CHAPTER 5

Meteorological years available for use under the review of the National Emission Ceilings Directive (NECD) and the Gothenburg Protocol

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This chapter justifies the choice of the five meteorological years available for use by integrated assessment modelling (IAM) under the revision of the NEC Directive and the Gothenburg Protocol. The selected five years are 1996, 1997, 1998, 2000 and 2003.

These years have been selected because of their climatological representativity over the last 30 years and with regard to feasible meteorological situations predicted for 2020-2030. The analysis of meteorological variability has been based on 9-year calculations from the Unified EMEP model, 33-years results from the EU-NEPAP project, using the MATCH model, and selected results from future climate estimates from IPCC 4^{th} assessment. For these five years, transfer relationships for use in integrated assessment modelling (IAM) have been calculated with the Unified EMEP model. The reasoning behind the choice of these particular 5 years is explained below.

5.1 Introduction

The transfer of air pollution from one country or region to another is dependent on the meteorological conditions and vary considerably from year to year. This is because meteorological conditions affect all stages in the lifetime of pollution in the atmosphere from its emission to air transport, chemical transformation and removal by precipitation and dry deposition.

For ozone, yearly air concentrations over Europe may change by 5-10% due only to changes in meteorology. These changes are comparable to those expected from reductions in precursor emissions over the next decades and therefore changes in meteorological conditions need to be considered when future air quality scenarios are analysed.

Similarly, inter-annual meteorological variability can impose changes in the deposition of acidifying and eutrophying compounds of about 10-20%. The effect of meteorological variability in particulate matter concentrations in air ($PM_{2.5}$) is even larger, generally by 15-25%. Current legislation plans presently suggest that over the next decade, we can expect a reduction of $PM_{2.5}$air concentrations in Europe by 25-35%. Thus, meteorological variations are also significant for particulate matter and depositions and need to be included in Integrated Assessment Modelling (IAM) when future emission reduction scenarios are analysed.

The inclusion of meteorological variability in IAM is usually done through the introduction of transfer relationships calculated for different years.

During the negotiations for the NEC directive and the Gothenburg Protocol, back in 1998, transfer relationships for 10 different years were available for use in the IAM framework for the study of acidification and eutrophication and 5 different years were available for the study of ground-level ozone.

For the present revision of the NECD and the Gothenburg protocol, 5 different years with transfer matrices can be envisaged. This is due to the time constrains for the revision and the complexity of the new EMEP transport model used to derive the transfer relationships that translates into extensive time requirements for the computer calculations.

The selection of the 5 different meteorological years has to be made with respect to the following requirements:

1) The first requirement is that the necessary meteorological input is available in a form that can be used by this EMEP Unified model.

2) The second, and most relevant, requirement is that the selected five years should provide a reasonable representation of typical meteorological conditions over a longer period and provide a good estimate of the expected meteorological conditions over the next two decades.

5.2 Analysis of the meteorological variability of different pollutants over 9-years

The meteorological variability of different air quality indicators has been analyzed for 9 different years with results from the Unified EMEP model (Simpson et al. 2003). The model has been run with the same emissions for 9 different meteorological years, corresponding to the period between 1995 and 2003.

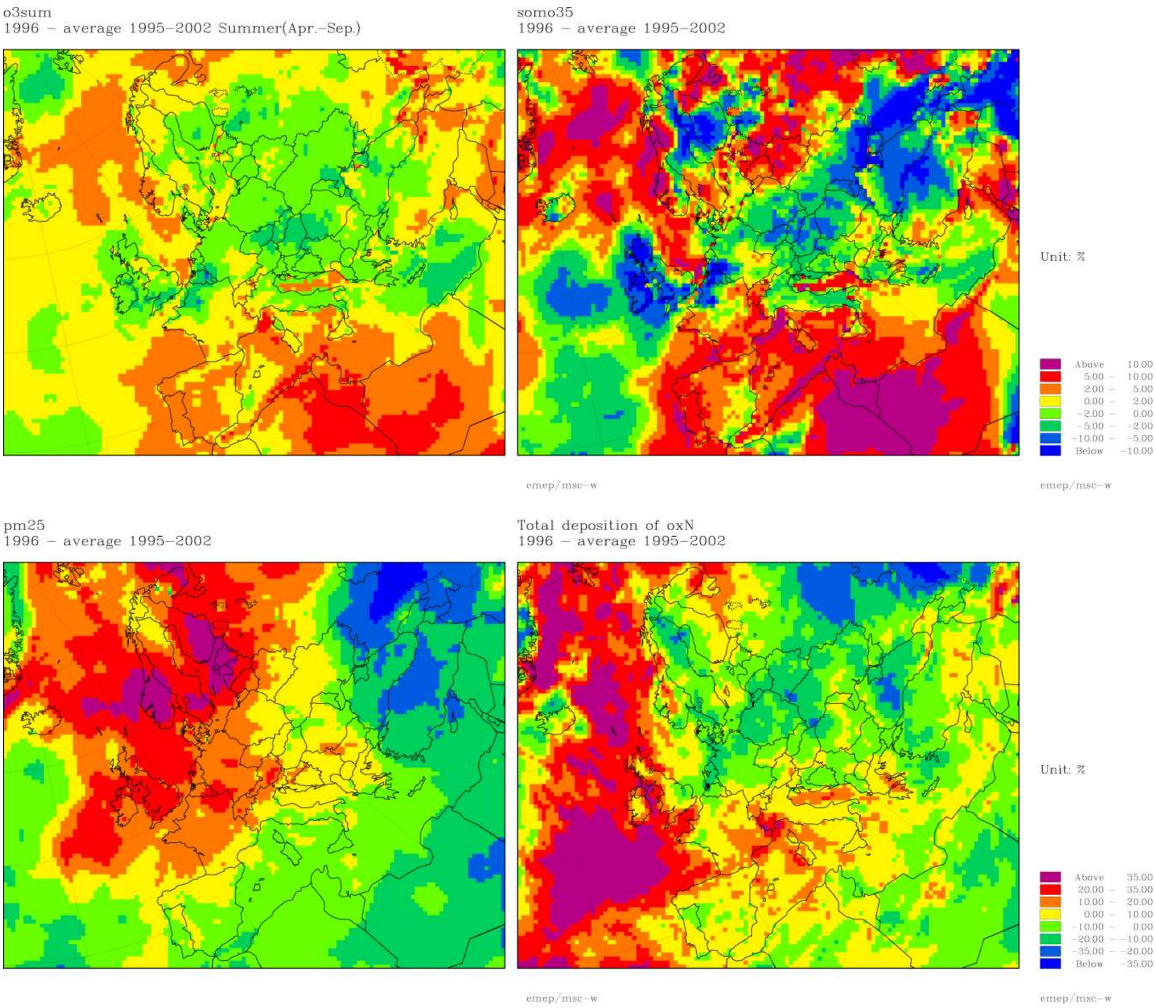

Figure 5.1: Relative changes in summer mean ozone (upper left panel), SOMO35 (upper right panel), $PM_{2.5}$ concentrations (lower left panel) and total deposition of oxidized nitrogen (lower right panel) due to the meteorological conditions of 1996. Note that the influence of meteorological variability is significantly different for the different air quality indicators.
Units: % of the 1995-2002 averaged values.

The meteorological variability has then been calculated in terms of the bias, that is, the percentage variations of air quality values for one specific year with respect to the averaged values. The averaged values have been calculated as a mean for the 8 years between 1995 and 2002. The year 2003 has been excluded from the mean averages because it was seen to have a different behavior than the other years, giving rise to higher concentration of air pollutants.

For all years analyzed, the impact of meteorological conditions is different for the different pollutants and air quality indicators under consideration. Figure 5.1 shows an example for the year 1996.

For ozone, concentrations can change by 5-10% in most European regions due to meteorological conditions only. It is interesting to note that the summer ozone mean (April to September) is usually more robust to meteorological variations (below 5%) than the sum of ozone means over 35ppb (SOMO35) which shows a slightly larger variability (between 5-10%). This is to be expected as any statistic based on the exceedance of a threshold value is more sensitive to meteorological variability than a non-threshold indicator. In fact, the higher the threshold is, the closer we get to the tail of the statistical distribution of ozone, and the larger is the sensitivity of the indicator to meteorological changes.

Changes in the meteorological conditions impose variations also larger variations in the yearly distribution of particulate matter ($PM_{2.5}$) and deposition of acidifying and eutrophying compounds than for ozone. These changes are usually about 10-20% of average conditions and are higher for concentrations in air than for depositions.

While ozone is mostly determined by temperature, cloudiness, relative humidity, radiation and wind flow conditions, the distribution of particulate matter is also significantly determined by the precipitation fields. The inter-annual variation of precipitation is considerable and subject also to large spatial variability. The changes in precipitation affect in turn the concentrations of $PM_{2.5.}$ and the distribution of sulphur and nitrogen accumulated deposition. This implies that areas with high ozone variability do not necessarily correspond with areas with high variability of $PM_{2.5.}$. There are in fact some areas where meteorological warm and wet conditions in combination with photochemical reactions can contribute to an anti-correlation between ozone and $PM_{2.5}$.

Figures 5.2 and 5.3 show the relative changes in SOMO35 and $PM_{2.5}$ air concentrations for each of the 9 years available for model calculations. It can be seen that both 1997 and 1998 are generally close to the 8-year average over most European land areas, while 2000 appears as a *cold* year with low ozone levels in western Europe and *warm* year with high ozone levels in central and northern Europe.

Since 2000 is a reference year for the CAFE program, this year was selected to be included for the calculation of the transfer calculations for integrated assessment modelling. That imposed the inclusion of 1996 as a complementary meteorological year, where the meteorological conditions favor the occurrence of higher ozone and $PM_{2.5}$concentrations in Western Europe. The selection of these four years thus allows the analysis of a representative average for the selected 8-year period. As noted in Figures 5.4 and 5.5, changes in SOMO35 and $PM_{2.5}$ with respect to the 8-year average are smaller for the average of the 4 selected years than for any of the individual years.

The year 2003 requires special attention, as already indicated in Figures 5.2 and 5.3, where both ozone and $PM_{2.5}$ are shown to be particularly high under this year's meteorological conditions.

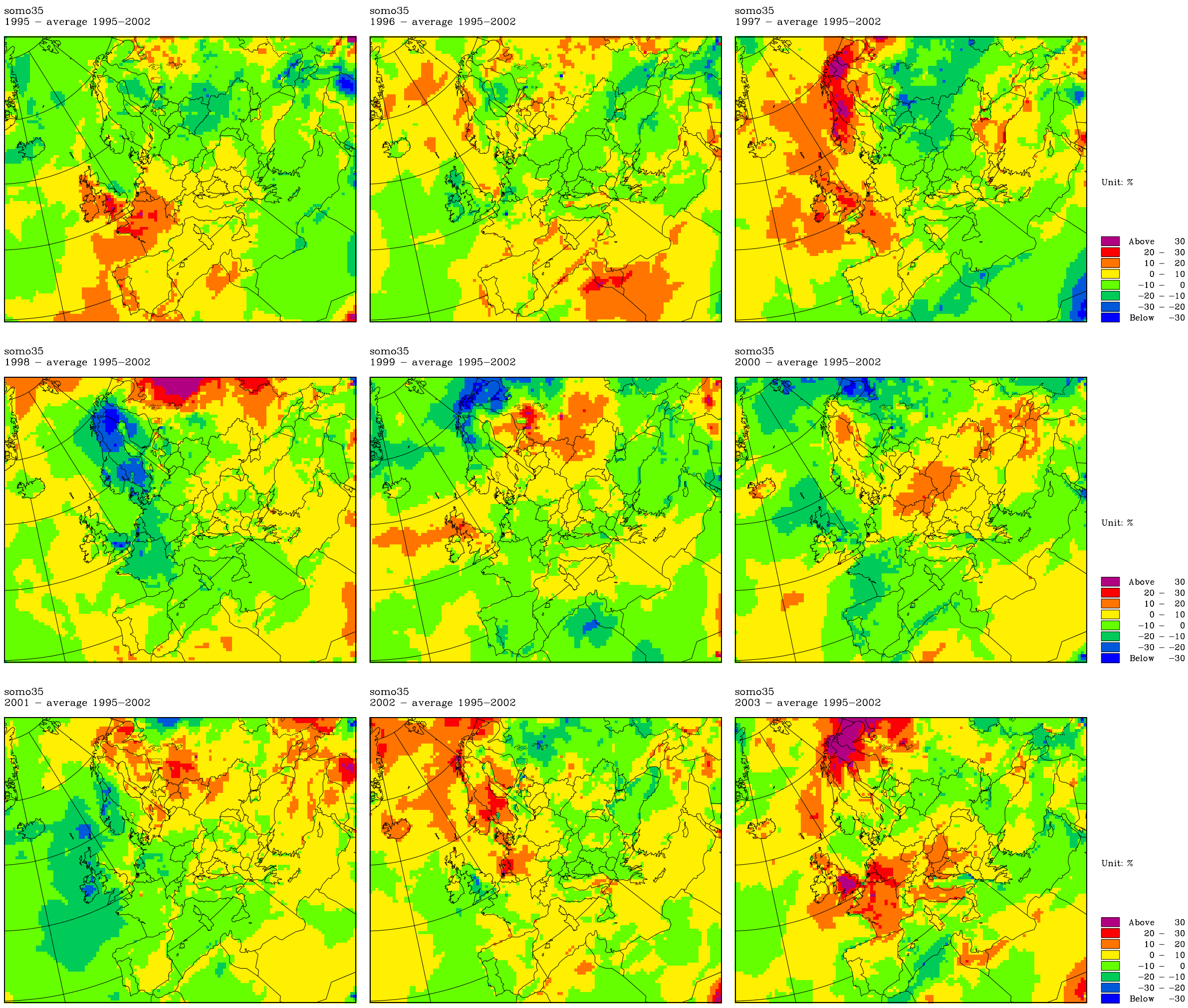

Figure 5.2: Relative changes in SOMO35 due to meteorological conditions. Maps are presented for 1995 to 2003 and calculated with the Unified EMEP model.
Units: % of the 8 year average from 1995 to 2002.

5.3 Climatological characterisation of 1996, 1997, 1998 and 2000

In order to determine to what extent the selected four years are climatologically representative over a longer time period, results from the EU-NEPAP project (Network for the support of European Policies on Air Pollution) have been considered here. In NEPAP, the Swedish Meteorological and Hydrological Institute (SMHI) has carried out a series of 33 years of air pollution transport calculations, from 1970 to 2003. The calculations have used the MATCH chemical transport model (Robertson et al., 1999, Langner et al. 2005, Solberg et al. 2005; further details and references regarding the

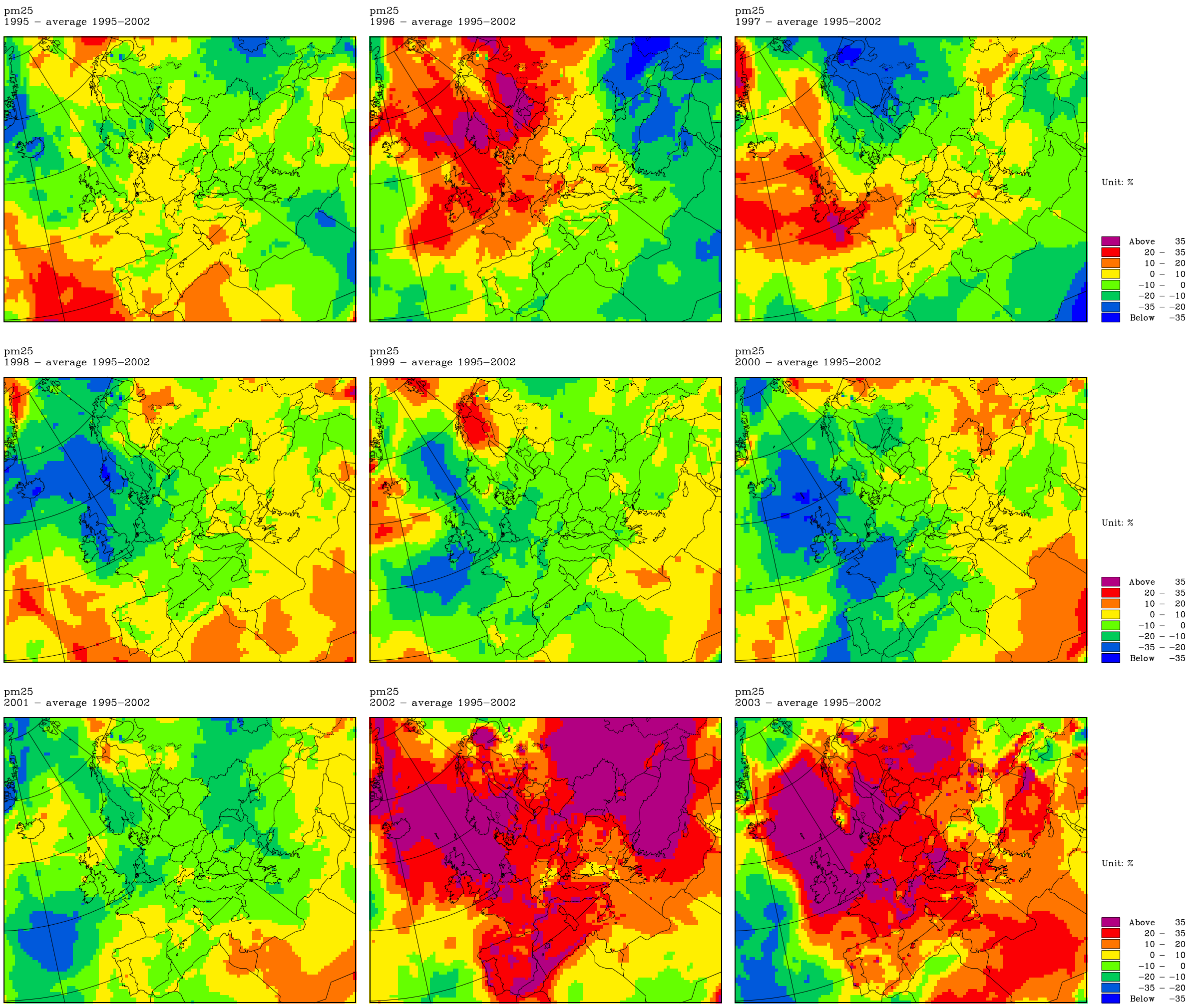

Figure 5.3: Relative changes in $PM_{2.5}$air concentrations due to meteorological conditions. Maps presented for 1995 to 2003 and calculated with the Unified EMEP model. Units: % of the 8 year average from 1995 to 2002.

MATCH model can be found at `http://www.smhi.se/sgn0106/if/FoUl/en/index.html`).

Meteorological input data at six-hourly intervals were taken from the ERA40 (Uppala et al. 2004a; Uppala et al. 2004b) reanalysis dataset at ECMWF. For the period September 2002 to the end of 2003 operational meteorological data from the ECMWF (European Centre of Medium-range Weather Forecasts) were used as input to MATCH since the ERA40 dataset only covers the period 1958 to August 2002.

Anthropogenic emissions for the simulations were derived from the emission data provided by EMEP MSC/W. The EMEP expert emissions (Vestreng 2003, Vestreng et al. 2004) for 2000 were used in the MATCH model calculations for all years. Chemical boundary conditions were also set identical for all years.

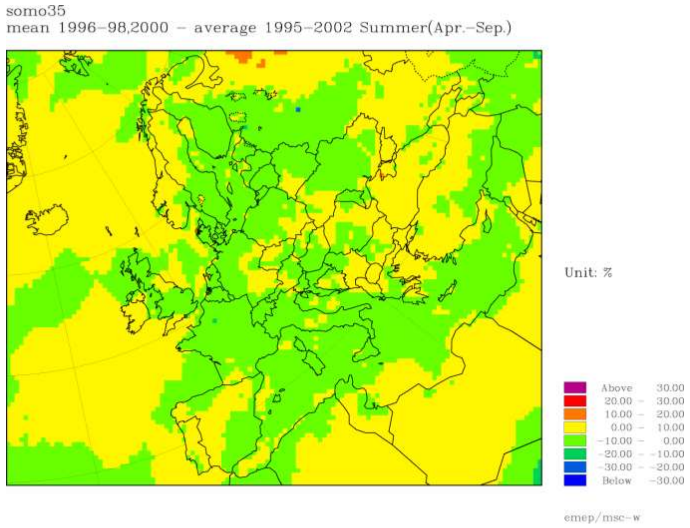

Figure 5.4: Relative changes in SOMO35 for the average values of the four selected years: 1996-1998, 2000. Note that changes in SOMO35 with respect to the 8-year average is smaller for the average of the 4 selected years than for any of the individual years.
Units: % of the 8-year average from 1995 to 2002.

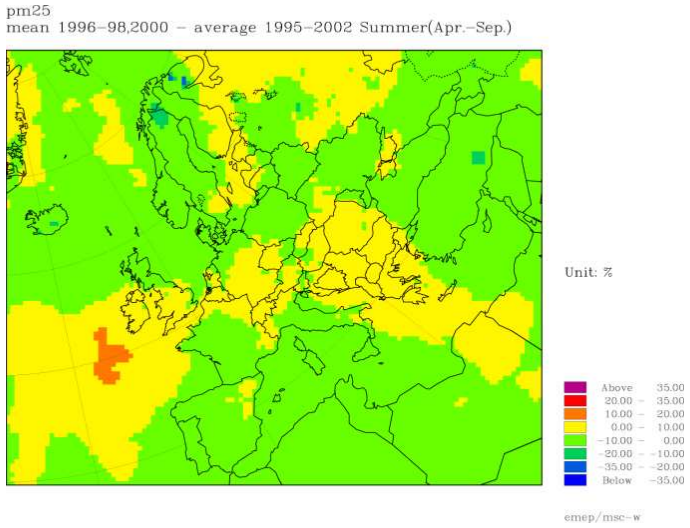

Figure 5.5: Relative changes in $PM_{2.5}$ air concentrations for the average values of the four selected years: 1996-1998, 2000. Note that changes in $PM_{2.5}$with respect to the 8-year average is smaller for the average of the 4 selected years than for any of the individual years.
Units: % of the 8-year average from 1995 to 2002.

The calculated ozone concentrations for 1996, 1997, 1998, 2000 and 2003 have been compared to a 32-year average from 1970 to 2002. Again, 2003 has been excluded from the average not to bias the results.

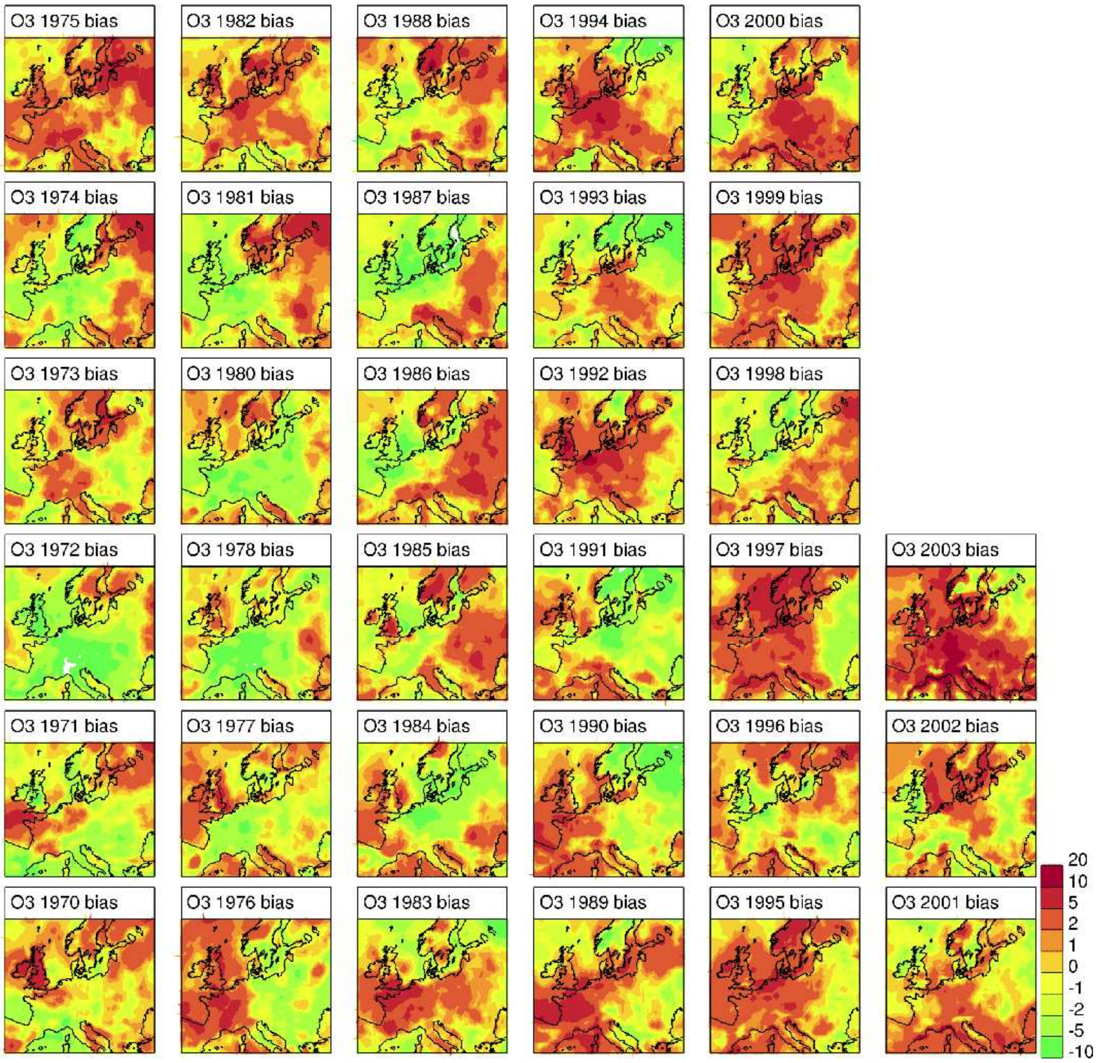

Figure 5.6: Calculated variability in mean summer (April-September) ozone concentrations 1970 – 2003. The relative difference for each year is compared to the average concentration for the years 1970 – 2002.
Unit: % of the 1970-2002 average concentration (NEPAP calculations).

Figure 5.6 shows the variability of mean summer ozone (April to September), due to meteorological variability from the MATCH calculations. It is interesting to note that the bias in summer mean zone calculated with respect to the 32-year average in the MATCH model is similar across Europe to the bias calculated for the last 8 years with the EMEP model. This confirms the robustness of the results. It is also reassuring that the bias in summer ozone for the average meteorological conditions of the four selected

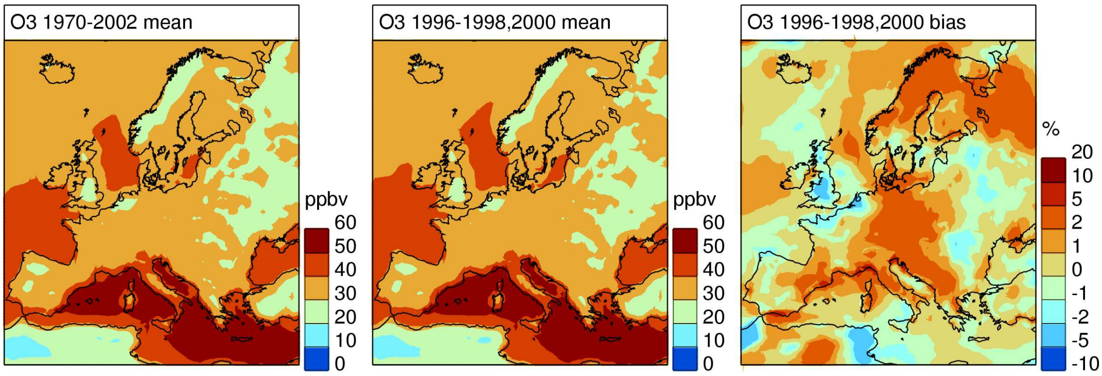

Figure 5.7: Mean summer ozone concentrations calculated with the MATCH model. Left: Average for the years 1970-2003 [ppb(v)]. Centre: Average for the four years 1996, 1997, 1998 and 2000 [ppb(v)]. Right: Relative difference of the 4-year mean (1996-1998, 2000) compared to the 1970-2002 mean [%].

years is usually below 5% (as illustrated in Figure 5.7, where the actual averages of summer ozone means for the different periods are also depicted).

The NEPAP project also analysed the meteorological variability for other ozone indicators, in particular, AOT40 and the number of days with exceedance of the 8-hour average above 60ppb. The results show that the sensitivity to meteorological conditions increases with the threshold level chosen for the indicator. So again, summer mean ozone is less sensitive to the variations in meteorological conditions (usually with bias below 5%) than the AOT40 indicator (larger than 10% variability due to meteorology). The number of days with exceedance of the 8-hour average above 60ppb is the ozone indicator showing the largest variability with the meteorological conditions. Comparison with the results from the previous section indicate also that SOMO35 seem to be more robust to meteorological variations than AOT40, as expected.

5.4 Inclusion of 2003 as extreme year?

The meteorological conditions of 2003 give variations in the air quality indicators that are larger than for any of the previous years calculated either with the Unified EMEP or the MATCH models. These extreme 2003 meteorological conditions result in mean summer ozone concentrations 5% higher than average, SOMO35 values about 10% higher, air concentrations of particulate matter also higher (about 35-50% higher) and depositions generally 20% lower.

2003, and to a certain extent also 2002, are extreme years with respect to past European climatology, with very high summer temperatures over Central Europe. The summer temperatures in Central Europe exceeded in 2003 the latest 30 year average by $\sim 3^{o}$C. The 2003 situation is characterised by the extension of the semi-arid conditions from Mediterranean regions and the presence of persistent anti-cyclonic systems over central Europe. It is interesting to note that the presence of the large scale high pressure systems in Central Europe develops drought conditions over the area and has a tendency to amplify non-linearly amplify local temperature anomalies. The increase in local temperature anomalies in 2003 is also seen in Figure 5.8 where the temperature bias is shown for six different years at the end of the 1990s, as calculated by the HIRLAM numerical weather prediction model.

The 2003 air surface temperature anomaly is about 1^{o}C over the whole of Europe, reaching considerable higher in particular areas. A general mean temperature increase over Europe by 2-3^{o}C is predicted by most future climate models as response to greenhouse gas forcing. Langner et al. (2005) use the Rossby Center regional atmospheric climate model to drive their chemical transport model MATCH, with boundary conditions by the Hadley Center and the Max Planck global climate models. Using the IPCC IS92a (business as usual) scenario, both global climate models predict an increase of global mean temperature by 2.6^{o}C to be reached by 2050-2070. Simulations from other global climate models can give estimates also for closer time ranges. For instance, under the SRES A2 greenhouse gas emission scenario, the GDFL model predicts an anomaly in surface temperature over Europe by 1-to 1,5^{o}C when comparing prediction for 2020-2029 with calculations for present conditions (1980-1999). This is illustrated in Figure 5.9. Such increase of mean temperature by 1-1.5^{o}C over particular regions in Europe in 2020-2030 is also predicted by the Max Planck climate model under the IPCC IS92a scenario (Hanssen-Bauer et al, 2003).

Not only the mean temperature over Europe is expected to increase in the future, also the variability of temperature distributions is expected to increase.

A recent study by Schär et al (2004) shows how we can expect an increase in the inter-annual variability of European climate conditions in response to greenhouse gas forcing. Using simulations from two global Hadley Centre climate models and a regional limited area climate model, the authors show that the increase in mean temperature is also associated to an increase in the standard deviation of the statistical distribution of temperature (see Figure 5.10). This means an increase in the probability of occurrence of extreme years relative to mean climatic conditions. Even with a small mean temperature increase, the climate model simulations using the SRES A2 greenhouse gas scenario suggest that, toward the end of this century, about every second summer could be as warm and dry in central Europe as 2003.

5.5 Consequences for future control strategies

The effect of meteorological variability in air pollution levels might mask the benefits of emission reductions. In fact, during the last two decades, we have already experienced how measured ozone levels have remained relatively unchanged despite documented reductions in the emissions of ozone precursors (Løvblad et al. 2004; Jonson et al. 2005). The reasons for this are mixed and require still further studies, but it is generally accepted that they related to large meteorological variability and increases

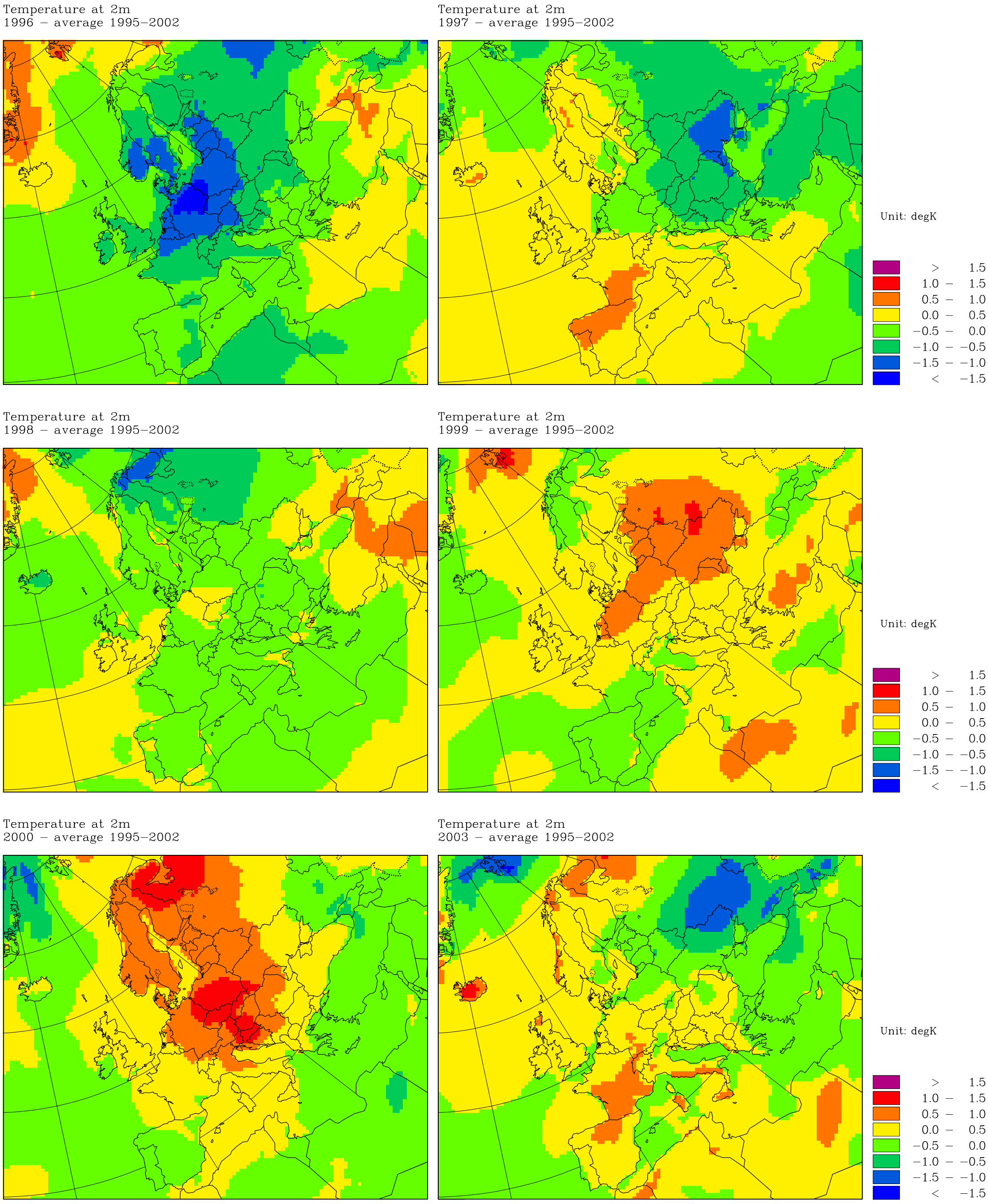

Figure 5.8: Mean temperature anomalies for 1995, 1996, 1997, 1998, 2000 and 2003 from averaged mean temperatures in the 8-year period 1995-2002, calculated with the HIRLAM NWP model. Note the increase in local scale temperature anomalies in 2003. Unit: ^{o}C

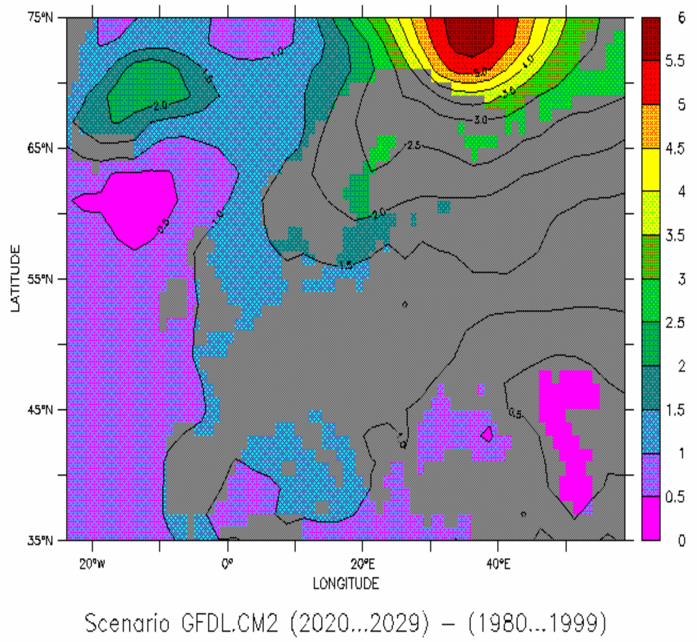

Figure 5.9: Calculated increase in annual mean temperature in 2020-2029 as compared to the 1980-1999 mean. Calculations with GDFL climate model using SRES A2 scenario.

in tropospheric background ozone levels.

In this section, we compare the changes in SOMO35 and in the air concentrations of $PM_{2.5}$ due to projected emission reductions with expected changes due to expected meteorological variability. For a particular meteorological year, Y, the changes in air concentrations due to emissions reductions have been calculated according to:

$$\Delta \text{emis}_{ij}^{Y} = |q_{ij}^{2020,Y} - q_{ij}^{2000,Y}| \tag{5.1}$$

where 2020 emissions correspond to the CAFE-CLE scenario and the 2000 emissions correspond to the CAFE Baseline 2000 values documented in Appendix A. The effect of meteorological variability in the concentrations has been calculated as the maximum range of variation for the selected 5 meteor logical years, according to:

$$\Delta \text{met}_{ij}^{2020,N} = |\max(q_{ij}^{2020,n})_{n=1,N} - \min(q_{ij}^{2020,n})_{n=1,N}| \tag{5.2}$$

(Y=1997,2003, ij=points in EMEP grid, N=5 years:1996,1997,1998,2000 and 2003)

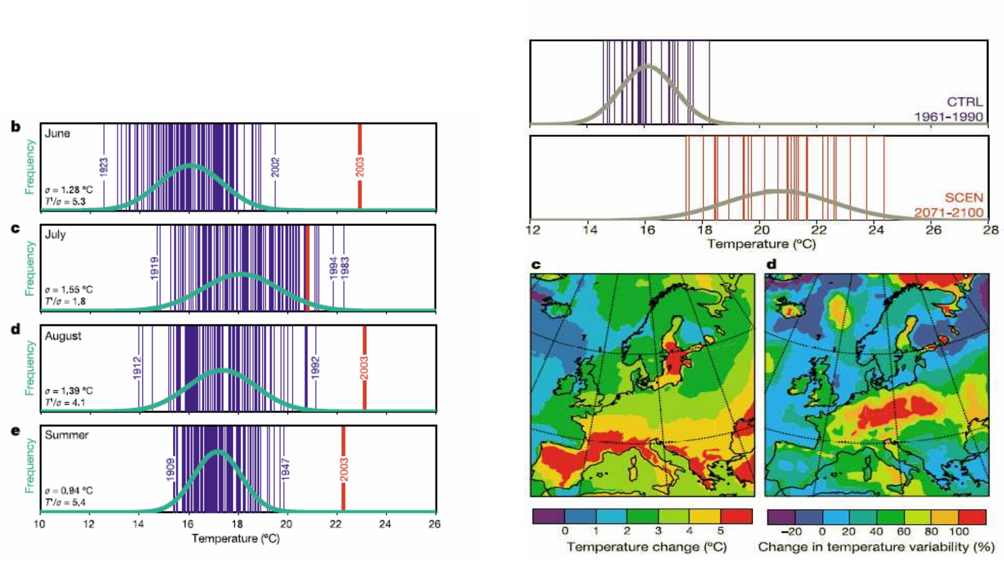

Figure 5.10: The left panel show the observed gaussian distribution of monthly and seasonal summer temperatures in Swiss stations for the period 1864-2003. The year 2003 is indicated in red. The right panel show climate model estimates for the same Swiss area representing the current CTRL) and future conditions (SCEN). Note the increase in standard deviations of the temperature distribution in future conditions (from Schär et al, 2004)

The relative importance of these expected changes has been compared in Figure 5.11. In red areas, projected emission reductions are likely to dominate in 2020 while in green areas, the effect of meteorological variability in air concentrations will be dominating. Note that there are large areas over Northern and Eastern Europe where meteorological variability is expected to be larger than the projected effect of emission reductions in 2020, both for ozone and for particulate matter.

5.6 Conclusions and recommendations

The meteorological years 1996, 1997, 1998, 2000 and 2003 have been selected for use in Integrated Assessment Modelling to support to review of the National Emission Ceilings Directive and the Gothenburg Protocol. These years have been selected in terms of their availability as input for transport model calculations, their climatological representativity over the last 30 years and with regard to feasible meteorological situations predicted for 2020-2030.

Of the meteorological years available to EMEP for chemical transport model calculations, 1997 and 1998 are the closest to averaged conditions for most air quality indicators. In particular, 1997 show relative low bias from the averaged $PM_{2.5}$ air

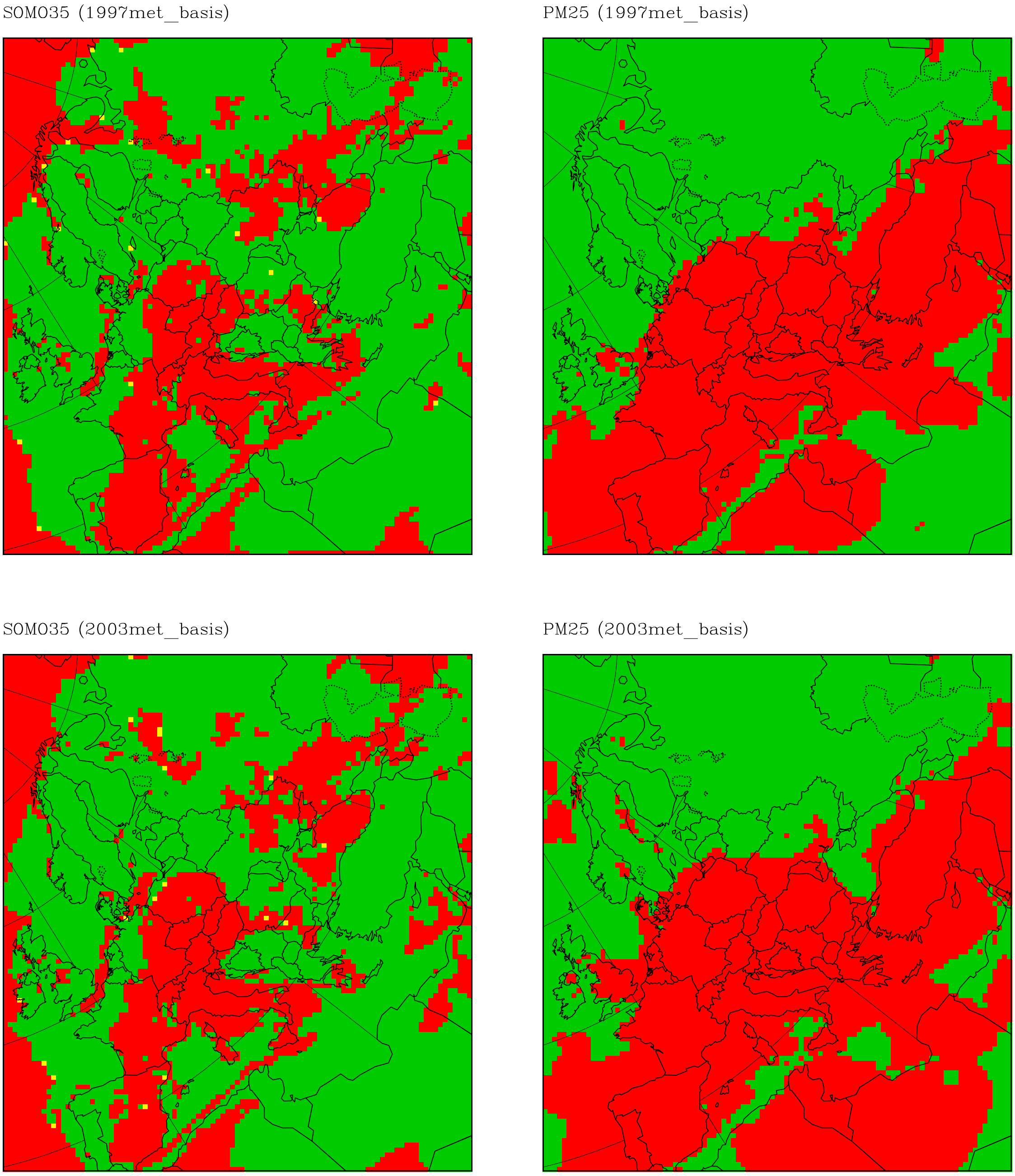

Figure 5.11: Relative importance of meteorological variability in 2020. In red areas, projected emission reductions are likely to dominate while in green areas the effect of meteorological variability in air concentrations will be dominating. Upper panel: SOMO35 and $PM_{2.5}$ with 1997 as meteorological basis year for emission variability. Lower panel: SOMO35 and $PM_{2.5}$ with 2003 as meteorological basis year for emission variability.

concentrations and depositions of acidifying and eutrophying compounds, for the last 8 years, while 1998 is a year close to average with respect to ozone levels in most European regions.

The year 2000 has been selected because it is the base year within the CAFÉ programme. The inclusion of this year in the calculations, making use of its actual meteorological conditions facilitates the validation of the results. In addition, 2000 represents an interesting meteorological situation, with predominance of warm high pressure systems during the summer over Western Europe and significantly colder conditions over Eastern Europe. The choice of year 2000 has determined in turn the choice of 1996 as the fourth selected meteorological year. 1996 represents a somewhat complementary situation from 2000, with cold and dry summer situations over Western Europe that result in high PM2.5 concentrations.

These four years have been thus selected so that their average is closer to averaged meteorological conditions than any individual year and that is the case for all air quality indicators. So, for instance the four year averaged $PM_{2.5}$ air concentrations (1996-1998, 2000) are generally over Europe below 10% difference from longer time averaged values and the summer ozone bias is below 5% difference from the 32-year average from 1970 to 2002.

In addition, 2003 has been selected to represent larger variability situations.Current understanding on future climate situations indicates that these meteorological conditions would be more probable in the next 20-30 years and are expected to be within the statistical normal variability by 2070-2100. In order to allow a possible investigation of the consequences of such extreme weather situation in 2020-2030, transfer matrices for 2003 will also be available for IAM under the revision of the NECD and the Gothenburg Protocol.

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CHAPTER 6

Meteorological variability in source allocation: Transboundary contributions across Europe

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This Chapter quantifies the effect of meteorological variability in source-receptor calculations. An overview of the average indigenous and transboundary fluxes is presented and the meteorological variability of the individual country contributions is also analysed here. The SR calculations used in this study have been carried out for five meteorological years, as selected in Chapter 5, using CLE-2010 emissions. The data from the runs with the CLE-2010 emissions is to be provided to IIASA for further use in the EU CAFE-BASELINE project (Amann et al. 2004) and form also the basis for the SR matrices provided in Appendix B.

An additional set of SR runs has been performed for the specific chemical and meteorological conditions of 2003. This second sets of SR runs forms the the basis for the country-specific data reports that, similarly as last year, accompany this main report (Klein et al. 2005). This set of SR runs forms the basis for SR matrices provided in Appendix C.

6.1 Introduction

Source-receptor (SR) matrices give the change in various pollution levels in each receptor country (or grid square) resulting from a change in anthropogenic emissions from each individual emitter[1]. Such matrices are generated by reducing emissions for each emitter of one or more precursors by a given percentage (15% in this case), running the EMEP model with these reduced emissions, and comparing the resulting output fields with the base simulation, i.e. a simulation without any emission reduction. The reason for this procedure is to keep the chemical conditions as close to the original conditions as possible.

The present SR calculations involve changes in emissions of the following six pollutants: SO_x, NO_x, NH_3, NMVOC, PPM_{fine} (fine primary particulate matter) and PPM_{coarse} (coarse primary particulate matter). Hence, in order to compute SR matrices for each pollutant separately, for each emitter in principle six simulations need to be performed. Since primary particulate are assumed inert, they will not interact with any of the other components in the model and vice versa. The effect of a reduction in emissions of PPM_{fine} and PPM_{coarse} can therefore be computed together with a change in the emissions of any of the other pollutants. This means that the number of simulations per emitter can be reduced to four. For one set of SR matrices (i.e. one meteorological year and set of emissions) about 200 different model simulations are needed. In the past year, six of such sets have been produced for various purposes, involving about 1200 different model simulations! On the fastest available platform, each simulation takes between 4 and 5 hours, using 36 processors. For all the computations discussed in this chapter model version rv2_0_10 was used.

In this chapter the joint effect of changes in all pollutant emissions mentioned above is considered. This joint effect is obtained by summing up the computed SR relationships that have been calculated for each pollutant separately. Due to non-linearities, this sum of the individual SR relationships is not exactly equal to the SR relationship obtained by changing the emissions of the six pollutants at the same time. For details and an analysis of the size of this effect, we refer to chapter 4 in Tarrasón et al. (2004). For the purpose of this chapter, the effects of the non-linearities are assumed to be not large enough to disturb the overall picture.

The SR calculations also include the changes in concentrations/depositions caused by changes (also of 15%) in:

NAT Natural marine sources

VOL Volcanic sources

BIC Includes all boundary and initial components except O_3.

Ozone is excluded from BIC for these runs because of its special importance and known high contribution to indices such as AOT40 and SOMO35. When reducing SO_x ”emissions” from BIC, the values of the boundary and initial conditions of both SO_2 and SO_4 are reduced by 15%. Similarly, for reducing NO_x ”emissions” all compounds containing nitrogen oxidized are reduced and for reducing NH_3 ”emissions”

[1] In order to keep terminology simple, with emitter in principle all entries listed in Table 1.1 are meant, including boundary conditions (BIC).

particulate ammonium is reduced, since boundary and initial conditions for NH_3 itself are zero. For NMVOC simply all boundary and initial conditions for the NMVOC species in the model are reduced.

This chapter contains results and analyses of SR calculations that have been performed for five meteorological years (1996, 1997, 1998, 2000 and 2003) using 2010 CLE emissions. The values in the SR tables in Appendix B are average values over those five years. An analysis of the transboundary and indigenous contributions, averaged over these five years, is given in Section 6.2, while a discussion on the meteorological variability for these years is provided in Section 6.3.

In addition SR calculations for the meteorological year 2003 have been performed using emissions for the year 2003. They form the basis for a series of country-specific reports (Klein et al. 2005) and will not be discussed in this chapter. SR tables based on these calculations are given in Appendix C.

6.2 Transboundary versus indigenous contributions

In this section an analysis of the SR results is given with respect to the transboundary and indigenous contributions. For this purpose, we consider the average SR results over the five meteorological years selected in Chapter 5 (1996, 1997, 1998, 2000 and 2003). An analysis of the meteorological variability of the SR results is given in section 6.3. For the meteorological years, SR results have been computed with exactly the same model input. The emissions are the CLE 2010 emissions as specified in Appendix A. Figure 6.1 shows the average transboundary contributions to all receptor areas for a number of components expressed as percent of the total computed contributions. There are large differences in the transboundary contributions for the different compounds. The bandwidth in Figure 6.1 is about 50%. Compounds with a long life time have longer traveling distances and hence larger transboundary contributions than compounds with a short life time. For instance, PPM_{coarse} has a very high deposition velocity and thus a short lifetime, resulting into low transboundary contributions. This holds to a lesser extent for PPM_{fine} because it has a lower deposition velocity than PPM_{coarse}. Deposition of RDN shows transboundary contributions of similar magnitude as PPM_{fine}, even though NH_3 is deposited very fast. A substantial part of the emitted NH_3 will however quite rapidly be converted into (particulate) ammonium, which has the same deposition velocity as PPM_{fine}. This explains why in most countries the percentage transboundary contributions to deposition of RDN are similar to those to PPM_{fine}.

In addition, for components like PPM_{fine} and PPM_{coarse} that are directly emitted, another effect plays a role. Suppose that in a given country a certain amount of PPM mass is emitted and that this country imports an equal amount of mass. These equal contributions in terms of mass may result in very unequal contributions in terms of concentrations of PPM in air at surface level. The contributions to concentrations in air mainly depend on how well the emissions have been mixed vertically, which is in

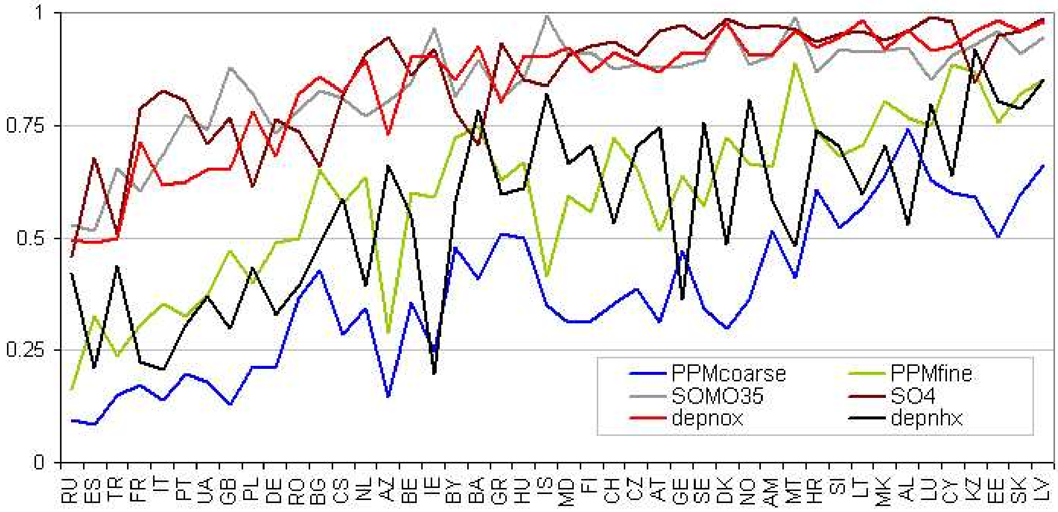

Figure 6.1: Average transboundary contributions for various components in % of the total calculated contribution.

turn mainly dependent on the transport distance. Hence, primary emissions will soon largely determine the concentrations in air of primary components at surface level, particularly in emission areas.

Much higher transboundary contributions are observed for secondary components that are formed from precursors through chemical and other processes. For example, in order to obtain SO_4, its precursor SO_2 needs to be oxidized. This process takes time and the emitted SO_2 has traveled already some distance before it is fully oxidized. Emission of SO_2 in a country will therefore not immediately lead to a contribution to SO_4 in that country. This explains why in the smaller countries around 90% of the SO_4 originates from outside the country, implying only a 10% indigenous contribution. Most of the emitted sulphur in these countries will still be present in the form of SO_2. For the larger countries the transboundary and indigenous contributions are about 75% and 25%, respectively. For O_3 (SOMO35) and deposition of OXN a similar reasoning as for SO_4 can be given: 'fresh' precursors do not immediately result into a contribution to secondary products like O_3 and particulate and gaseous nitrate. This explains why the transboundary contributions to SOMO35 and deposition of OXN in percent of the total contributions are similar to those of SO_4 in Figure 6.1. Even the largest countries have transboundary contributions over 50%, underlining once more the transboundary character of air pollution.

The countries in Figure 6.1 are sorted in ascending order according to the average transboundary contributions over the components. As has been explained above, there is a general relationship between the size of the country and the size of the transboundary contributions. Other factors influencing the relative size of the transboundary contributions are the location of the country and the source strengths. The latter is ob-

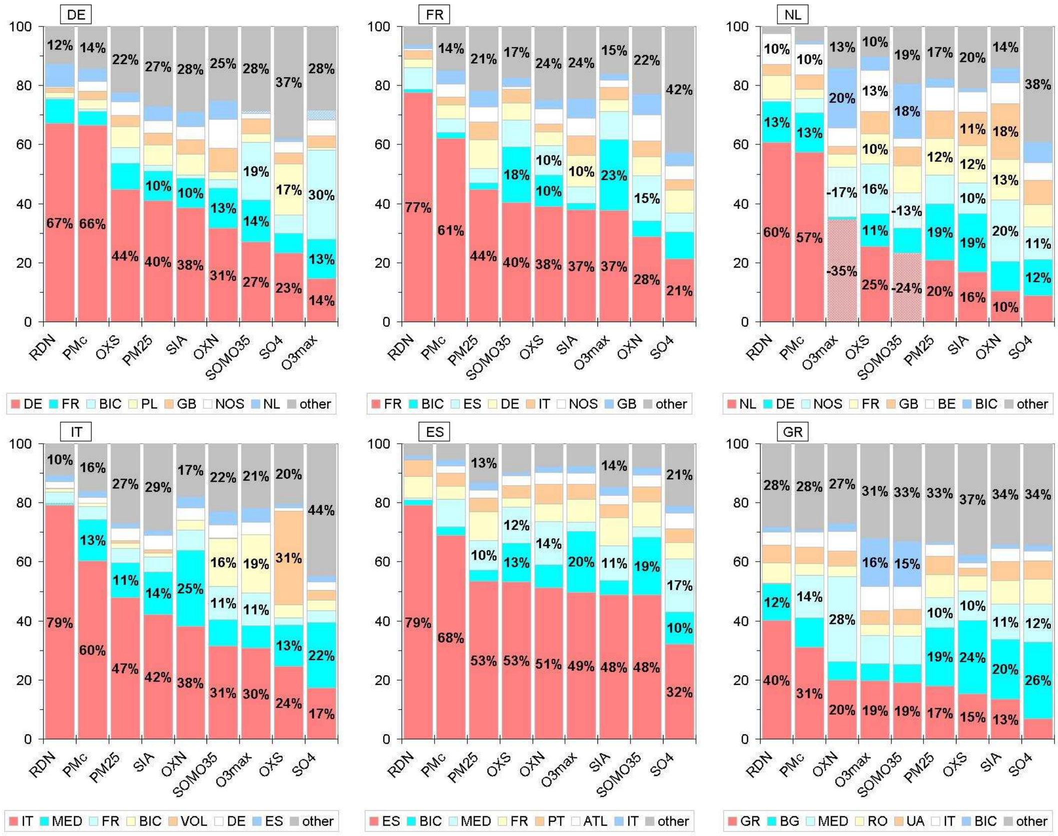

Figure 6.2: Average contributions to a number of pollutants in a few countries, expressed as percent of the total sum of contributions. Units: %.

vious: if a country - as an extreme case - is not emitting at all, all pollution will be transboundary, regardless the size of this country. The location of a country plays also a role. A country that has no direct emitting neighbours will have a lower transboundary share than a country of the same size and with similar emission strengths that has direct emitting neighbours. Also the meteorological conditions influence ratio between indigenous and transboundary contributions. For instance, on the Iberian peninsula often flow patterns occur that cause the pollution to circulate in the area. This explains for example why Spain has relatively low transboundary contributions.

The Figures 6.2 and 6.3 show the average contributions in percent for a number of countries and pollutants. The plots are averaged over the five meteorological years and the computed contributions per component are added up using absolute values and negative contributions are indicated by a dotted fill pattern. Negative values occur when a reduction in emissions in a country results into an increase in a pollutant due to non linear chemical processes. In some areas a decrease in NO_x emissions may lead to an increase in ozone, and as a result negative SR values for SOMO35 and O3max can arise. For the other pollutants considered here, negative contributions play hardly a role. For each country the indigenous contributions and the six largest transboundary

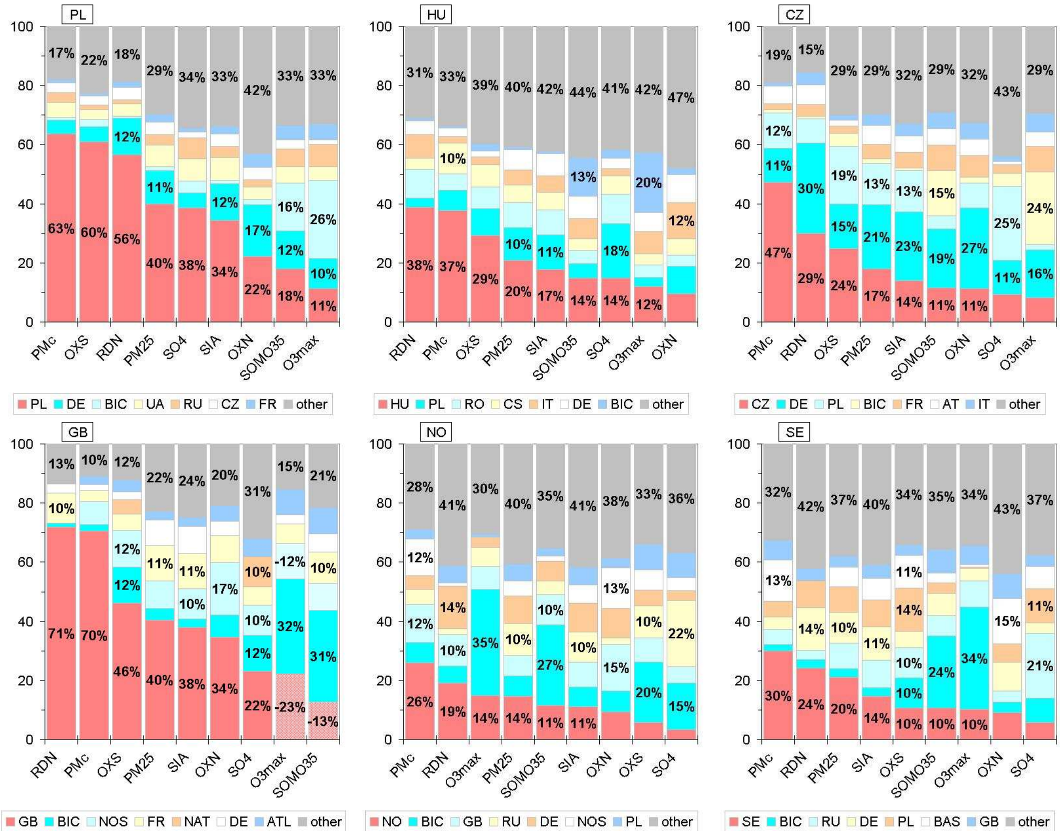

Figure 6.3: Average contributions to a number of pollutants in a few countries, expressed as percent of the total sum of contributions. Units: %.

contributions (averaged over the components) are shown, the remaining contributions are added up and are represented by "others" in the plots. For the countries and pollutants shown, the indigenous and six largest transboundary contributions are, with a few exceptions, responsible for 60% or more of the total computed contributions. The Figure 6.2 and 6.3 also clearly show that the contributions from the different contributors may vary over the components. A certain contributor in a given country may be responsible for a large share with respect to one pollutant and a low share with respect to another.

6.3 Meteorological variability of SR calculations

In this section, the influence of different meteorological conditions on the SR results is investigated using the SR results for the five meteorological years. The first four of the five meteorological years are chosen such that the averaged values of various pollutions over those years are very close to the longer term average, see Chapter 5 for further details. In addition, the year 2003 was selected because this year was char-

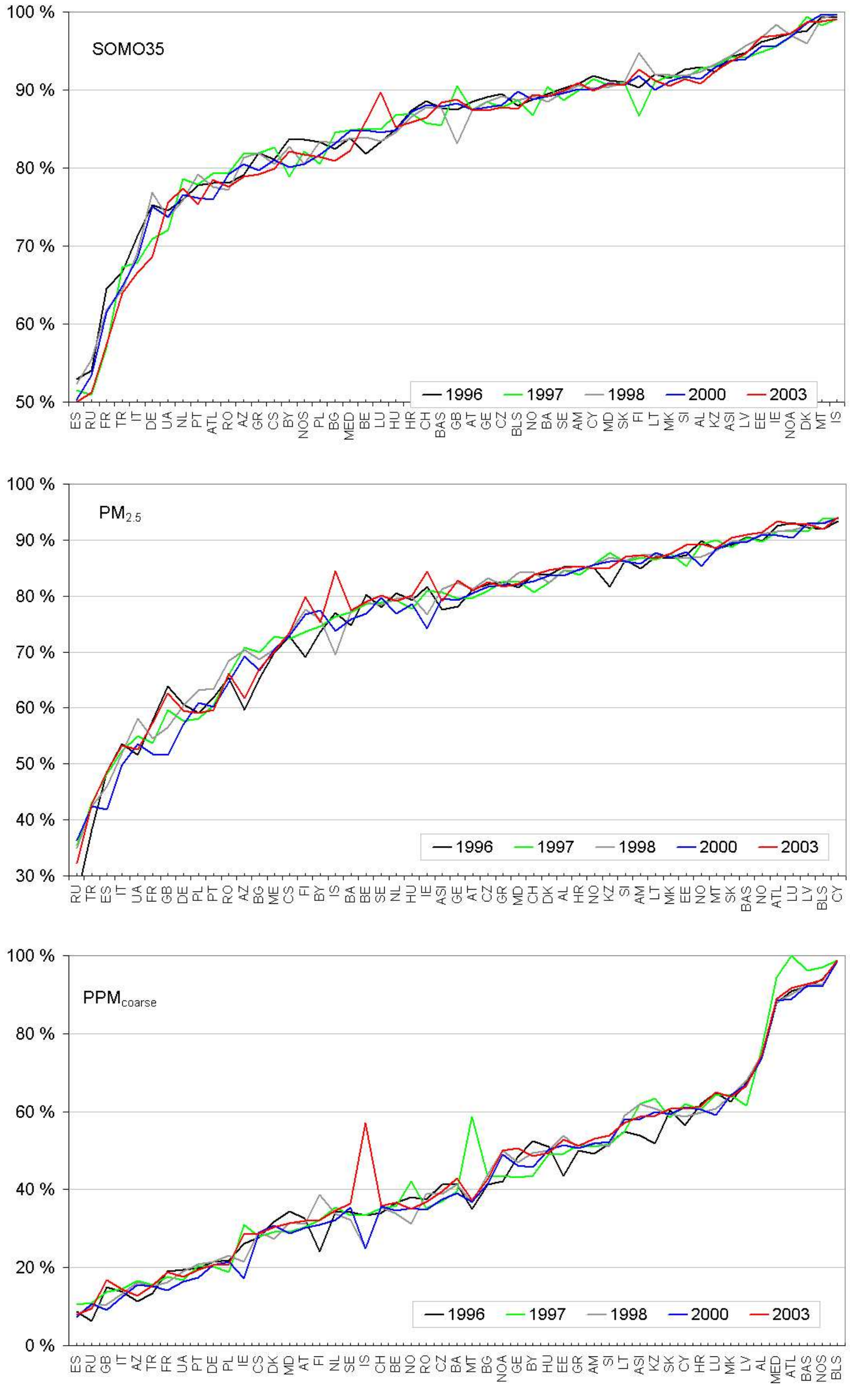

Figure 6.4: Variability in transboundary contributions for SOMO35, $PM_{2.5}$ and PPM_{coarse}.

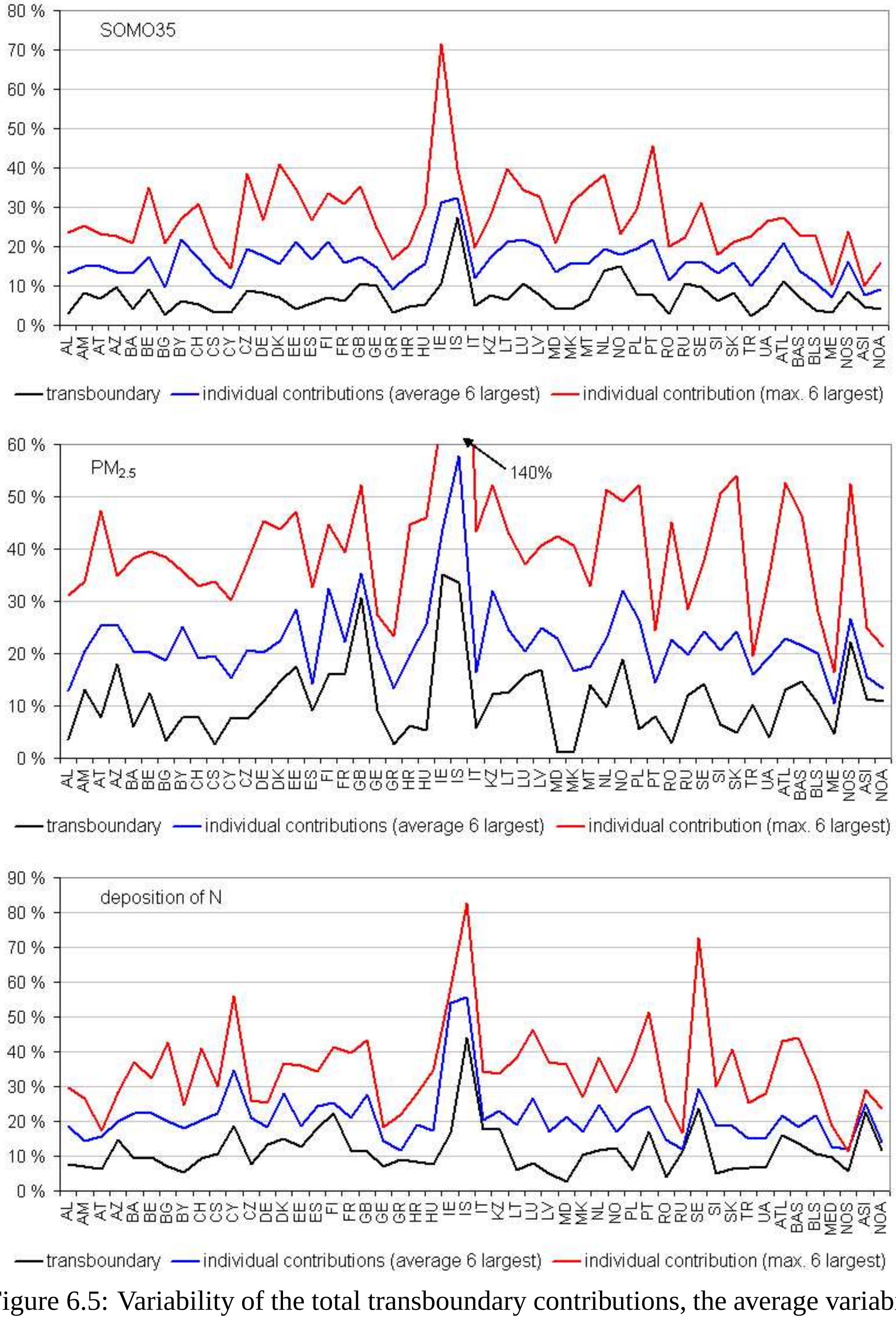

Figure 6.5: Variability of the total transboundary contributions, the average variability and the maximum variabily of the six largest contributors to SOMO35, $PM_{2.5}$ and deposition of N. Unit: %.

acterized by a large variability in meteorological conditions in large parts of Europe, especially during the summer months. A key question is to which extent different meteorological conditions influence the main characteristics of long-range transport and country-to-country pollutant exchange. Are the main contributors to a certain pollution component in a given country still the same and are the relative sizes of the contributions similar as in other years, or is a different behaviour observed? And how large are these changes?

In the remainder of this section, the variability in SR results due to meteorology is discussed. We will express this variability in terms of the relative standard deviation σ_X^{rel} of a quantity $X = \{x_{1996}, x_{1997}, x_{1998}, x_{2000}, x_{2003}\}$, being defined as

$$\sigma_X^{\mathrm{rel}} = \frac{\sigma_X}{\bar{X}}, \tag{6.1}$$

where $\bar{X}$ denotes the average over the values of X. The quantity X typically represents a transboundary contribution to a certain country, either the total transboundary contribution or an individual contribution from a given country. Often simply the term variability is used, instead of referring to the relative standard deviation. Also the term average variability will be used, which is simply an average over individual relative standard deviations.

6.3.1 Analysis on country level

The meteorological variability in the transboundary contributions is shown in Figure 6.4 for SOMO35, $PM_{2.5}$ and PPM_{coarse}, expressed as percent of the total calculated contributions. Generally, the variability is around 10%, which is of the same order of magnitude as the changes in projected emissions, implying already at this point that meteorological variability cannot be neglected in integrated assessment modelling.

Note that we consider only yearly averages here and that variations on shorter time scales (e.g. a month) may be larger. We also note that in Figure 6.4 the year 2003 does not show a different behaviour on a yearly basis compared to the other years. An additional reason why no large inter-annual variations in the transboundary contributions are observed is that most countries receive pollution from all wind directions, because all surrounding countries are emitters, though of course with different emission densities. Inter-annual variations in flow patterns will therefore not lead to drastic changes in the transboundary contributions.

For individual contributions, this is very different. The meteorological conditions affect to a large extent the contributions from individual countries to pollution in a certain area. This is illustrated by Figure 6.5, where the variability is shown for the transboundary contributions to SOMO35, $PM_{2.5}$ and N deposition. The average variability in the six largest contributors is around 20% for $PM_{2.5}$ and N deposition and somewhat lower for SOMO35. This is about 10% higher than the variability of the total transboundary contributions. Individual contributions have an even higher variability, as is indicated by the line showing the maximum variability over the six largest

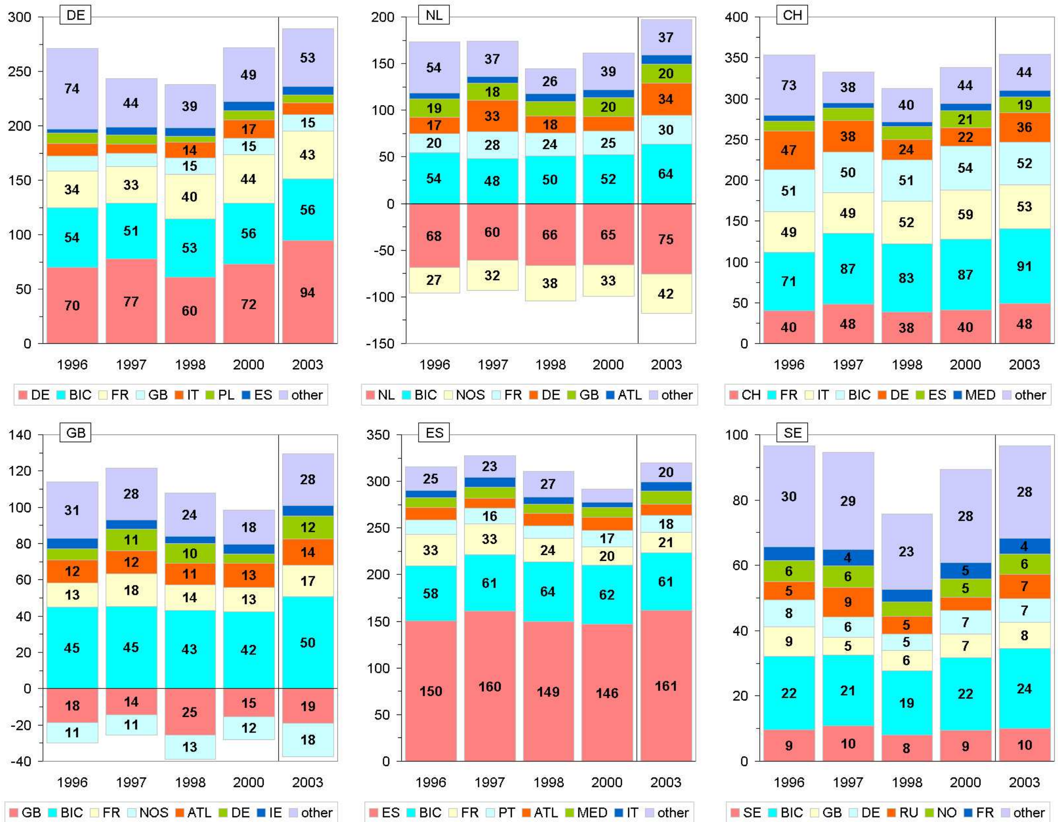

Figure 6.6: Main contributors to SOMO35 in a few countries. See text for further explanation. Units: ppb·d.

contributions. Considering the variability in contributions from all contributors is not meaningful because small contributions to the total will be highly variable. As shown before, the indigenous plus six largest transboundary contributions make up about 60% of the total, implying the remaining almost 50 contributions to make up 40%. Hence a lot of contributions are in the order of, say, 2% or lower and are highly variable, because generally speaking they concern contributions from large distances which can be imagined to be much more variable than contributions from nearby. The Figures 6.6, 6.7 and 6.8 show the contributions to SOMO35, $PM_{2.5}$ and deposition of N (sum of OXN and RDN), respectively, for some selected countries. For each of these countries the indigenous contribution and the six largest transboundary contributions are shown for each of the meteorological years. As already observed in Figure 6.5 the individual contributions in SOMO35 do not vary so much as for the other two components. A possible reason may be that high ozone levels which contribute relative most to SOMO35, are often observed under typical weather conditions with transport of ozone and precursors from largely the same source region(s). The plots in Figure 6.6 for Germany and The Netherlands show higher total contributions in 2003 than in any of the other years, which is also the case for France (not shown). It was in particular these

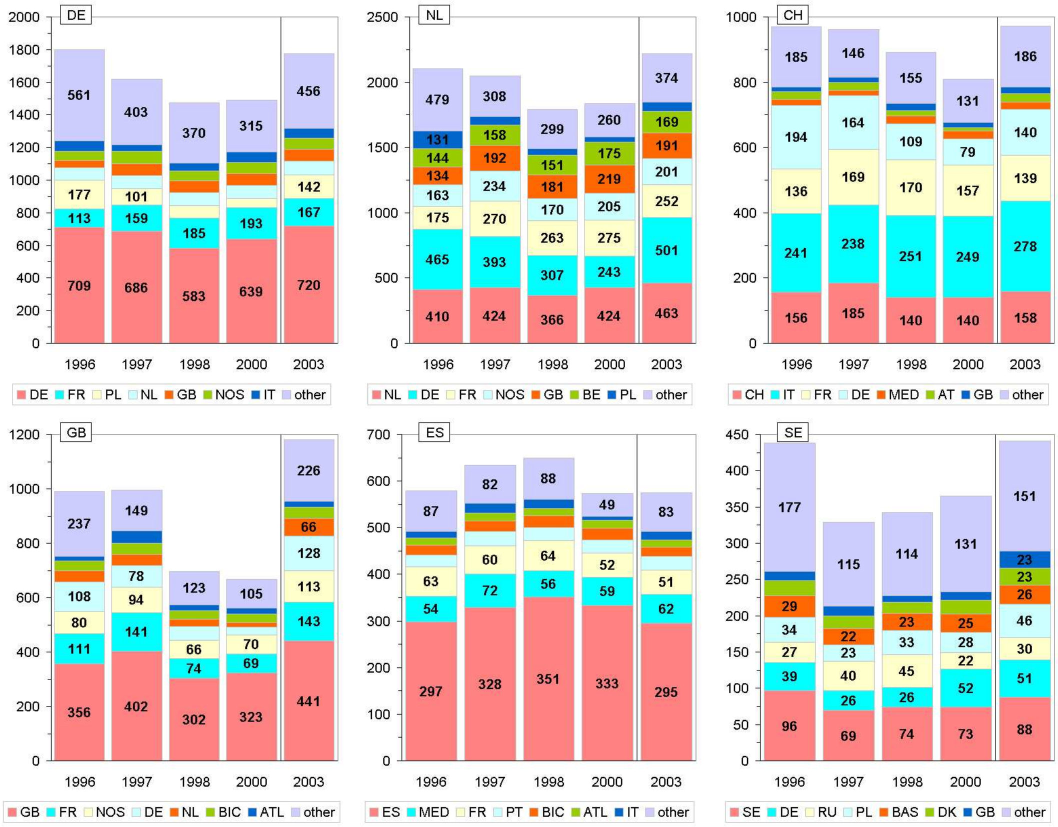

Figure 6.7: Main contributors to $PM_{2.5}$ in a few countries. See text for further explanation. Units: ng/m^3.

countries that experienced high ozone values during the warm summer of 2003. For almost all other countries the total computed contribution in 2003 is not the maximum of all years (not shown). This can also be concluded from Figure 5.2 (Chapter 5): even though enhanced SOMO35 values are more widespread over Europe in 2003 than in any of the other years shown in Figure 5.2, at many individual locations the deviation from the average in 2003 can also be seen in one of the other years. Another observation that can be made from Figure 6.6 is that there does not seem to be a significant change in the size of the individual contributions to SOMO35 in 2003 compared to the other years. In line with Figure 6.4 the variations in the totals of SOMO35 in the countries shown and in the individual contributions are moderate and generally smaller than for $PM_{2.5}$ and deposition of N, when comparing Figure 6.6 with Figure 6.7 and 6.8. For $PM_{2.5}$ the total contributions in 2003 calculated for Germany and The Netherlands (and France, not shown) are again on the high side, similarly as for SOMO35, but not exceptional. In Great Britain relatively large variations occur, with 1996 and 1997 having much higher total contributions than 1998 and 2000. The total contribution in 2003 is much higher, exceeding the four year average by about 40% and the years 1996 and 1997 by about 20%. The largest contributors are clearly re-

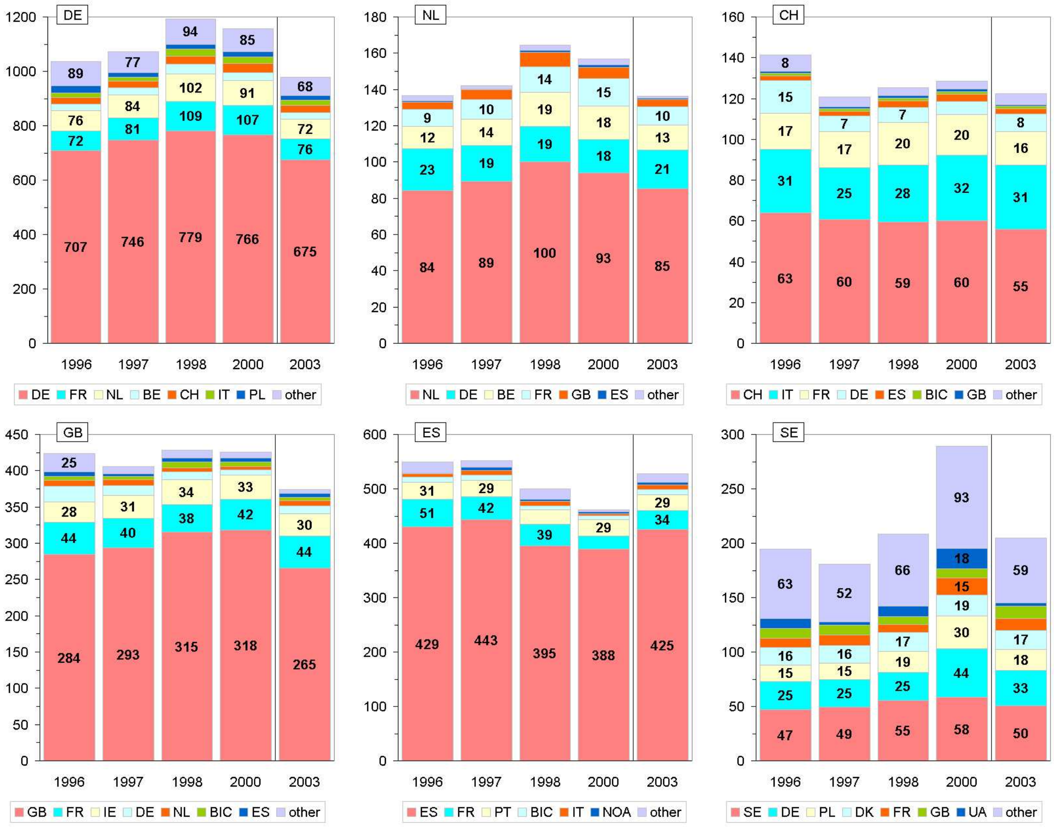

Figure 6.8: Main contributors to deposition of N in a few countries. See text for further explanation. Units: 100 tonnes of N.

sponsible for the higher total contribution in 2003. Variations in deposition of N seem to be large over Scandinavia, as can be seen from Figure 6.8. The panel for Sweden in Figure 6.8 clearly shows that the contributions in the year 2000 were substantially higher than in the other years. It shows generally higher contributions from the main contributors. Analysis of the underlying data shows that for deposition of nitrogen more than half of the total emitters contributes by at least 50% more than on average, which is also the case for OXS deposition. In addition, only a few emitters (five) have lower than average contributions, including the neighbouring countries Norway and Finland. This indicates that in the year 2000 relatively more South-North transport to Sweden has taken place. Though total depositions to the Scandinavian countries are relatively modest compared to values for Central Europe, this is an important observation because critical loads for eutrophication and in particular for acidification are still exceeded in these countries.

6.3.2 Analysis on grid level

The analysis above was restricted to country totals and averages. In this section some spatial analysis is presented, now using only results for 1996, 1997, 1998 and 2000. The year 2003 is excluded here because in Section 6.3.3 a number of results for 2003 is shown relative to the average over the aforementioned four years.

SOMO35 The average modeled values of SOMO35 and the average variability of the six largest transboundary contributions to each grid cell in the EMEP model domain are plotted in Figure 6.9. The variabilities of the largest contributions are lowest in the centre of the model domain, usually around 20%. though locally higher values are seen. Higher values are also observed in areas with low total computed SOMO35, such as the Nordic countries and the Northern part of Russia.

$PM_{2.5}$ The average modeled values of $PM_{2.5}$ and the average variability of the six largest transboundary contributions to each grid cell in the EMEP model domain are plotted in Figure 6.10. As for SOMO35, the variabilities of the largest contributions are lowest in the centre of the model domain, but somewhat higher than for SOMO35, around 30%. This is in line with Section 6.3.1, Figure 6.5, where higher variabilities were observed for $PM_{2.5}$ compared to SOMO35 on country level.

Deposition of N The average modeled values of deposition of N (i.e. the sum of oxidised and reduced nitrogen) and the average variability of the six largest transboundary contributions to each grid cell in the EMEP model domain are plotted in Figure 6.11. From this figure it becomes clear that the lowest variations occur in the central parts of the model domain. As has been stated before, countries in central Europe, receive pollution from all wind directions, because all surrounding countries are emitters of the main pollutants, though of course with different emission densities. Inter-annual variations in flow patters will therefore not lead to drastic changes in deposition totals, because in contrast to air concentrations of pollutants, the principle of mass conservation applies to deposition quantities: the total deposition amounts of OXS, OXN and RDN in the domain are nearly equal to the respective sums of their emissions, differences being caused by net in- or outflow over the domain boundaries and initial conditions. This means that basically only the spatial distribution varies over the years, not the totals.

Higher variations are seen in regions close to the model boundaries. At least partly these are also the regions where the pollution levels can be expected to be much more sensitive to inter annual variations in wind patterns, because these areas are not surrounded by sources areas in all wind directions and large part of the pollution originates from large distances.

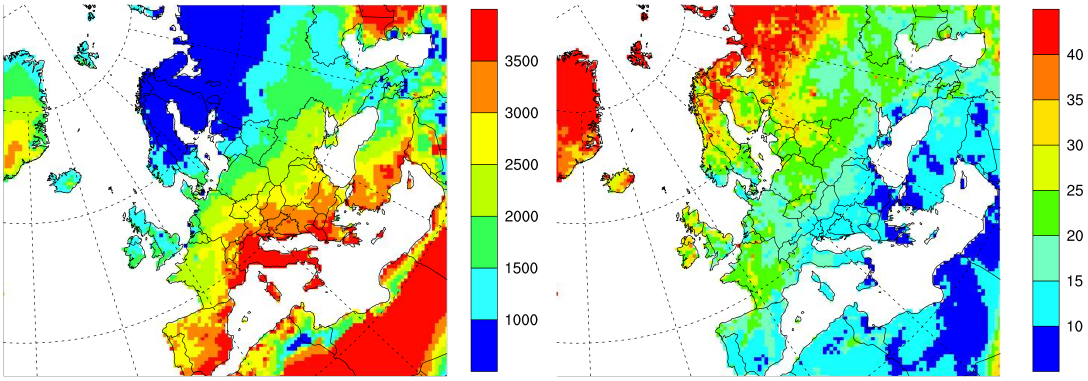

Figure 6.9: Average modeled SOMO35 in ppb·d in the five meteorological years (left panel) and average meteorological variability of the six largest transboundary contributors (right panel) in %.

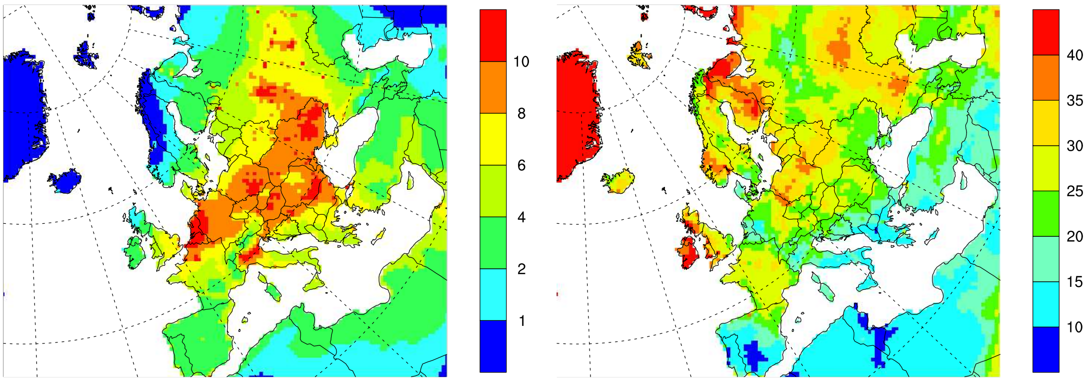

Figure 6.10: Average modeled $PM_{2.5}$ concentrations in μg/m^{3}in the five meteorological years (left panel) and average meteorological variability of the six largest transboundary contributors (right panel) in %.

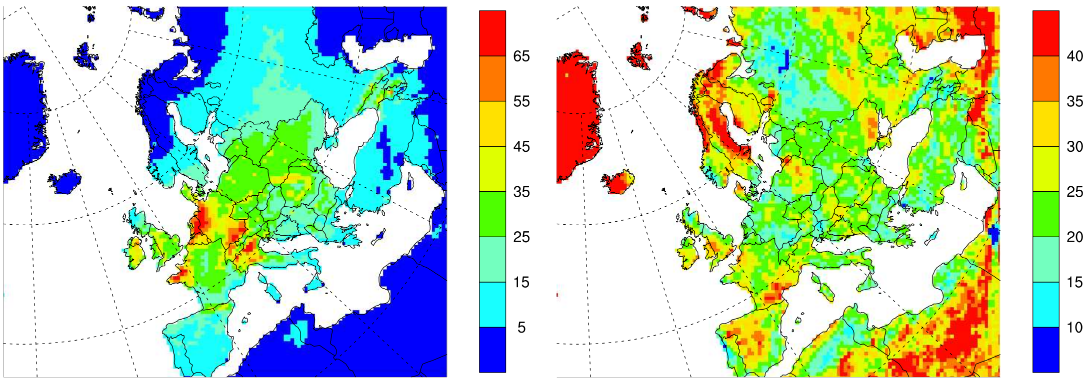

Figure 6.11: Average modeled N deposition in 100 tonnes N/cell in the five meteorological years (left panel) and average meteorological variability of the six largest transboundary contributors (right panel) in %.

6.3.3 The year 2003

In this section a few comparisons of results for 2003 are made with the averages for the other four years. From the previous analysis we have already seen that in some areas the variability is large for a given pollutant and that high contributions in 2003 can be observed indeed. We have to emphasize that here only yearly average values of pollutants are considered, whereas the extreme meteorological conditions in 2003 mainly occurred during the summer months. Considering pollutants on a yearly basis will therefore damp the size of the effects due to the extreme conditions that occurred during the summer of 2003.

In Figure 6.12 the total contribution to SOMO35, $PM_{2.5}$ and deposition of N in 2003 are compared to the mean values (left panels) and the maximum values (right panels) over the four other years.

The modelled contributions to SOMO35 are higher than average in large parts of the model domain and in particular over large parts of France, the Benelux and parts of Germany. This corresponds to the clearly higher than average observed ozone values in these regions and agrees with Figure 6.6 which showed that in Germany and The Netherlands the highest contributions of the five meteorological years investigated occur in the year 2003. For large parts of the domain this is not the case and even though the contributions in 2003 are often slightly above the four year average, the total contributions in these areas do not reach a maximum in 2003 as can be seen from the upper right panel in Figure 6.12. In other words, the computed contributions for SOMO35 in 2003 are within the bandwidth of the 'non-extreme' years. We note here also that even though there are areas where the contributions in 2003 reach a maximum, this does not mean that something unprecedented occurred in 2003, since the comparison is limited to only four meteorological years and in other years higher values may have occurred. In that sense, the right panels in Figure 6.6 may overestimate the special character of 2003.

For $PM_{2.5}$ a similar reasoning can be given as for SOMO35: higher total contribution compared to the four year average are quite wide spread, but extreme values are only observed in limited areas and to a lesser extent than for SOMO35.

For deposition of N a different picture arises due to the principle of conservation of mass. The total deposition of N equals roughly speaking the total emissions in the model domain (this is true if we ignore the effect of initial and boundary conditions). As explained earlier, this implies that only the spatial pattern of the deposition is influenced by inter-annual meteorological variability and that areas with higher and lower total contributions cancel out each other. This canceling out can be local, as is the case in the Southern part of the domain, but also more regional. The later is for example the case in parts of Germany, France and The Netherlands, where lower than average deposition occurs in 2003. This is remarkable, because for SOMO35 and $PM_{2.5}$ higher contributions are observed with even maximum values of SOMO35. In Germany and The Netherlands, the computed total contributions to deposition of N are the lowest of the five years considered, c.f. Figure 6.8 and this is also the case for OXS. This

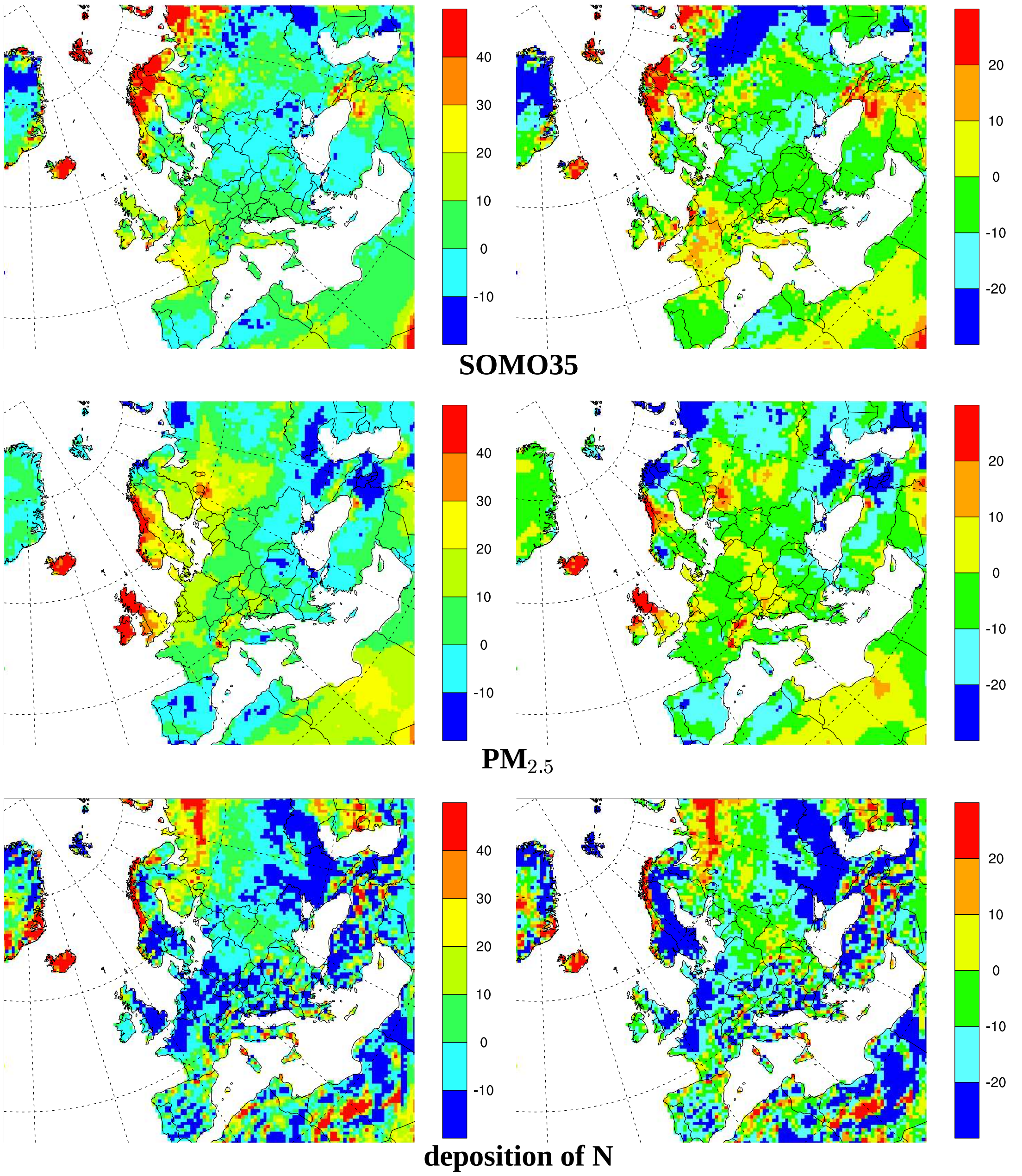

Figure 6.12: Difference in total contributions in 2003 relative to the four year average (left panels) and relative to the maximum total contribution in the four years (right panels) for SOMO35, $PM_{2.5}$ and deposition of N. Note the different scaling in the left and right panels. Units: %.

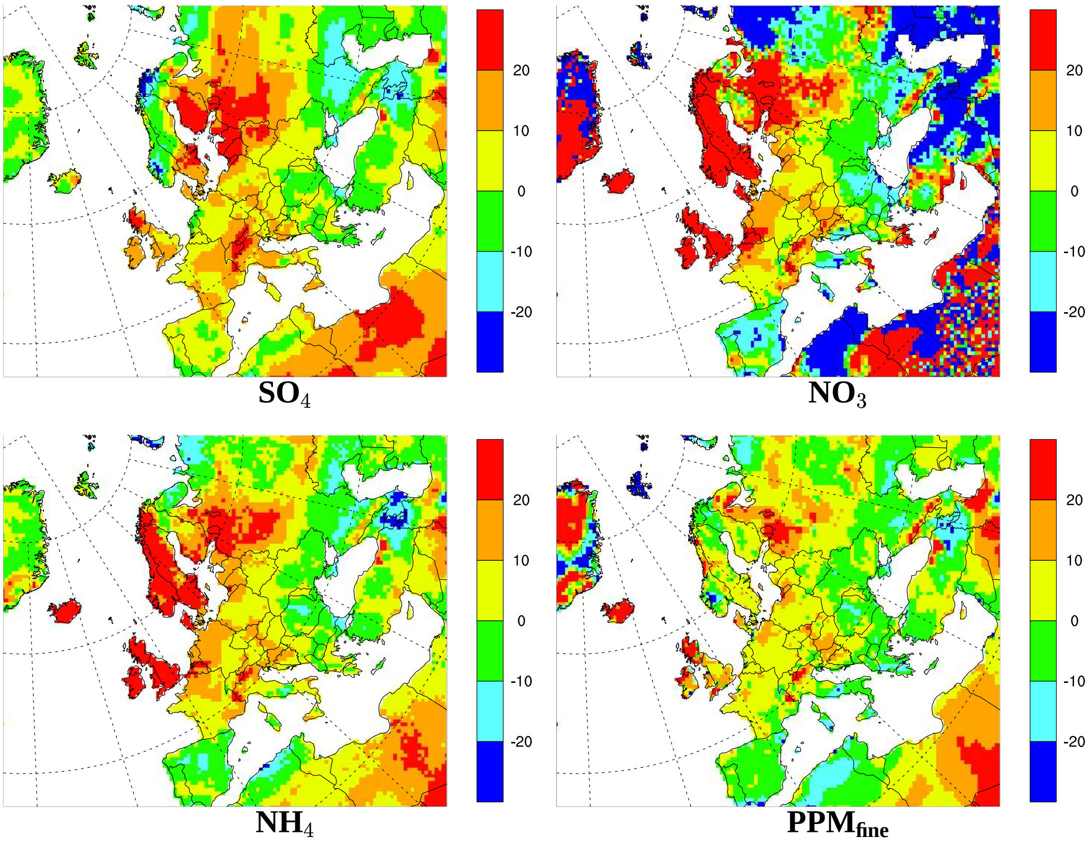

Figure 6.13: Difference in total contributions in 2003 relative to the four year average for SO_4, NO_3, NH_4 and PPM_{fine}. Units: %.

result clearly shows that enhanced values for one pollutant do not necessarily imply enhanced values for an other pollutant. On the contrary, it can even be that one component reaches extreme values, whereas the values for an other component are lower than average. Lower than average values of deposition of N (and OXS) are also seen over the whole of Sweden and large parts of Norway and nowhere in this area a maximum is reached. The most likely explanation is that there has been less transport of nitrogen and sulphur from the main source areas, which at least for sulphur are mainly located in the (south) eastern part of Europe. Despite the lower deposition of N in Scandinavia and also in parts of Germany, France and The Netherlands, the total contributions to $PM_{2.5}$ show higher than average values in these areas in 2003, partly even maximum values. Based on the clearly lower total contributions to deposition of N and OXS, one would expect lower contributions to concentrations of SO_4, NO_3 and NH_4 in air. This seems however not to be the case, see Figure 6.13. The same figures makes clear that the higher contributions in Sweden to $PM_{2.5}$ in 2003 are the result of higher contributions to NH_4 and in particular to NO_3.

6.4 SR results for the Appendix

In Appendix B average SR matrices are given based on the five meteorological years 1996, 1997, 1998, 2000 and 2003 and using the CLE 2010 emissions (see Appendix A) in all five years. For each country, reductions in six different pollutants have been calculated separately: with an emission reduction of 15% for SO_x, NO_x, NH_3, NMVOC, PPM_{fine} or PPM_{coarse} respectively.

In Appendix C SR matrices are given for the year 2003. The tables in this Appendix are calculated using both the meteorological data for 2003 and the emissions for 2003 (see Appendix A).

The deposition tables in the appendices show the results of these (15%) model runs after scaling with a factor 100/15, giving the equivalent of 100% emission reductions. Although introducing some small errors due to non-linearity (see Chapter 4 in Tarrasón et al. (2004)), this procedure allows an estimate of the complete deposition budget over each country. The depositions tables can thus be interpreted as the contributions from one country to another. (With the limitations discussed in Chapter 4 in Tarrasón et al. (2004))

For the other tables in the appendices, the differences obtained by the 15% emission reduction are given directly. The tables should be interpreted as the predictions of this reduction scenario.

6.5 SR results for the country reports

In order to allow a concise and detailed summary of EMEP results for each country, 45 country-specific data reports have been prepared to accompany this main report (Klein et al. 2005). This time, the data for the country reports has directly been computed using both the meteorology and emissions in the reporting year 2003. The emissions used in these calculations are listed in Appendix A.

Similarly as for the SR tables on deposition in the appendices B and C, in the country reports deposition data for sulphur, oxidized and reduced nitrogen have been extrapolated to the equivalent of 100% emission reductions.

6.6 Conclusions and recommendations

From the results presented in this Chapter the following conclusions are drawn

- The transboundary contributions in percent of the total contributions depend very much on the pollutant considered. In most countries the transboundary contributions to SOMO35 is 75% or more of the total, whereas the transboundary contributions to PPM_{coarse} are usually lowest, often below 40%. The transboundary percentages seem to be quite stable over the years.

- In most countries the indigenous together with the six largest transboundary contributions make up 60% or more of the total contribution. This is true for all components considered.
- Generally speaking, the variations in the pollutants levels vary from year to year by 10-20%, which is of the same order of magnitude as expected future emission changes. This implies that meteorological variability cannot be neglected in integrated assessment modelling.
- The individual contributions vary much more than the pollutant levels itself with variabilities reaching about 40%, implying that in an arbitrary year deviations well over 40% may have occurred.
- The SR results for 2003 showed that 2003 was a special year in terms of SR matrices in restricted areas. Deviations from the average were of the same order of magnitude that was also seen in other years, though they were in 2003 maybe more wide spread than in other years. It should however be emphasized that the analysis provided here only dealt with yearly averages, which partly masks the effects due to the exceptional meteorological conditions in the summer of 2003 in large parts of Europe.

Given the large inter-annual variations in individual contributions it is recommended that this variability is taken into account by Integrated Assessment Modelling (IAM), either by considering average source receptor matrices or by performing the optimization process for a number of different meteorological years and considering the average results. It is recommended that both options are investigated before drawing definite conclusions.

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CHAPTER 7

Air quality indicators for CAFE scenarios

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7.1 Introduction

Over the last two decades the emissions of air pollutants have been significantly reduced in Europe. As a result, levels of most of the species having negative effects on human health and/or the environment have decreased at roughly the same rate as the emissions (Løvblad et al. 2004). One exception here is ozone. For this species measured levels have been relatively unchanged over the past 20 years despite large European reductions in ozone precursors (NOx, CO and NMVOC (Non Methane Volatile Organic Compounds)).

Despite of the emission reductions already achieved, several European targets for air pollutants and depositions have not been met. In order to eliminate, or at least close the gap between current levels and the environmental targets, emissions should be further reduced. For this purpose the Clean Air for Europe (CAFE) programme of the European Commission has compiled a set of baseline projections outlining the consequences of present legislation. Furthermore the benefits and costs associated with further improvement of environmental quality have been explored within the CAFE programme. Tightened environmental targets are set for PM2.5 concentrations, ozone, eutrophication and acidification.

The purpose of this Chapter is to present the air quality situation derived from the different scenarios developed by IIASA within CAFE. Results from the EMEP Unified model runs for the year 2000 and scenarios for 2010 and 2020 are presented, initially only for two of the five selected years: 1997 and 2003. Results from the other selected meteorological years will be reported are under The emissions scenarios are shortly described below. Next, the analysis of differences between scenarios in terms of ozone levels, particulate matter concentrations and depositions of acidifying and eutrophying compounds is presented.

7.2 Description of the scenarios

The clean Air for Europe (CAFE) programme of the European Commission aims at a comprehensive assessment of the available measures for further improving European air quality beyond the achievement expected from the full implementation of all present air quality legislation. The current legislation (CLE) scenarios, and scenarios with various levels of ambition with regard to environmental quality are described through a series of reports available at http://www.iiasa.ac.at/rains. All these emission scenarios are based on energy scenario that achieves a stabilization of the EU-25 CO_2 emissions compared to 2000 (the so called "climate policy" CAFE baseline scenario). Within CAFE the following environmental objectives were taken into account:

- For PM2.5 the aim is to reduce the (population weighted) loss in statistical life expectancy attributable to exposure to PM2.5 in the EU25.
- For health effects attributable to ozone the objective is to reduce the number of premature deaths estimated based on the SOMO35 concept. No separate targets are set for effects on vegetation, but the critical level for forest trees, AOT40f, parallels the SOMO35 to a large extent. Thus the optimization targets for SOMO35 should yield similar results for AOT40f.
- For eutrophication and acidification the aim is to reduce the excess deposition over all ecosystems in the EU member states.

Assuming current legislation, emissions of air pollutants are expected to gradually decrease in Europe. The difference between year 2000 emissions and the emissions for the current legislation case for 2020 (CLE 2020) are depicted in Figure 7.1 for CO, NMVOC (Non Methane Volatile Organic Compounds), NH_3, NOx and SOx. Emission changes between year 2000 and CLE 2010 are similar in its geographical pattern, but smaller in magnitude.

In addition to the CLE scenario, other scenarios were defined for 2020. The purpose of those scenarios was to guide the discussion on possible ambition levels for future policies to be recommended by the Thematic Strategy on air pollution, currently under preparation by the European Commission. Based on RAINS optimization routine, scenarios with three ambition levels have been prepared:

- Low ambition(Case A)
- Medium ambition(Case B)and

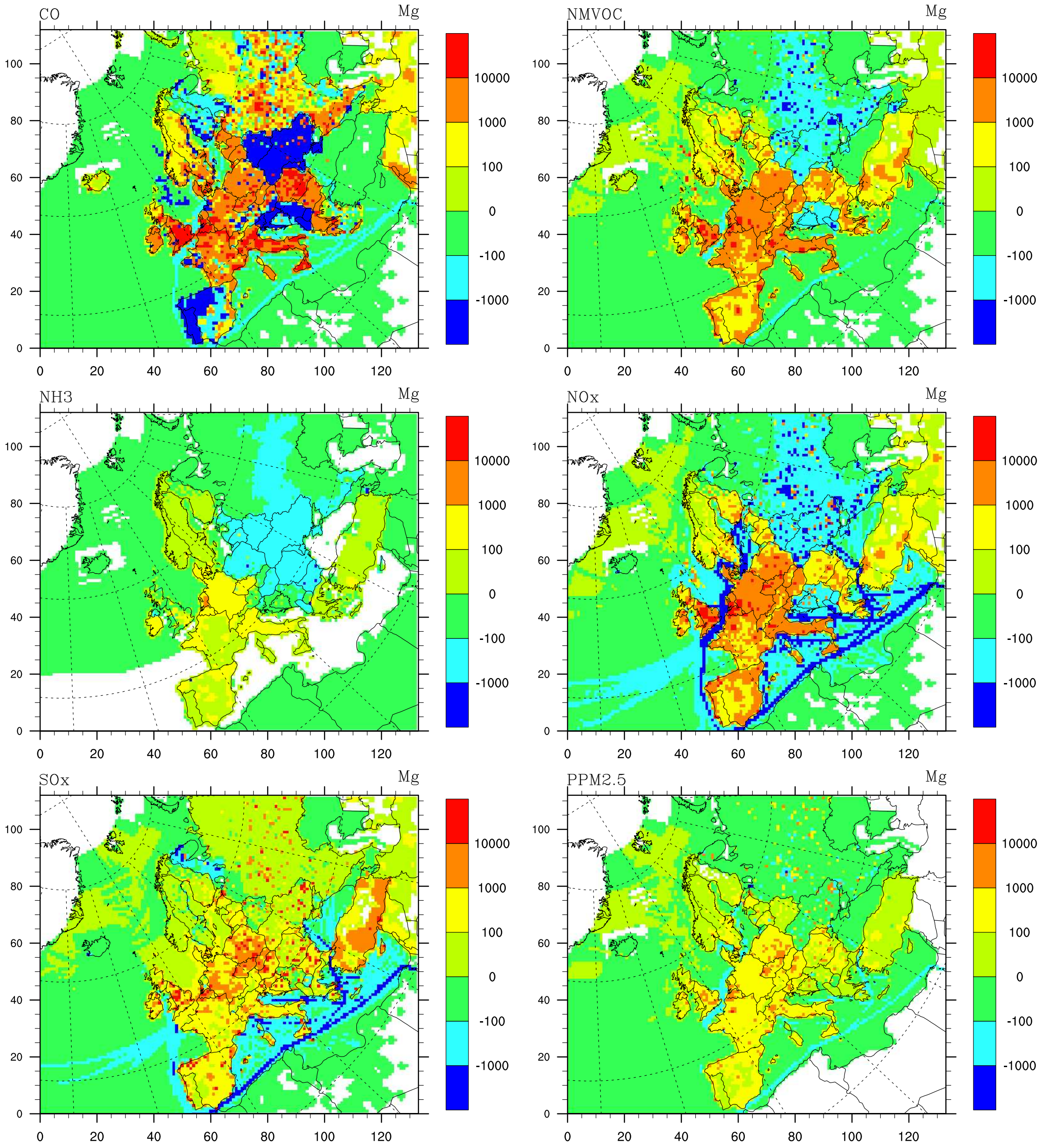

Figure 7.1: Changes in emissions between the years 2000 and 2020. Top left for CO (Gg of CO), top right for NMVOC (Gg of NMVOC), middle left for NH_3 (Gg of NH_3), middle right for NOx (Gg of NO_2), bottom left for SOx (Gg of SO_2), bottom right PM2.5 (Gg of PM2.5).

- High ambition (Case C).

Finally the emissions of air pollutants for the above scenarios are shown in Appendix A. The values originate from the CAFE scenario Analysis Report nr. 6 available from http://www.iiasa.ac.at/rains.

7.3 Status in 2000, CAFE-Baseline

Despite substantial reductions of air pollutants since the late 1980s air pollution and deposition levels violate targets set by the EU and WHO. The situation for some key species are summarized below.

7.3.1 Ozone

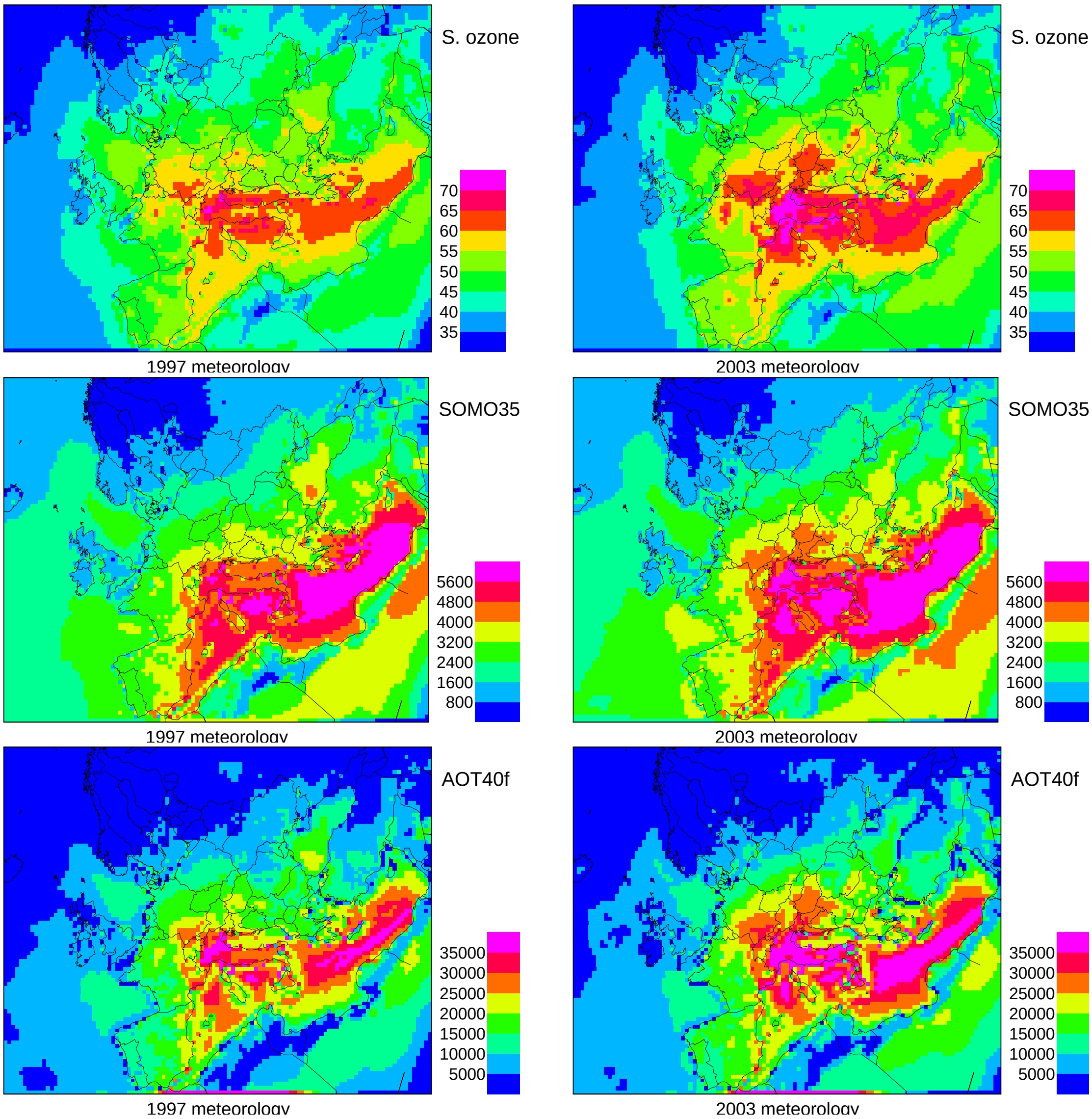

Figure 7.2: Model calculated Summer (June, July, August) mean of daily maximum ozone in ppb (top), SOMO35 in ppb days (middle) and AOT40f in ppb hours (bottom) for 1997 (left and 2003 (right)

Figure 7.2, upper two panels shows average summer (June, July, August) daily maximum ozone for the meteorological years 1997 and 2003. The motivation for showing summer ozone rather than annual ozone is that reductions in the emissions of ozone precursors will result in ozone changes of opposite sign in winter and in summer. In winter reductions in NOx emissions will result in less titration and subsequently higher ozone levels. In summer reductions in NOx emissions will in most cases result in reductions in ozone levels. It is desirable to reduce ozone in the summer months when levels are high. Ozone changes in winter, when concentrations are low, should have no effect on vegetation and virtually no health effects. When depicting annual ozone, the effect of the more significant, in terms of impact on vegetation and health, summertime reductions may be partially masked by the increase in winter.

Summer ozone is particularly high in east and central Mediterranean with a tongue stretching through northern Italy into southern Germany. Calculated summer ozone levels are in general markedly higher in 2003 compared to 1997. In parts of Europe the 2003 summer was extremely warm and dry resulting in high ozone levels (see chapter 4). The higher ozone levels in 2003 are also reflected in calculated SOMO35 (middle two panels) and in AOT40f (lower panels).

7.3.2 $PM_{2.5}$

Figure 7.3 shows the model calculated $PM_{2.5}$ concentration with 1997 meteorology (left) and 2003 meteorology (right). With year 2000 baseline emissions for both the meteorological years, concentrations are higher in 2003 compared to 1997, demonstrating the effect of interannual variability. For both meteorological years high levels are calculated in and around the Netherlands an Belgium, in northern Italy and parts of eastern Europe. Present model capabilities do not allow the quantification of the absolute levels of $PM_{2.5}$ mass, but will include the bulk of $PM_{2.5}$ mass of anthropogenic origin.

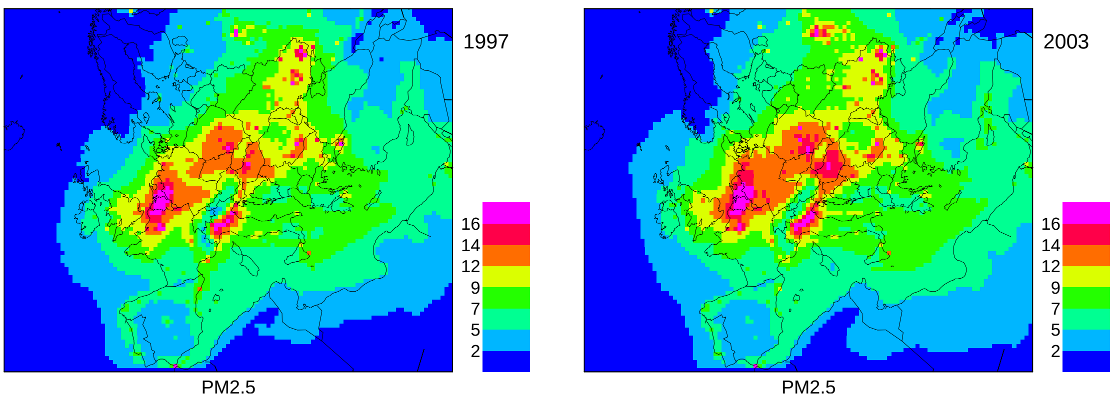

Figure 7.3: Model calculated PM2.5 in μg m^{-3} for 1997 (left and 2003 (right)

7.3.3 Depositions of sulphur and nitrogen compounds

Figure 7.4 illustrates the annual depositions of oxidized sulphur and nitrogen and reduced nitrogen with year 2000 emissions for the meteorological years 1997 and 2003. Contrary to what was the case for PM2.5 and ozone depositions are very similar for 1997 and 2003. High depositions of oxidized sulphur are calculated for the Eastern European countries and around the English channel. High depositions of nitrogen are in particular calculated for west and central Europe and northern parts of Italy.

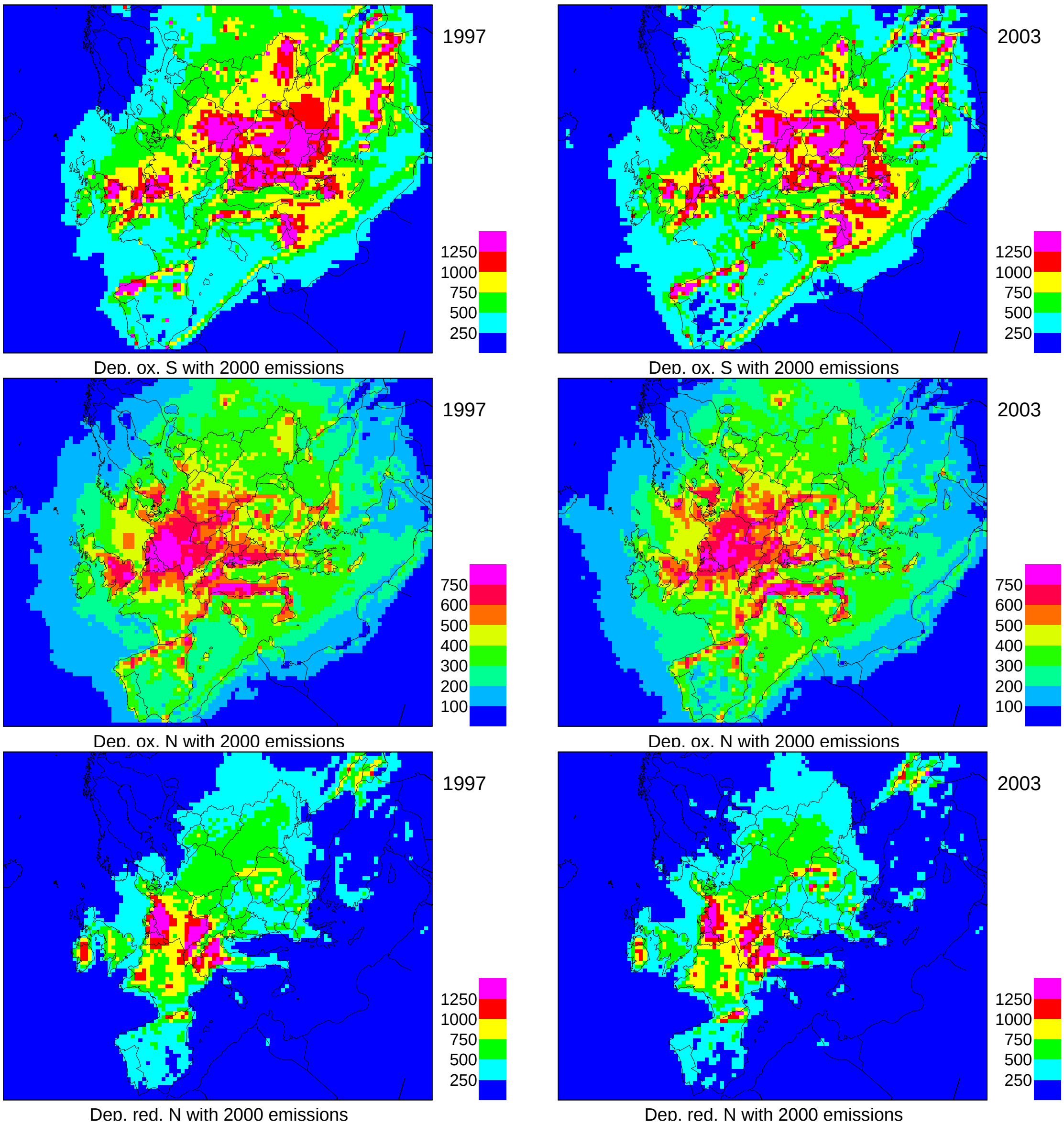

Figure 7.4: Annual depositions of oxidized sulphur as $\mu g(S)m^{-3}$ (top), oxidized nitrogen as $\mu g(N)m^{-3}$ (middle) and reduced nitrogen as $\mu g(N)m^{-3}$ (bottom). Calculated depositions in 1997, left and in 2003, right.

7.4 Effects of emission projections for 2010

Model calculations are also made for the NEC 2010 scenario.This scenario assumes that each country will reduce its emissions to the level determined by the National Emission Ceilings (NEC) Directive. Again two meteorological years 1997 and 2003 were included. The discussion in this section is limited to the analysis of the effects of emission reductions for PM2.5 and summer ozone.

7.4.1 Ozone

Changes in summer ozone calculated with year 2010 versus 2000 current legislation emissions are shown in Figure 7.5. Summer ozone levels are expected to decrease in most of central Europe. The largest reductions are calculated for northern Italy with reductions of 8 - 10 ppb. Outside Central Europe there are large areas with a slight increase in summer ozone caused by an increase in lateral boundary concentrations.

7.4.2 $PM_{2.5}$

Compared to concentrations with year 2000 emissions, reductions of emissions as expected for 2010 results in reduction of calculated $PM_{2.5}$ mass as shown in Figure 7.6. In Central Europe calculated reductions are of the order of 2-3μgm^{-3}. Although there are marked differences in $PM_{2.5}$ concentrations for calculations made with 1997 and 2003 meteorologies, the effects of emission changes are very similar in both spatial distribution and in magnitude.

7.4.3 Depositions of S and N compounds

Differences in depositions of the above compounds with 2010 versus 2000 are shown in Figure 7.7. For oxidized sulphur there are reductions everywhere except along the shipping routes in the Mediterranean. For oxidized nitrogen there are reductions in most of Europe, and in particular in west/central Europe and UK. Depositions of reduced nitrogen are decreasing in western Europe. Depositions are however increasing in eastern Europe as a result of higher emissions here.

7.5 Effect of emission projections for 2020

In this section, model calculated pollutant indicators and depositions for the CLE 2020 scenario are compared to year 2000 results. Again, the comparison is done for the meteorological years 1997 and 2003. The CLE results are next compared with the scenarios aiming at higher environmental quality improvement (CAFE optimized cases A to C plus the MFR scenario).

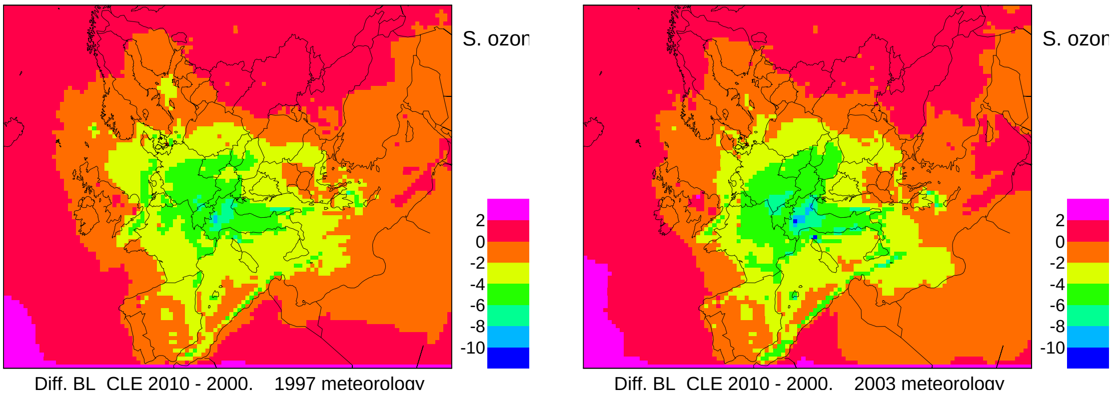

Figure 7.5: Model calculated changes in summer (June, July, August) ozone in ppb with NEC 2010 versus 2000 emissions. 1997 meteorology left and 2003 meteorology right.

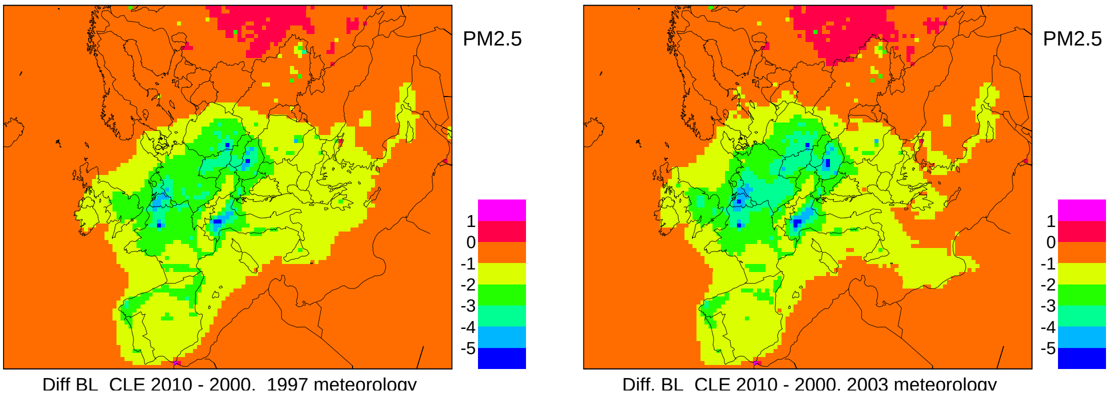

Figure 7.6: Model calculated differences in PM2.5 in μg m^{-3} with NEC 2010 versus 2000 emissions. 1997 meteorology left and 2003 2003 meteorology right.

7.5.1 Ozone

Changes in summer ozone for the CLE2020 versus 2000 are shown in Figure 7.8 (upper 2 panels). Calculated changes are very similar to what was calculated for 2010 versus 2000 emissions, with summer ozone levels expected to decrease in most of central Europe. Again the largest reductions are calculated for northern Italy with reductions now exceeding 10 ppb. Also shown are the corresponding differences in SOMO35 (lower left) and AOT40f (lower right) with 1997 meteorology.

Figure 7.9 depicts the calculated differences in SOMO35 between the CLE scenario and the more ambitious scenarios. The MFR scenario results in further substantial reductions, in particular in Southeast Europe. Reductions in SOMO35 for the A to C cases are all similar in their spatial pattern, but the magnitude of the reductions increase with the ambition level. the case C allows to achieve the largest reductions. For these scenarios reductions are high in southwest Europe, and in particular near the Mediterranean coast. The MFR scenario allows achieving significantly higher reduc-

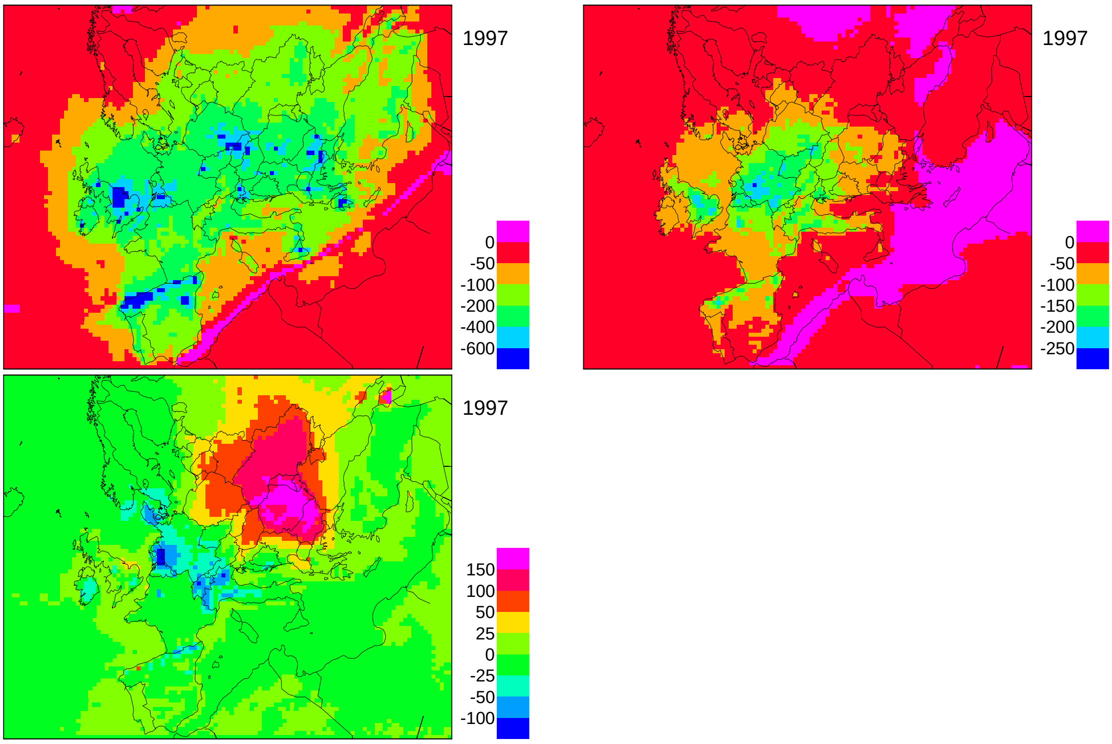

Figure 7.7: Model calculated changes in depositions with NEC 2010 versus 2000 emissions with 1997 meteorology. Upper left depositions of sulphur in μg(S)m^{-2}. Upper right depositions of oxidized nitrogen in μg(N)m^{-2}. Bottom left depositions of reduced nitrogen in μg(N)m^{-2}

tions, even compared compared with the high ambition (case C) case.

7.5.2 $PM_{2.5}$

Compared to calculated $PM_{2.5}$ mass with year 2000 emissions, current legislation with climate policy will result in further reductions for 2020 as shown in Figure 7.10. In Central Europe calculated reductions are of the order of 3-4μgm^{-3} or more, resulting in further improvements compared to calculations with the NEC 2010 scenario, but with virtually the same spatial distribution.

In Figure7.11 the calculated effects of the other scenarios are compared to the CLE scenario for 2020. Further substantial reductions are achieved for $PM_{2.5}$ concentrations in the MFR scenario (Figure 7.11 upper left), in particular in Eastern Europe. Reductions are larger when 2003 meteorology is used, but the spatial pattern remains the same. Reductions in $PM_{2.5}$ mass for the CAFE optimized scenarios (cases a to C) are of the order of 2-3μgm^{-3}. The largest reductions are calculated in areas where concentrations were high in 2000,i.e., in and around the Netherlands and Belgium, northern Italy and parts of Eastern Europe.

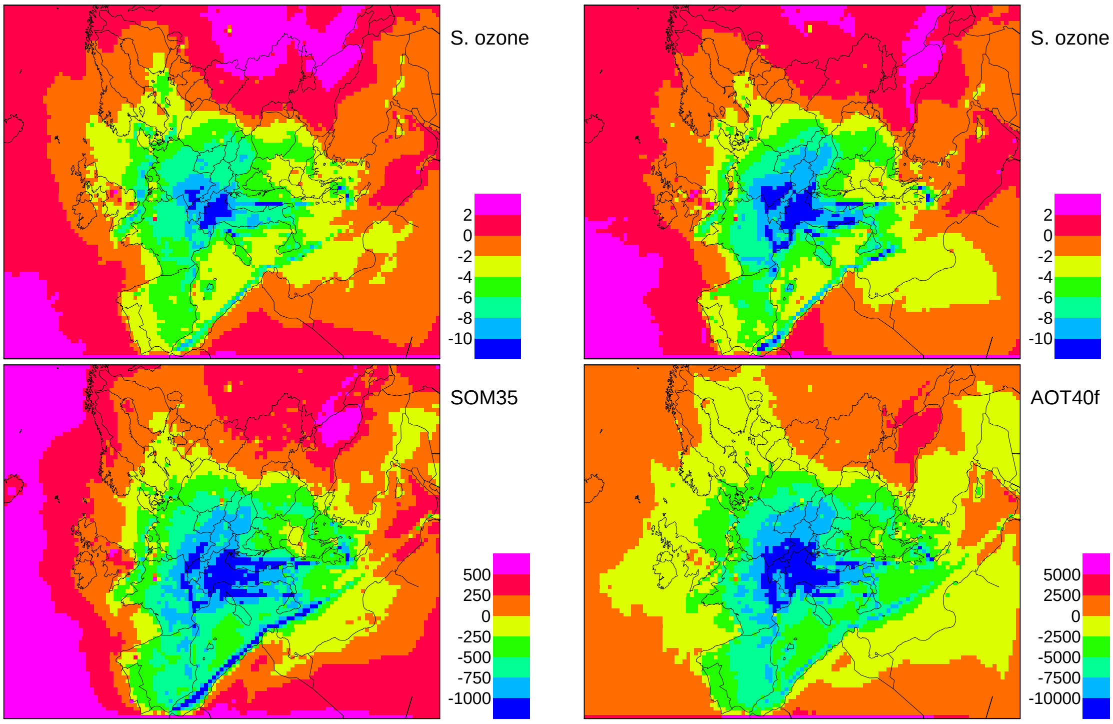

Figure 7.8: Difference in ozone indicators (in ppbv) between CLE 2020 and 2000 scenarios with 1997 meteorology (upper left) and 2003 meteorology (upper right). The corresponding differences in calculated SOMO35 (lower left) and AOT40f (lower right) are calculated with 1997 meteorology.

7.5.3 SIA speciation

Figure 7.12 depicts the differences in air concentrations for sulphate, nitrate, ammonium, primary PM2.5 and primary PM coarse calculated for the CLE 2020 minus year 2000 emissions. Sulphate in air is reduced virtually everywhere in Europe. Reductions largely reflects the changes in sulphur emissions (section 7.2). Nitrate in air is also reduced throughout Europe. Concentrations are reduced also in those areas with a moderate increase in NOx emissions (non EU eastern European countries). Here the HNO_3 to nitrate ratio increases as less sulphate is available forming ammonium sulphate. Ammonium in air is also reduced everywhere, and as for nitrate, also in the areas where emissions are increasing. Again this is caused by the reduction of sulphate available, and thus less ammonium sulphate is formed. Changes in the air concentrations of primary particles largely reflects the changes in emissions.

7.5.4 Depositions of sulphur and nitrogen

In this section changes in depositions resulting from the emission changes between 2000 and 2020 (CLE) are described. Additional reductions resulting from the more ambitious scenarios described in section 7.2 are also discussed.

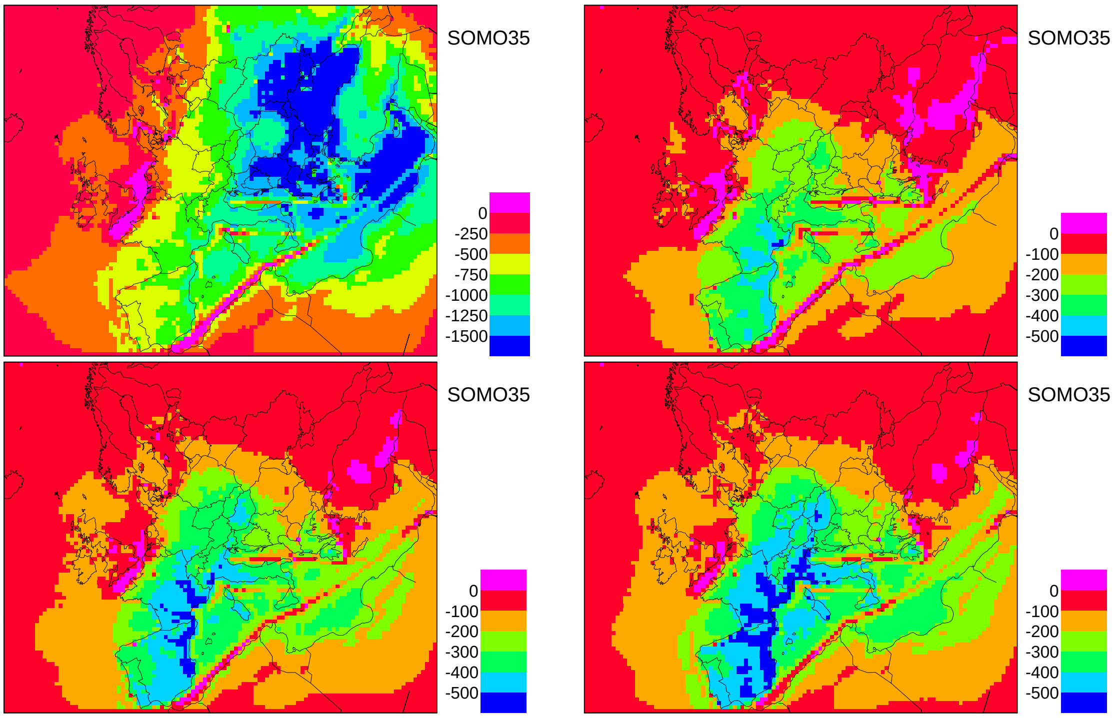

Figure 7.9: Model calculated differences in SOMO35 (ppb days) for 2020, MFR - CLE (upper left), case A - CLE (upper right), case B - CLE (bottom left) and case C - CLE (bottom right)

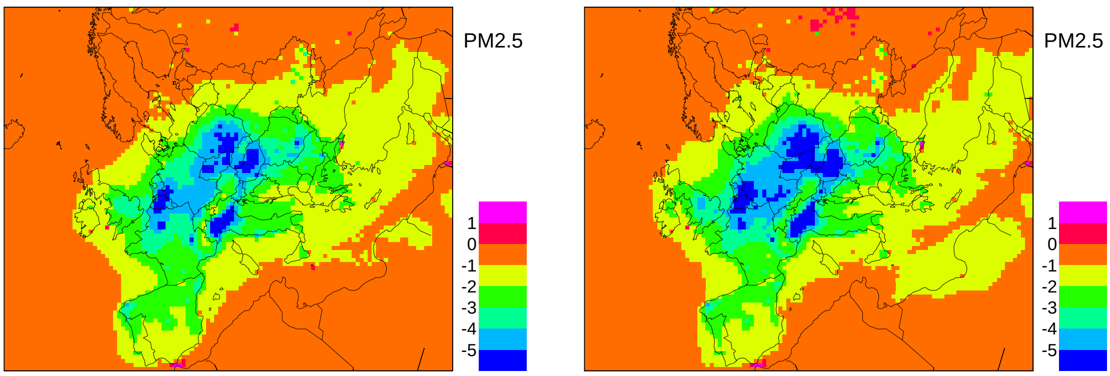

Figure 7.10: Model calculated difference in PM2.5 in μg m^{-3} with CLE 2020 versus 2000 emissions. 1997 meteorology left and 2003 meteorology right.

Depositions of oxidized sulphur

Presented in (Figure 7.13) 2020 CLE versus year 2000 changes in depositions of oxidized sulphur reflects the changes in emissions and the corresponding changes in air concentrations as described in section 7.5.3. Further reductions in depositions for scenarios with higher ambition levels are consistent with the emission development in

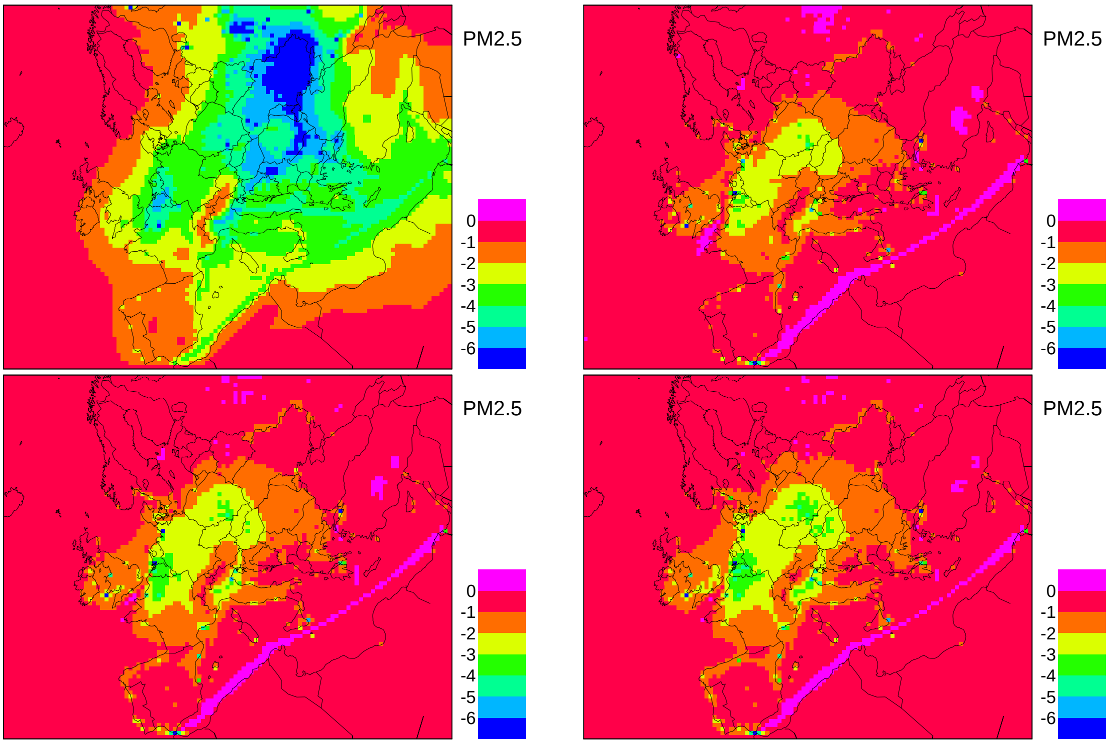

Figure 7.11: Difference in $PM_{2.5}$ in μg m^{-3} with 2020 emissions and 1997 meteorology calculated for the CAFE scenarios MFR - CLE (upper left) case A - CLE (upper right), CASE B - CLE (lower left) and case C - CLE (lower right)

those scenarios.

Depositions of oxidized nitrogen

Changes in depositions of oxidized nitrogen (2020 CLE vs. year 2000), Figure 7.14 upper left, partially reflects the changes in emissions and the corresponding changes in air concentrations as described in section 7.5.3. The largest calculated reductions are seen in western and central parts of Europe and correspond to the largest reductions in emissions. Reductions also occur in eastern Europe where emissions are expected to increase slightly. Following the reductions in sulphur emissions, the HNO_3 to particulate nitrate ratio increases and as a result nitrogen is deposited closer to its sources. This phenomenon was also seen for the concentrations in air as discussed in section 7.5.3.

Remaining parts of Figure 7.14 show further reductions in depositions as a result of the more ambitious scenarios.

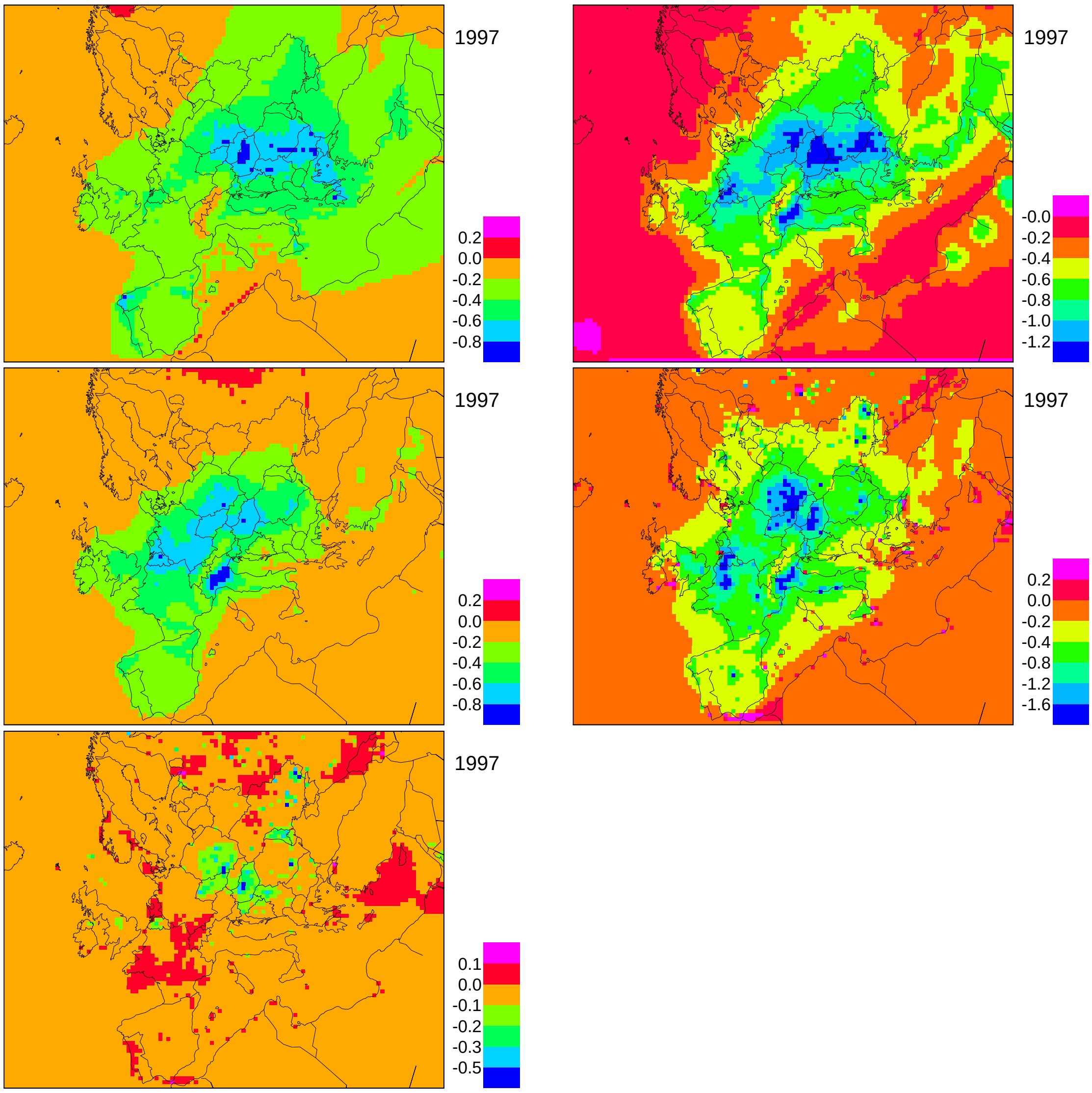

Figure 7.12: Difference in air concentrations for CLE 2020 vs 2000 emissions. The following differences are shown: sulphate in μg(S)cm^{-3} (upper left), nitrate in μg(N)m^{-3} (upper right), ammonium in μg(N)m^{-3} (middle left), primary PM2.5 in μgm^{-3} (middle right) and primary PM coarse in μgm^{-3} (bottom)

Depositions of reduced nitrogen

Year 2020 versus 2000 changes in depositions of reduced nitrogen (Figure 7.15 upper left) largely reflect the changes in emissions, but to a less extent the corresponding changes in air concentrations as described in section 7.5.3. Calculated reductions are seen western Europe, corresponding to the largest reductions in emissions. In eastern Europe depositions increase, and more so than can be expected from the emissions alone. Again this is caused by the decrease in sulphur, as less ammonium sulphate

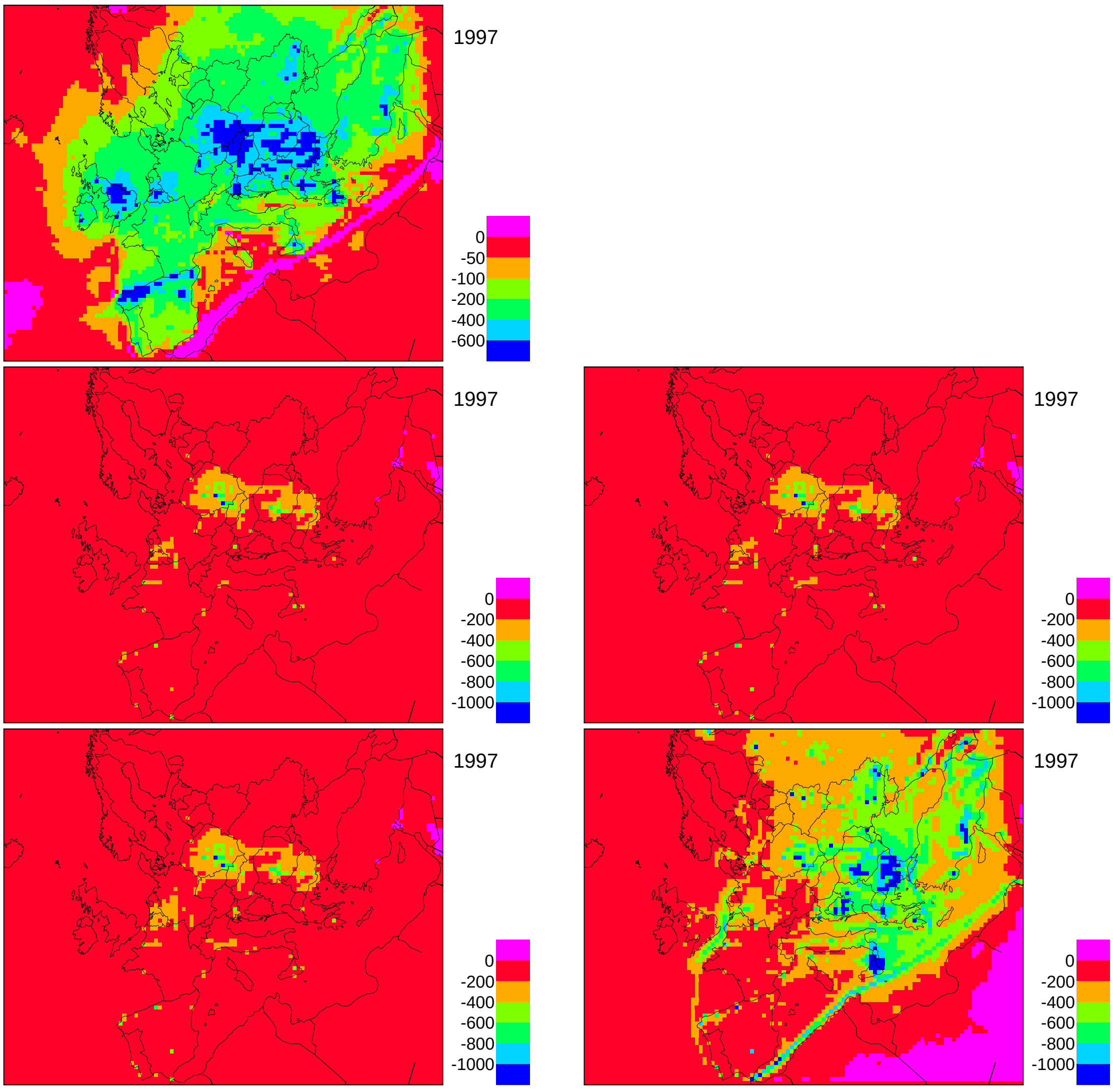

Figure 7.13: Model calculated changes in depositions of oxidized sulphur in $\mu g(S)m^{-2}$. Top left, CLE 2020 - 2000. Middle left, case A - CLE. Middle right, case B - CLE. Bottom left, case C - CLE. Bottom right, MFR - CLE

is formed and thus the NH_3 to NH_4 ratio increase and reduced nitrogen is deposited closer to the sources.

Further reductions in depositions are calculated as a result of the more ambitious scenarios are also shown in Figure 7.14.

7.6 Benefits of the emission reductions

The emission reductions discussed above yield substantial improvements of environmental quality in Europe. Below the most important indicators characterizing physical

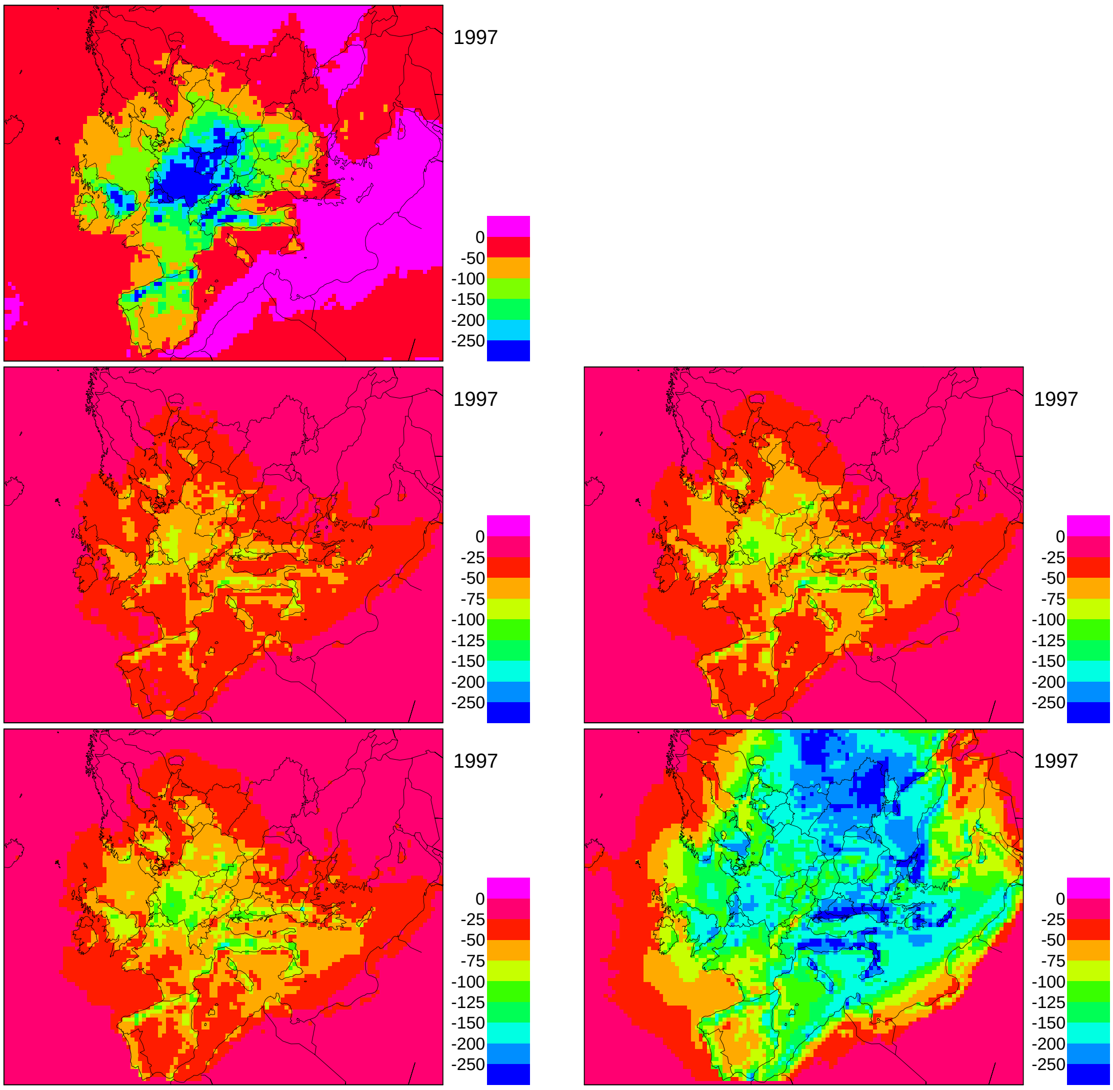

Figure 7.14: Model calculated changes in depositions of oxidized nitrogen as $\mu g(N)m^{-2}$. Top left, CLE 2020 - 2000. Middle left, case A - CLE. Middle right, case B - CLE. Bottom left, case C - CLE. Bottom right, MFR - CLE.

benefits are presented. Even with additional control measures target for health and the environmental standards can not be met over large parts of Europe. In particular for ozone future levels will also depend on hemispheric background ozone. Changes in background levels can be caused by changes in emissions in other continents or in changes in circulation. Furthermore changes in climate and larger interannual variability will affect air concentrations as discussed in chapter 5.

For emissions of air pollutants as in the year 2000 the statistical life expectancy in the EU25 is estimated to be shortened by 8.1 months. The largest loss in life expectancy is calculated for Belgium (13.2 months). With CLE emissions for 2020 the

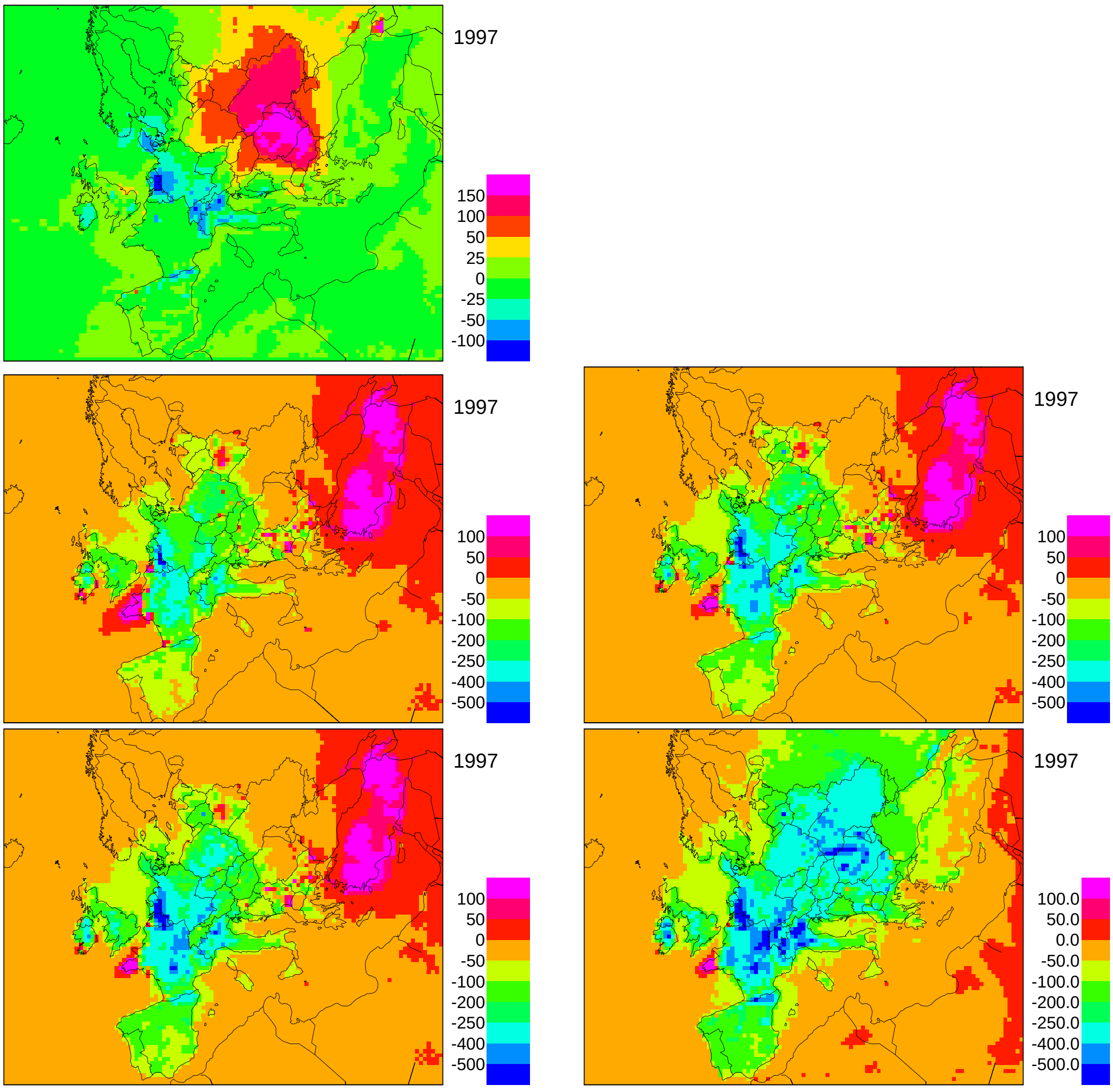

Figure 7.15: Model calculated changes in depositions of reduced nitrogen as μg(N)m^{-2}. Top left, CLE 2020 - 2000. Middle left, case A - CLE. Middle right, case B - CLE. Bottom left, case C - CLE. Bottom right, MFR - CLE

average life expectancy in EU25 increase by 2.6 months and by 4.3 months in Belgium. The optimized CAFE scenarios result in reducing the loss in life expectancy to 4.4, 4.1 and 4.0 months (cases A, C and C respectively).

The largest violations of health and vegetation criteria for ozone occur in the Mediterranean area. In 2000 in the EU25 approximately 21 thousand premature deaths are estimated to be caused by ozone exposure. The CLE measures reduce this number till 2020 to 17,5 thousand. The optimized cases yield additional reductions of 1.3, to 2.0 thousand cases.

Compared with 2000, area of ecosystems with nitrogen deposition exceeding critical loads for eutrophication decreases in the CLE 2020 scenario by 54 percent. Further reductions by 13 to 19 percentage points (relative to 2000 levels) are brought about by the optimized scenarios. Nevertheless, still a high proportion of ecosystems in Europe is likely to suffer from exceedances. The main reason for this is that ammonia emissions remain at high levels, also in the optimized cases.

Although the reductions of emissions will improve the situation with acidification of ecosystems, the problem will remain throughout much of EU25. The forest area with acid deposition above critical loads will decrease from 21 percent of European forests in 2000 to ten percent in 2020, CLE case. Optimized scenarios bring improvement by about five percentage points.

A comprehensive description of physical benefits of scenarios analyzed within the CAFE Programme is to be found in the CAFE Scenario Analysis Report No. 6, 'A final set of scenarios for the clan air for Europe (CAFE) programme', available at http://www.iiasa.ac.at/rains.

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CHAPTER 8

Intercontinental air pollution transport

Caroline Forster and Andreas Stohl
Peter Wind and Anna Benedictow

In recent years more and more attention has been directed to the importance of intercontinental transport (ICT) of air pollution for the composition and the chemistry of the atmosphere. As ICT occurs on timescales on the order of a few days to one month, it is most relevant for atmospheric compounds with a lifetime within this range. For instance, the lifetime of ozone in the atmosphere is on the order of a month (Liu et al., 1987), whereas the lifetime of aerosols is on the order of hours to a few days (Andronache et al., 2002). Both compounds are critically important for air quality and climate (e.g. Hauck, 1992; Vingarzan, 2004; Daniel and Solomon, 1998; Logan et al., 1981). The same is true for some of the ozone precursor substances, e.g., carbon monoxide with a lifetime of a few months. Indeed, satellite, aircraft, and ground-based observations as well as model studies have recently shown that air pollution can be transported over long, even intercontinental and hemispheric distances (e.g. Berntsen et al., 1999; Stohl and Trickl, 1999; Yienger et al., 2000; Edwards et al., 2003; Jaffe et al., 2003; Huntrieser et al., 2005). The potential consequences are wide-ranging for human health, cultivated and natural ecosystems, visibility, weather, radiative forcing and tropospheric oxidation capacity.

There are concerns that regional control strategies for air pollution may be inefficient in a situation where background concentrations of air pollutants increase due to rising emissions in other parts of the world. Under the Convention on Long-range Transport of Air Pollution (CLRTAP) a new Task Force on Hemispheric Transport of Air Pollution (TFHTAP) has recently been established under EMEP to plan and conduct scientific work necessary to develop a fuller understanding of ICT of air pollution for consideration in the reviews of protocols to the Convention. As evidence is growing that background pollution levels in the free troposphere over Europe are increasing, studies analyzing to what degree tropospheric background pollution affects surface-level concentrations become more and more relevant.

While the major transport mechanisms for ICT are relatively well known (see 8.1), the impact of ICT on surface pollution concentrations is still uncertain. Further studies on the exchange mechanisms from the free troposphere to the surface layer, on the evaluation of the free tropospheric levels and the origin of ozone and PM, and on the analysis of long term budgets would be necessary to allocate the contribution of ICT to surface PM and ozone levels. Within the EMEP centers, work has begun to combine episode studies on a Lagrangian framework with long-term Eulerian model calculations. This chapter provides an overview of the current knowledge on ICT and presents the progress of work at CCC and MSC_W concerning the study ICT of pollution.

8.1 Major transport mechanisms

The major mechanisms for intercontinental transport in the middle latitudes are warm conveyor belts (WCB), rapidly ascending air streams ahead of cold fronts(Browning, 1973, 1990; Stohl, 2001), and deep convection (Thompson et al., 1994; Horowitz et al., 1998; Prados et al., 1999). Both mechanisms can lift air masses efficiently to the upper troposphere (Kowol-Santen et al., 2001) where they can rapidly be transported over large distances (Stohl and Trickl, 1999; Yienger et al., 2000; Stohl et al., 2002). Of special importance for air quality and climate is the ICT of anthropogenic emissions or emissions from natural sources like dust storms and biomass burning.

Figure 8.1 shows the global distribution of anthropogenic emissions of carbon monoxide according to the EDGAR inventory for the year 1995 (Olivier and Berdowsky, 2001). The carbon monoxide emission distribution largely reflects the energy consumption of day-to-day human activities and, thus, the emission distribution of other substances (at least for those associated with combustion, e.g. nitrogen oxides) is quite similar. The bulk of the carbon monoxide emissions are concentrated in the Northern Hemisphere. There are four regions with particularly high emissions: the North American east coast, Western and Central Europe, East Asia, and Southern Asia. The first three are in the middle latitudes, where westerly winds prevail during most of the year (at least at higher altitudes), while the fourth is located in tropical Asia, where the winds are dominated by the seasonally varying monsoons. It is therefore clear that the transport patterns of emissions from South Asia will be vastly different from those of the emissions occurring at more northerly latitudes. Convection plays a very important role during the monsoon season, when emissions from South Asia are carried high into the upper troposphere. In the middle latitudes, two high-emission regions (eastern North America and East Asia) are located at the eastern seaboards of the continents, while Europe is located at the west side of the Eurasian continent and at higher latitudes than the other two regions. The first two regions are located close to the entrance to the North Atlantic and North Pacific stormtrack, while Europe is located at the exit of the North Atlantic stormtrack. Because air on average ascends at the beginning of a stormtrack and descends at its end (Stohl, 2001), this has important consequences for the transport of the emissions from the three regions. Emissions from North America and Asia tend to be lifted into the upper troposphere, while emissions from Europe tend to remain in the lower troposphere (Stohl et al. 2002).

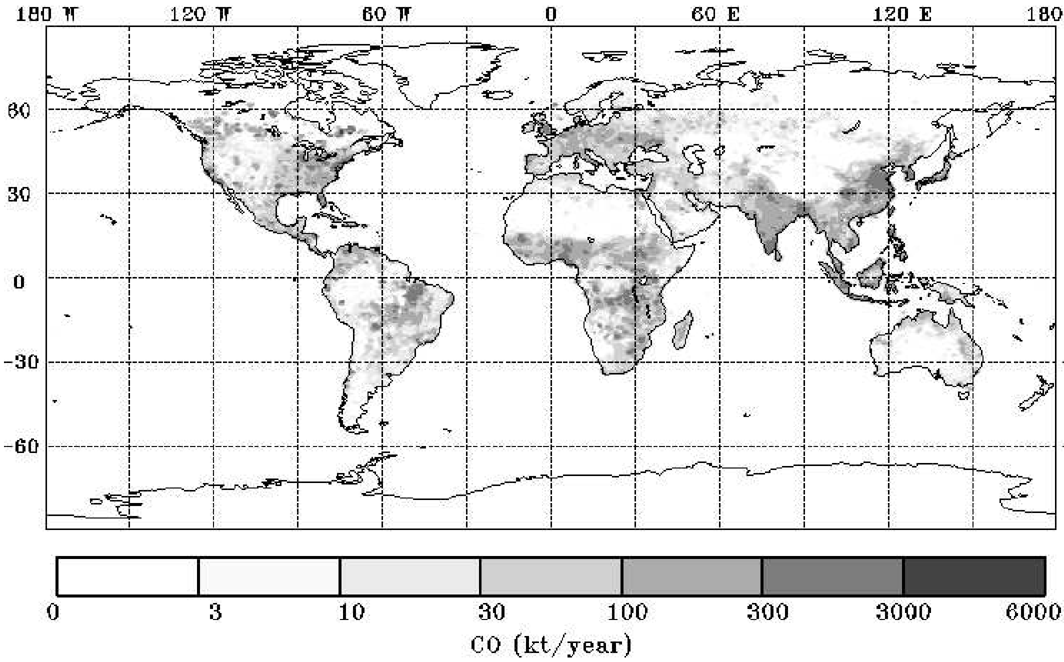

Figure 8.1: Distribution of global anthropogenic emissions of carbon monoxide according to the EDGAR 1995 inventory.

Figure 8.2 summarizes the average transport of pollutants from the three Northern Hemisphere continents. In the tropical region, especially in South Asia, but also in the southernmost parts of North America, transport occurs mainly eastwards, whereas in the middle latitudes transport is directed west-wards. Over South Asia the effect of the monsoon can be seen clearly: in summer, westward transport occurs in the upper troposphere (following rapid upward transport in the monsoonal convection), whereas in winter, low-level transport into the Indian Ocean towards the Inter-tropical Convergence Zone via the northeasterly trade winds predominates. During this season, large haze layers have been observed over the northern Indian Ocean as a result of anthropogenic emissions in India, with a possibly important influence on the regional climate (Lelieveld et al. 2001).

In the middle latitudes, there are distinct differences between the three continents. Emissions from North America and Asia are mostly transported in the upper troposphere, following upward transport with WCBs. Transport there is rapid, especially in winter when there is a strong jet stream in the upper troposphere, and pollutants on average can cross the Atlantic and Pacific Ocean within the 10 days and episodically within about three or six days (Stohl et al., 2002; Stohl et al, 2003a,b). This has been confirmed by aircraft measurements over both North America and Europe, where distinct plumes from Asia and North America, respectively, were found (e.g. Stohl et al, 2003a; Forster et al, 2004). Low-level transport is much slower and, particularly in summer, is too slow to cross the Pacific Ocean within 10 days.

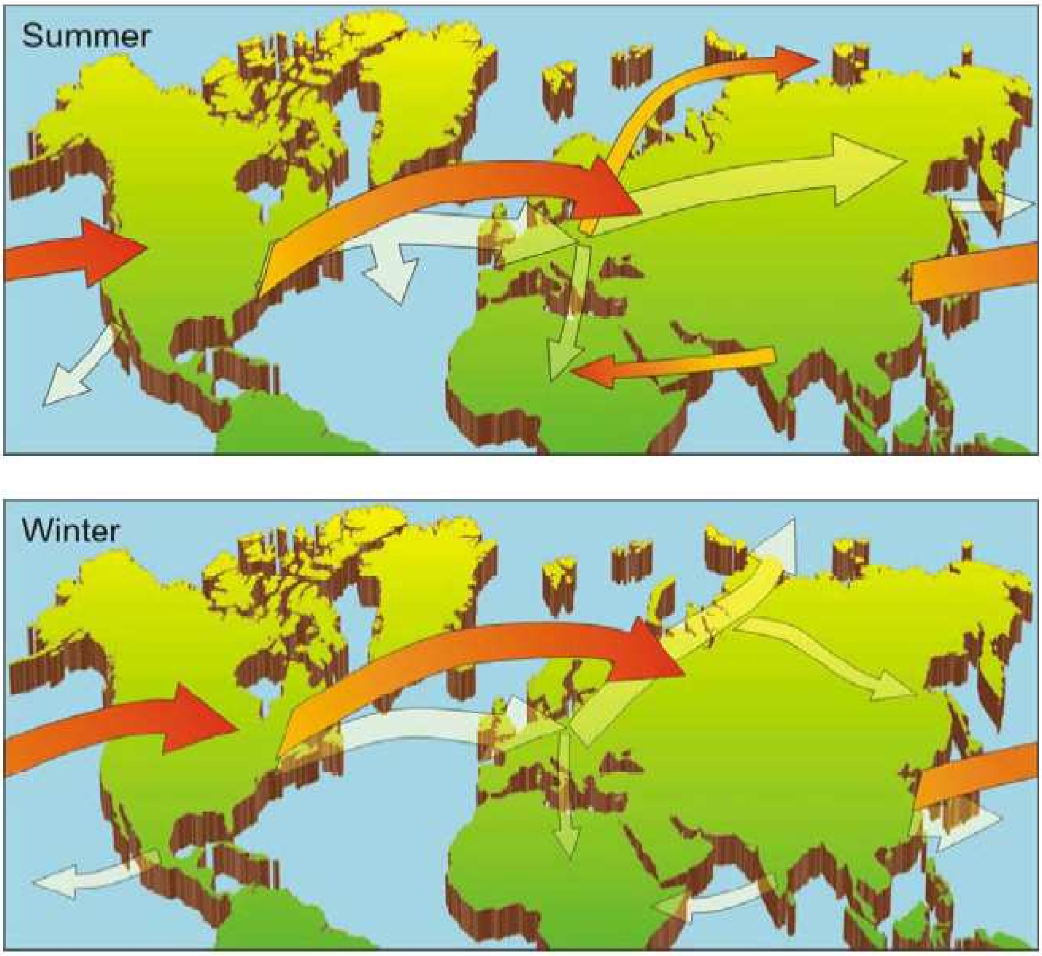

Figure 8.2: Schematic illustration of the pathways of intercontinental transport in the Northern Hemisphere. The orange arrows illustrate transport in the middle and upper troposphere, whereas the light shaded arrows illustrate lower-level transport. The arrows' widths qualitatively indicate how much pollution is transported along the respective pathways. The figure is adapted from fig. 2 in Stohl and Eckhardt (2004).

Emissions from Europe behave differently. In wintertime, practically no European pollutants are transported to the upper troposphere and even in summer low-level transport predominates. Furthermore, there is much more meridional transport than over the other two continents. In winter, most of the European pollutant outflow is directed towards the Arctic. A significant pathway, especially in summer, also leads into the Mediterranean and towards Africa, where it is overrun by pollutants from South Asia. The North Atlantic Oscillation, the dominant mode of climate variability in the North Atlantic region has a strong influence on the pathways of pollutants from Europe: During its high phase, there is more meridional transport than during its low phase. Especially the transport towards the Arctic is strongly enhanced during the high phase of the North Atlantic Oscillation (Eckhardt et al., 2003).

8.1.1 ICT of natural emissions

Episodically, natural sources like dust storms or intense biomass burning can be the dominant sources for pollutants in remote regions due to ICT (e.g. Husar et al, 2001; Forster et al., 2001). The most spectacular and well documented cases of intercontinental dust transport are probably those from Asian desert regions across the Pacific to the west coast of North America and beyond (Husar et al, 2001). Occasionally trans-Pacific dust transport may contribute to violations of air quality standards for particulate matter in North America. These events are also well documented in Greenland ice for prehistoric times. Dust transport in the atmosphere is important for a number of reasons. For instance, it is potentially a hazard to human health (Hauck, 1992), it affects the radiative balance of the atmosphere (Christopher et al, 2000; Hsu et al., 1999), and it can modify cloud occurrence (Twomey, 1977; Feingold and Morley, 2003) and provides surfaces for chemical reactions in the atmosphere.

Emissions from biomass burning have also been known as an important pollution source for a long time. About 15 years ago, using satellite data it was discovered that biomass burning in the tropics causes a widespread distribution of high levels of ozone and carbon monoxide in the tropical southern hemisphere (Fishman et al., 1991), confirming earlier studies which suggested a global influence from biomass burning (Crutzen et al, 1979). The pollution was shown to be caused by large biomass burning emissions in Africa during the dry season from August to October. Tropical biomass burning also occurs on other continents and can cause strong seasonal enhancements of the concentrations of aerosols, ozone and carbon monoxide. The large-scale burning of biomass in Indonesia during 1997/1998, when El Niño conditions prevailed, caused severe air pollution problems over very large regions (Thompson et al., 2001). The fires were mostly started by humans, but were intensified by the drought conditions due to El Niño. With large on-going landuse changes in the tropics, accompanied possibly by changes in the regional climate, it can be expected that biomass burning emissions will also change in the future.

Large forest fires occur also in the boreal region, but it was not until recently that their hemispheric-scale impact on the atmospheric composition was fully recognized. In 2000, it was discovered that Canadian forest fires can strongly affect ozone concentrations in the southern United States (Wotawa and Trainer, 2000), and soon after large enhancements in aerosols, carbon monoxide, nitrogen oxides and ozone were found in a Canadian forest fire plume over Europe (Forster et al, 2001). Even larger areas burn in Siberia, leading to a strong impact of boreal forest fire emissions on the northern hemispheric trace gas budget (Wotawa et all, 2001). Boreal fires are also subject to substantial vertical transport. If deep convection occurs in the vicinity of a fire, the convection associated with the fire itself can intensify the deep convective activity, which in turn can intensify the fire activity. A number of studies where forest fire aerosols and trace gases were observed relatively deep in the lower stratosphere already suggest that convection plays a major role for the transport of forest fire emissions to high altitudes (Fromm et al, 2000; Siebert et al., 2000; Jost et al., 2003; Waibel et al., 1999). However, not before only recently it was documented that strong winds associated with thunderstorms likely intensified forest fires, which in turn intensified the thunderstorms, a mechanism called pyro convection (Fromm and Servranckx, 2003; Fromm et al., 2005).

8.1.2 Influence of ICT on lower tropospheric concentration levels

While ICT in the free troposphere can be identified quite clearly (e.g. Stohl and Trickl, 1999; Lelieveld et al., 2001; Jacob et al., 2003; Stohl et al, 2003a; Forster et al, 2004), observed pollution episodes at the surface are very difficult to attribute to ICT (Jennings et al., 1996), and the impact of ICT on surface concentrations (and, thus, on regional air quality) is therefore still uncertain. ICT to surface sites can either occur via transport at low altitudes or via transport at high altitudes followed by downward transport and entrainment into the boundary layer as for the first time documented by Huntrieser et al. (2005) over Europe. Measurement and model studies suggest that ICT plays a major role for lower tropospheric aerosol levels (e.g. Querol et al., 2004; Satake et al., 2004; Salonen et al., 2004, VanCuren et al., 2005; Hueglin et al., 2005), and some model studies estimated the influence of ICT on ozone in the lower troposphere. By using transport simulations with a chemistry transport model Duncan and Bey (2004) found that the tropospheric burden of the ozone precursor carbon monoxide from European sources varies by as much as +/-20% over both Western Europe and the North Atlantic and +/-15% over the Arctic in winter because of inter-annual variations in transport. A modeling study by Li et al. (2002) suggests a significant impact of North American emissions on the ozone concentrations at the surface over Europe. It has been estimated that 20% of the violations of the European Council ozone standard would not have occurred in the absence of North American anthropogenic emissions. Auvray and Bey (2005) recently estimated that North American and Asian ozone contribute substantially to the annual ozone budget over Europe, accounting for 10.9% and 7.7%, respectively.

However, some of these model studies differ in their results on the influence of ICT on background concentrations at surface level, as their estimates depend on the parameterization of the vertical exchange in the different models (Jonson et al, 2001; Li et al, 2002). Regarding aerosols the models also suffer from an oversimplification in the treatment of especially natural dust emissions (Tegen, 2003). There is still considerable debate with respect to the vertical distribution and the spatial and temporal scales of atmospheric particle transport (Lazaridis et al., 2002). In addition, it is difficult to observe the effect of ICT at the surface, because pollution transport at low altitudes or the descent of pollution from higher altitudes is much slower compared to direct transport in the mid or upper troposphere and, especially, because mixing with surrounding air masses is stronger in the atmospheric boundary layer than in the free troposphere. Mixing reduces the contrast between different air masses and, therefore, makes it difficult to identify ICT plumes. The highest pollution concentrations are normally caused by domestic emissions, whereas pollution imported from an upwind continent is typically sufficiently diluted that it cannot lead to the violation of air quality standards without additional local production. However, it can produce an increased background on which local production can build and, thus, lead to more frequent exceedances of air quality standards. Furthermore, the reason for the significant increase in ozone background concentrations at Northern latitude surface stations is still unknown (Solberg et al., 2005) but likely due to ICT. So far, only few studies like Huntrieser et al. (2005) show clear evidence of ICT at surface stations. Thus, there is a strong need to further investigate ICT and its influence on tropospheric background and surface concentration levels.

8.2 Studies on ICT within EMEP: Assessment of the impact of ICT on European surface pollution levels

At CCC it is planned to apply the particle dispersion model FLEXPART Stohl et al., 1998) in combination with the EMEP monitoring data in order to assess the impact of ICT on European surface pollution levels. FLEXPART parameterizes turbulence (Stohl and Trickl, 1999), is equipped with a convective parameterization scheme (Emanuel and Zivkovic-Rothman, 1999), and was validated in a number of studies on air pollution transport (e.g. Wotawa and Trainer, 2000; Forster et al., 2001; Spichtinger et al., 2001; Stohl et al., 2003a). We will apply the model in backward mode (details on the backward simulations can be found in Seibert and Frank, 2004), i.e. for selected EMEP monitoring stations (receptors) 40000 particles with unit mixing ratio will be released every 6-hour interval over several years within the EMEP monitoring period. A response sensitivity function to emission input which is related to the particles residence time and can be used to determine the source regions and pathways of air masses to the receptor, will then be calculated on a uniform grid. While the total columns of the sensitivity function gives information on the pathways of the air masses to the receptor, the sensitivity function in the lowest model layer adjacent to the ground the so-called footprint can be used to determine the source regions of surface emissions. The sensitivity function in a particular grid cell is proportional to the contribution a source with unit strength in this cell would make to the mixing ratio at the receptor. By multiplying this sensitivity function with the tracers actual source strength in the respective cell (e.g. from an emission inventory), the actual contribution from this cell to the mixing ratio measured at the receptor can be obtained. Summing up the contributions from all grid cells finally gives the total mixing ratio at the receptor. The described method is very efficient and has already successfully been used to analyse the origin, pathways and impact of polluted air masses within several case studies (e.g. Stohl et al., 2003; Cooper et al., 2004; Huntrieser et al., 2005). For EMEP, we will use this method to identify ICT pollution episodes, to investigate the pathways of the pollution to its receptor, especially with regard to processes like convection, and to estimate the impact of ICT on European surface concentrations. All simulations will be based on the ERA-40 data (1957-2001) from the European Centre for Medium-Range Weather Forecast (ECMWF). For the years after 2001 operational data will be used. The data have a horizontal resolution of 1°x 1° on 60 vertical levels and a temporal resolution of 3h (analyses at 0, 6, 12, 18 UTC; 3h forecasts at 3, 9, 15, 21 UTC).

The results from the FLEXPART model will be useful also to test the performance of the hemispheric/global version of the EMEP Unified model (see 8.3). Reciprocally, the use of the EMEP model in the study of ICT episodes will complement the analysis made by FLEXPART and allow to determine the influence of chemical reactions along the ICT transport, a process that is currently not included in the FLEXPART model. Thus, CCC and MSC_W will work jointly in the study of ICT and its influence on surface ozone and PM levels. A combined analysis of episodes of intercontinental transport using both models and existing aircraft, satellite and ground based observation will allow to determine to what extent ICT episodes are well described by the Eulerian model and the degree of influence of different precursor emissions.

8.3 Studies of ICT within EMEP:Progress with the hemispheric/global version of the Unified EMEP model

The EMEP Unified regional model developed at MSC-W over several years has been successfully implemented, evaluated and reviewed in detail (Simpson et al., 2003, Fagerli et al., 2003, Tarrason et al., 2003, Tarrason et al., 2004, UN-ECE, 2004). The model has a modular flexible structure that allows the choice of different model domains and resolutions (Wind et al, 2002, Wind et al., 2003). It is therefore well suited to allow simulations in different domains from hemispheric to regional and local scale.

However, the implementation of the EMEP Unified model in a different domain with different resolution requires more than a simple change in the numerical structure of the model. In order to use the EMEP Unified model, first in hemispheric and further in global scale, new input data needs to be compiled. Also, after that the model is able to make use of the global input data, it will still be necessary to refine the range of processes described by the model. This is because not all physical processes which are important at the global level are at present adequately described by the EMEP model. In particular, the parametrisation of convective exchange needs a new formulation and the vertical structure of the model needs to be re-evaluated.

The successive stages to allow for a hemispheric/global application of the EMEP Unified model are summarised below. Starting from the EMEP regional model (50x50 km^2) we will need to:

- Evaluate the use of new meteorological input data
- Compile global scale physical input information (landuse, emissions ...)
- Reconsider the vertical extension and resolution of the vertical grid
- Allow the EMEP model to be run in other grid projections than polar stereographic
- Modify the domain of the model from hemispheric to global.

In this section, special attention is given to the first point, because the meteorological driver of the model is (together with emissions) the most important input to any chemical transport model. For hemispheric/global scale modelling we will use the ECMWF/ERA-40 meteorological database (Kållberg et al., 2004), while for regional model applications we have always used a specially dedicated version of the HIRLAM model in polar stereographic grid (PARLAM_PS). The following sections, present a quantification of the differences in the EMEP model results that can be expected because of the use of new meteorological input data.

8.3.1 Evaluation of new meteorological input data: ERA-40 data

The two types of meteorological data compared in this section are:

- ERA-40 data calculated by the atmospheric model IFS CY23r4 at the European Centre for Medium Range Weather Forecasts (ECMWF) and archived in ECMWF's Meteorological Archive and Retrieval System (MARS) (Kållberg et al., 2004)
- PARLAM data calculated by the atmospheric model PARLAM-PS, a special dedicated model version of HIRLAM-3, at the Norwegian Meteorological Institute (MET.NO) and stored in MET.NO's archive system (Benedictow, 2005)

For our air pollution model applications, a significant difference between the ERA-40 and PARLAM data is that the former has been produced based on a significantly coarser grid resolution. The ERA-40 uses a spectral grid TL159, corresponding to a grid resolution of 1.125° (ca. 125 km), while our PARLAM grid is based on a polar stereographic projection with about 50 km resolution (50 km is the resolution at 60° North; due to the projection, the resolution is finer at lower latitudes and coarser closer to the North Pole). In the MARS archive only short-range forecasts: +3h and +6h for

ERA-40 data are available for all four analyses per day (00, 06, 12 and 18 UTC) and therefore used in this comparison. In comparison the PARLAM data used as input to the EMEP model are based on +9h and +12h forecasts generated four times a day. The forecasts are chosen in order to allow for sufficient spin-up time to establish a balance between the humidity and the dynamical variables.

In order to compare the two meteorological source data, the ERA-40 data is interpolated onto the 50 km resolution PARLAM/EMEP grid. Starting from a 288x145 longitude/latitude global grid, a simple first order interpolation is adopted for all fields, except wind fields and precipitation. For the wind fields additional corrections are applied, in order to secure the mass consistency of the interpolated fields. A zero order interpolation is used for precipitation in order to minimize the numerical spreading. An overview of the basic meteorological fields used by the EMEP model is shown in Table 8.1.

ERA-40 field	PARLAM/EMEP field	dimension	unit
eastward wind	wind in x - direction	3 D	m s^{-1}
northward wind	wind in y - direction	3 D	m s^{-1}
vertical velocity ($\dot{P}$)	vertical velocity ($\dot{\sigma}$)	3 D	s^{-1}
temperature	potential temperature	3 D	Deg. K
specific humidity	specific humidity	3 D	mass ratio
cloud cover	cloud cover	3 D	%
precipitation (accumulated)	precipitation(accumulated)	3 D	kg m^{-2}
log surface pressure	surface pressure	2 D	Pa
temperature at 2 m	temperature at 2 m	2 D	Deg. K
surface flux sens. heat (accumulated)	surface flux sens. heat	2 D	W m^{2}
surface flux latent heat (accumulated)	surface flux latent heat	2 D	W m^{2}
surface stress (componentwise, accumulated)	surface stress	2 D	N m^{2}

Table 8.1: Overview over the ERA-40 fields used to derive the basic meteorological input data used by the EMEP model.

Wind fields

The average horizontal wind fields for PARLAM and ERA-40 are compared in Figure 8.3. The left hand side figures show the average for a winter month (January 2001) and the figures on the right hand side show average values for a summer month (July 2001). The arrows show values obtained by averaging the x- and y-wind components, and the colors show the average of the wind speed.

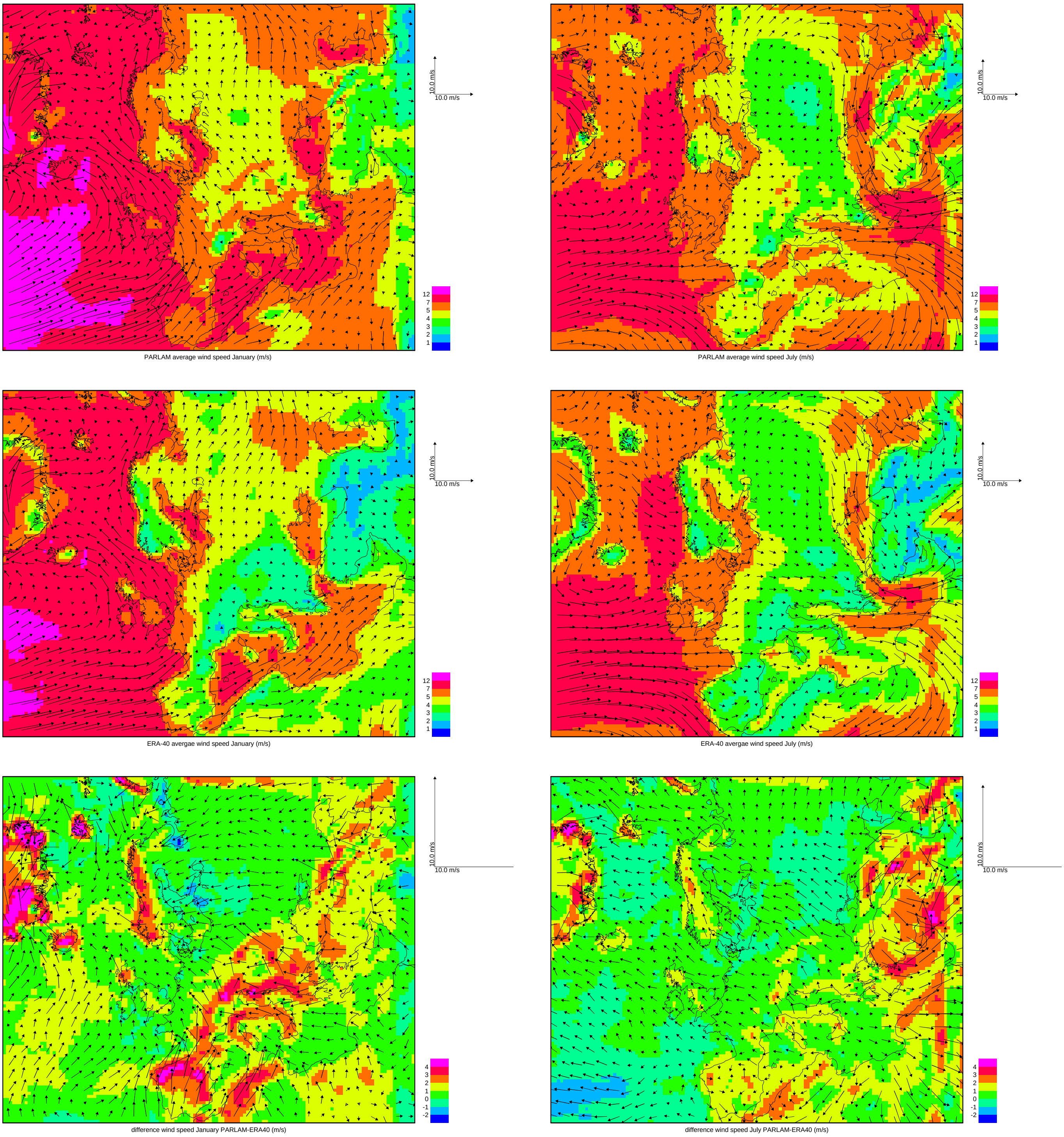

Figure 8.3: Comparison of PARLAM and ERA-40 average winds. Arrows show average wind directions and colors show average wind speed (m/s). Left figures: average January 2001, right figures: average July 2001. Upper figures: PARLAM results, middle figures ERA-40 results, bottom figures difference PARLAM-ERA40.

Both in January and July the average directions of the wind are very similar. But there are significant differences in the average wind strength. The PARLAM wind is systematically stronger than the ERA-40 wind. Specially in coast and mountain areas, the differences are large, reaching 2-4 m/s. This could be a consequence of differences in surface roughness parametrization used in the models, or an effect of the finer scale of the PARLAM model: processes in the scales 50 to 125 km may not be captured by the coarser grid of the ERA-40 meteorology.

Mass consistency of wind fi elds

Interpolated wind fields will in general introduce an artificial divergence of the wind fields. This can seriously disturb the analysis of air pollutants budgets. An ideal treatment of the mass consistency problem would require that the same grid and advection scheme is used in the meteorological model and in the air pollution model. A simpler and more flexible approach is to require the wind fields to be divergence-free: divergence-free wind fields will in general give relatively small mass consistency problems.

In our case we have taken as a starting point the first order interpolation of the wind fields. As expected, the resulting wind fields are not mass conservative. Still there is an infinity of ways to define divergence-free wind fields. A simple scheme is to leave the horizontal wind fields unchanged, and adapt the vertical winds, starting from the lowest level. This approach can give undesired side effects in the case of relatively large corrections, since a correction in the lowest level may be reported through all the vertical layers until the top of the grid. This can cause an artificial vertical mixing of the layers, which is potentially highly disturbing in air pollution transport studies.

Instead we have used the following simple scheme: for each grid cell the divergence is computed as

$$\text{div} = \Delta\dot{\sigma}\frac{\Delta x \Delta y}{\Delta\sigma} + \Delta u + \Delta v$$

Where Δx, Δy and $\Delta\sigma$ are the horizontal and vertical dimensions of the gridcell, and Δu, Δv and $\Delta\dot{\sigma}$ are the corresponding wind speed differences between opposite faces of the gridcell.

The vertical wind velocity is then corrected, with the limitations that it neither can increase in magnitude nor decrease by more than 99% of its value. This first correction will generally remove most of the divergence. The remainder divergence is reported in the 2-dimensional horizontal directions. Note that in the our case, the horizontal faces of a gridcell are much larger than the lateral faces, and the divergence of a gridcell is much more sensitive to changes in the vertical winds than to changes in the horizontal winds.

An example of the divergence and the wind fields obtained after these corrections are pictured in Figure 8.4. The Figure indicates that most of the corrections affect the vertical velocities, while the horizontal fields are generally only changed by less than 1 m/s. This could indicate that the divergences essentially arises from poor vertical wind description. The poor description of the vertical winds can be attributed to the interpolation process: the vertical winds are not only interpolated horizontally and vertically, but also the vertical coordinates are different in the original ERA-40 and in the grid used by the EMEP model. The original ERA-40 defines the vertical winds as $\dot{P}$, while the EMEP model use $\dot{\sigma}$.

We have derived the first order vertical winds in our sigma vertical coordinates ($\sigma = \frac{P-P_T}{P_S-P_T}$) from the ERA-40 $\dot{P}$ through:

$$\dot{\sigma} = \frac{\dot{P}}{P_S - P_T} - (u\frac{\partial P_S}{\partial x} + v\frac{\partial P_S}{\partial y})\sigma$$

Where P is the pressure, P_S is the surface pressure, $P_T = 100$hPa is the pressure at the top of the layers, and u and v are the horizontal wind components in x and y directions. Surface pressure tendencies ($\frac{\partial P_S}{\partial t}$) are here neglected.

With this procedure, the resulting error in the mass budget of air pollutants is of the same order in the interpolated ERA-40 and the direct PARLAM cases; i.e. 1-2% of the total mass after one year run cannot be assigned.

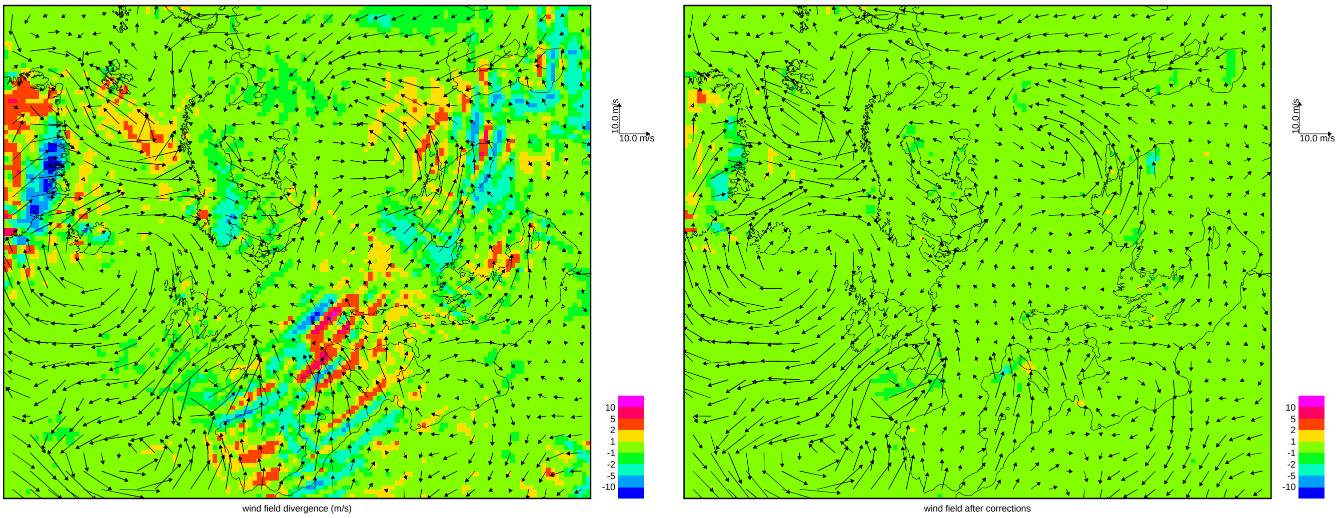

Figure 8.4: ERA-40 interpolated wind fields (on 10th of January 2001 at 03:00). The arrows in the left hand side figure show the horizontal wind field directly after first order interpolation; the colors shows the divergence of the wind fields (units: m/s per gridcell). The arrows in the right hand side show the wind field after the mass balance corrections; the colors show the remaining divergence after that the vertical winds are corrected (units: m/s per gridcell).

Precipitation

The precipitation in January and July 2001 obtained from ERA-40 and PARLAM are compared in Figure 8.5. Total precipitation amounts are significantly lower in the

ERA-40 case: The total precipitation amount integrated over all the EU countries give $30.2\ 10^{10} m^3$ in January according to PARLAM and $24.4\ 10^{10} m^3$ according to ERA-40. In July PARLAM give a precipitation amount over EU of $34.2\ 10^{10} m^3$, compared to $22.2\ 10^{10} m^3$ for ERA-40. This shows that the precipitation in the ERA-40 data are 20% lower in January and even 35% lower in July compared to PARLAM results.

Differences in precipitation will directly cause differences in the rates of wet deposition of air pollutants and affect their concentration and transport patterns.

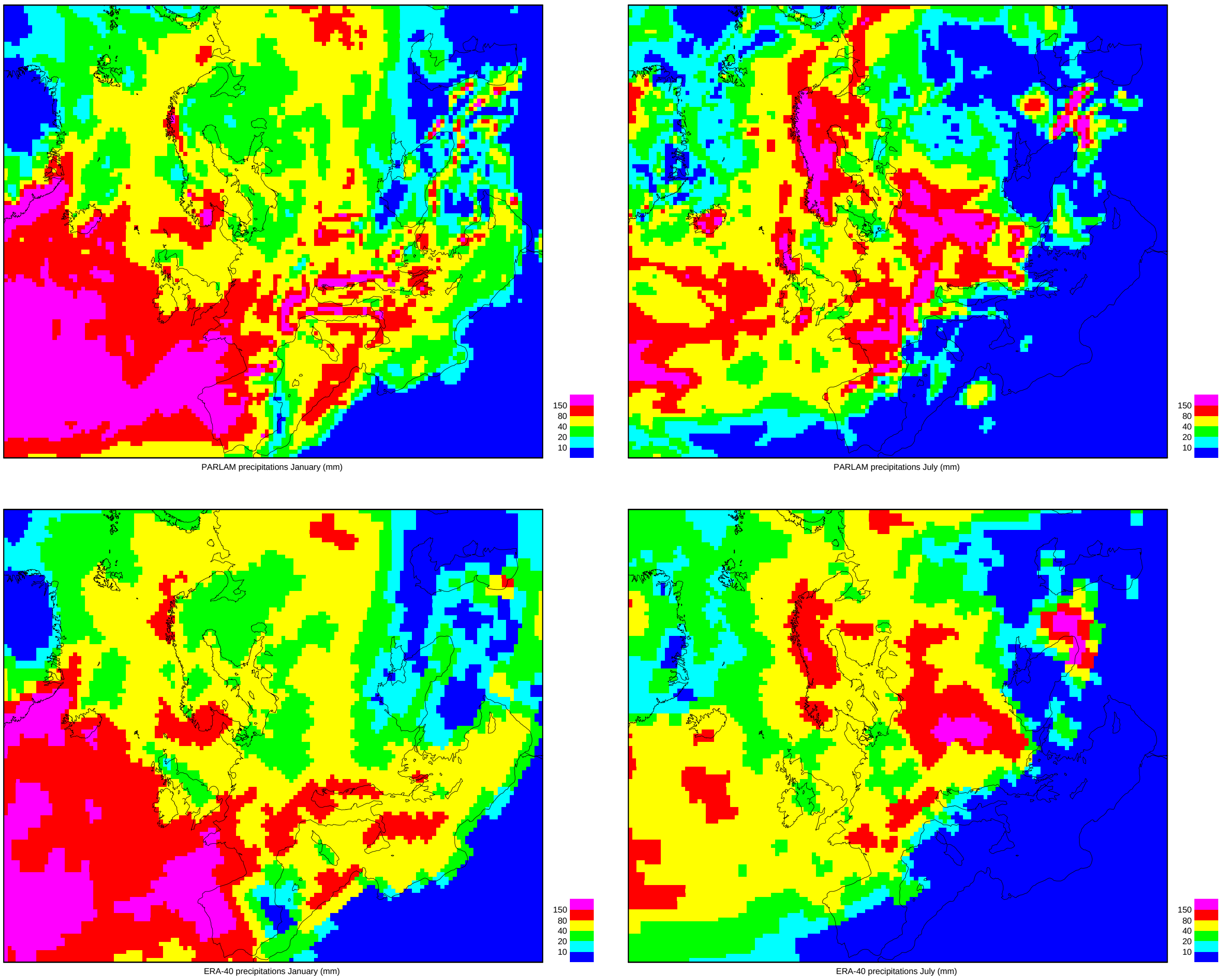

Figure 8.5: Comparison of PARLAM and ERA-40 average precipitation (mm). Left figures: January 2001, right figures: July 2001. Upper figures: PARLAM results, bottom figures ERA-40 results.

8.3.2 Effect of the new meteorology on the dispersion of air pollutants

Figure 8.6 show the change in concentrations of Primary fine Particulate Matter (PPM2.5) in January 2001 caused by a 15% reduction of German emissions; Figure 8.7 show the corresponding change in SOMO35 in July 2001 and in Table 8.2 the integrated differences are given.

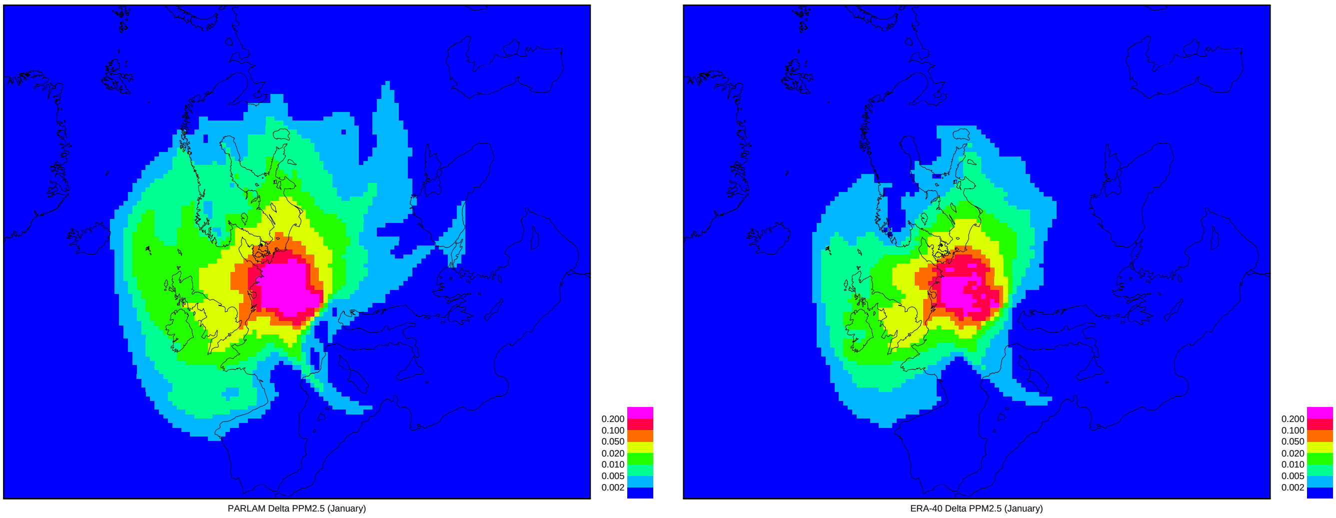

Figure 8.6: Change in PPM2.5 concentrations due to a 15% reduction of German emissions (January).

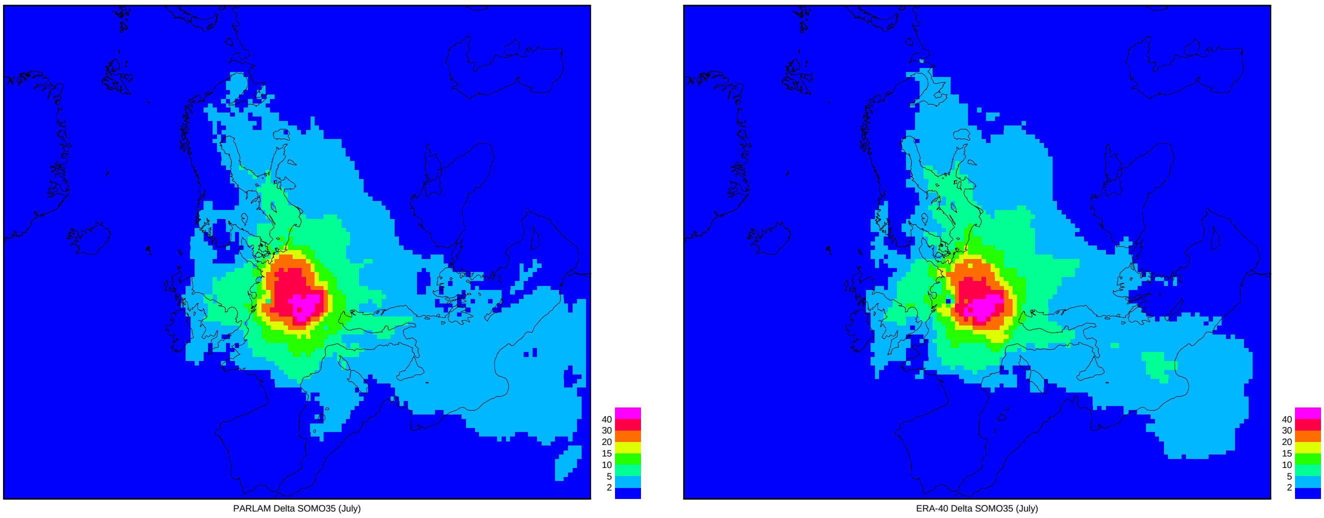

Figure 8.7: Change in SOMO35 due to a 15% reduction of German emissions (July).

We observe that the PPM2.5 seem to have a slightly shorter range dispersion in the cases where ERA-40 is used, compared to the results obtained using PARLAM meteorological input data, whereas the results for SOMO35 are very similar in the two cases. The concentrations of O_3 are directly influenced by several meteorological parameters: wind, temperature and cloud cover, but will be little affected by precipitation. On the other hand, PPM2.5 is not involved in chemical processes, but it is susceptible to wet scavenging. This indicates that the processes involving O_3 are described similarly with the two meteorologies, but that the compounds sensitive to differences in precipitation may give different results.

Effect on the wet and dry deposition of air pollutants

Almost all the emitted sulfur and nitrogen will end as depositions in the model domain. (A small part will however leave the domain through the lateral or upper boundaries, and some will remain in the air.) The total deposited amount will therefore not be much influenced by the meteorological driver, however the relative fractions of wet and dry depositions will be affected by the precipitation frequency and intensity.

Table 8.2 show that the ERA-40 meteorological input data causes the fraction of wet depositions of pollutants to be systematically larger than in the PARLAM case. This result is obtained although the ERA-40 precipitation have a *weaker* intensity than the precipitation from the PARLAM meteorology.

	PARLAM January	ERA-40 January	PARLAM July	ERA-40 July
Precipitation (10^{10} m^3)	30.2	24.4	34.2	22.2
Dry OXS (ktons)	2.52	2.16	0.97	0.90
Dry OXN (ktons)	1.24	1.05	2.46	2.12
Dry RDN (ktons)	2.09	1.45	2.02	1.80
Wet OXS (ktons)	2.38	2.83	1.99	2.09
Wet OXN (ktons)	3.60	4.00	2.92	3.27
Wet RDN (ktons)	2.67	3.37	3.88	4.10
PM2.5 (μg $m^{-3}m^2$ 10^{12})	0.95	0.78	0.42	0.44
PPM2.5 (μg $m^{-3}m^2$ 10^{12})	0.20	0.14	0.088	0.075
SOMO35 (ppb day m^2 10^{12})	0.52	0.59	55.8	56.0

Table 8.2: Changes in depositions and concentrations caused by a 15% reduction of German emissions. All the quantities are monthly values, integrated over the entire map, except precipitation which are integrated over EU countries only.

The scavenging of gases and particles is a process which does not vary linearly with the precipitation intensity. The wet deposited amounts are more sensitive to the precipitation frequency than to the precipitation intensity. Since the ERA-40 meteorological fields have originally a coarser resolution (about 125 km), localized precipitation will appear as distributed over several 50 km gridcells and cause a “smoothing” of the precipitation fields. This is difficult to see in the maps of one month accumulated precipitation, but can clearly be observed if the precipitation are accumulated over a short period of time. In Figure 8.8 the precipitation patterns for the two meteorological models accumulated over a three hours period are shown. The ERA-40 results are more diffuse and have lower intensity, while the PARLAM precipitation cover a smaller area but are stronger in intensity. This has for consequence that, at a given point, the precipitation frequency will be higher in the ERA-40 description than what is obtained using the PARLAM data.

In order to minimize the artificial spreading of precipitation during grid conversion, a zeroth order interpolation is adopted for the precipitation fields (i.e. the value of the nearest neighbour is taken without further interpolation)

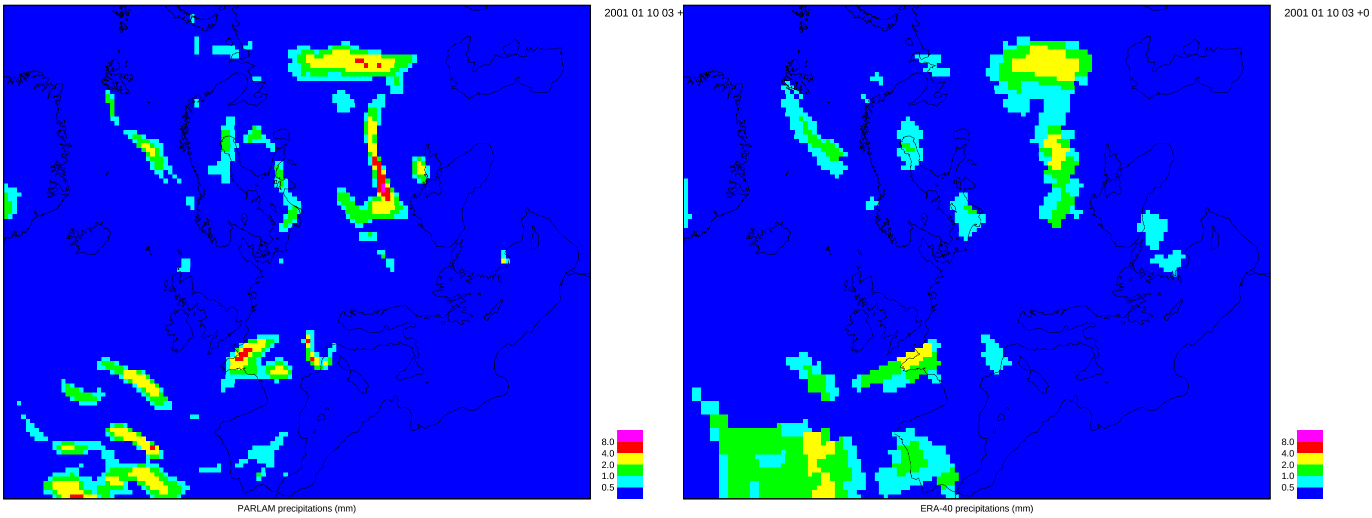

Figure 8.8: Three hours accumulated precipitation (in mm) on 10th of January 2001 from 00:00 to 03:00 . The PARLAM (left) precipitation are stronger and more localised than the ERA-40 results (right).

Validation of results with new meteorological input data

In Table 8.3 the performance of the EMEP model as compared to observations are summarized in the case when PARLAM or ERA-40 meteorology is used. The results refer to one year (2001) run.

In general, the results for air concentrations are relatively similar. As already discussed in the preceding section, the wet deposition amounts are significantly higher in the ERA-40 case although the precipitation amount is smaller. Also SO_2 average air concentrations are lower in the ERA-40 results; this could be due to an increased oxidation rate caused by larger cloud coverage: we can expect a spreading of cloud coverage for similar reasons as the spreading of precipitation. The differences in the correlations of HNO_3+NO_3 could be attributed to differences in wet deposition rates, although a more detailed analysis would be required to confirm this.

Component	Observations	Model result		correlation (spatial)	
		PARLAM	ERA	PARLAM	ERA
In Air					
NO_2 μg(N) m^{-3}	2.05	1.72	1.65	0.81	0.82
SO_2 μg(S) m^{-3}	0.76	0.99	0.85	0.74	0.75
SO_4^{2-} μg(S) m^{-3}	0.71	0.65	0.66	0.76	0.79
NH_4^+ μg(N) m^{-3}	1.00	1.04	0.98	0.82	0.83
NH_3+NH_4^+ μg(N) m^{-3}	1.31	1.66	1.55	0.72	0.65
HNO_3+NO_3^- μg(N) m^{-3}	0.49	0.59	0.59	0.80	0.59
NO_3^- μg(N) m^{-3}	0.44	0.50	0.51	0.77	0.79
Wet deposition					
SO_4^{2-} mg(S)m^{-2}	23550	24064	24278	0.67	0.57
SO_4^{2-} mg(S)l^{-1}	0.57	0.47	0.70	0.33	0.42
NH_4^+mg(N)m^{-2}	18348	17990	19336	0.65	0.65
NH_4^+mg(N)l^{-1}	0.37	0.34	0.54	0.70	0.63
NO_3^- mg(N)m^{-2}	17751	13085	13814	0.76	0.66
NO_3^- mg(N)l^{-1}	0.41	0.26	0.39	0.35	0.47
Precipitation mm	884	989	683	0.59	0.68
Component	Observations	Model result		correlation (time+spatial)	
		PARLAM	ERA	PARLAM	ERA
In Air					
NO_2 μg(N) m^{-3}	1.99	1.67	1.60	0.68	0.69
SO_2 μg(S) m^{-3}	0.76	0.98	0.84	0.51	0.55
SO_4^{2-} μg(S) m^{-3}	0.70	0.64	0.65	0.60	0.59
NH_3 μg(N) m^{-3}	3.68	1.82	1.67	0.79	0.79
NH_4^+ μg(N) m^{-3}	0.79	0.79	0.74	0.62	0.60
NH_3+NH_4^+ μg(N) m^{-3}	1.24	1.49	1.39	0.56	0.54
HNO_3 μg(N) m^{-3}	0.14	0.17	0.21	0.18	0.21
HNO_3+NO_3^- μg(N) m^{-3}	0.45	0.54	0.54	0.51	0.45
NO_3^- μg(N) m^{-3}	0.38	0.42	0.43	0.55	0.54

Table 8.3: Comparison of observations and model results obtained with ERA and PARLAM meteorological data (2001). The observations are averaged over stations where measurements are available (from 8 to 88 stations). The correlations are between yearly averaged measured and modelled (spatial) and between all daily measured and modelled values (time+spatial).

8.3.3 Towards a hemispheric model application

We have demonstrated that the use of ERA-40 meteorological data as input for the EMEP model is possible. The most important differences in the results concerns the increased wet deposition rates. For compounds which are susceptible to wet scavenging, the increased wet depositions will also indirectly affect other important results. Increased wet depositions cause the air concentrations to decrease. Lower air concentrations will in turn reduce dry depositions; for some species (S, N) the mass conservation laws require dry depositions to decrease if wet depositions increase. The transport distances can also be reduced, since the chemical compounds may be deposited earlier.

These problems are not an effect of the interpolation, but a consequence of the coarser resolution of the meteorological model. One can expect that the same effect will be present in for example hemispheric/global runs, as long as the model is based on coarse resolution meteorological data. We see no obvious shortcut for including these small scale physical effects in a coarse grid. These limitations are to be kept in mind, and obviously coarse grid meteorological model will not be able to describe all the features of smaller scales.

Since ERA-40 data has a global coverage, the same procedure can now be used at the hemispheric scale. We have made a first attempt to couple the ERA-40 data for the Northern hemisphere to the EMEP model. An example of a hemispheric map in polar stereographic coordinate showing a preliminary result of the hemispheric EMEP model with a 100x100 km^2 grid resolution is given in Figure 8.9. This show that the model is able to make use of the meteorological data also at the hemispheric scales. The emissions have been compiled in polar stereographic projection by IER-University of Stuttgart based on EDGAR (Emission Database for Global Atmospheric Research, Olivier, 2001). Landuse data are derived from the MM5 TERRAIN database (ftp://ftp.ucar.edu/mesouser/MM5V3/TERRAIN_DATA/). Note however that at this stage the hemispheric results of the model are in no way reliable and only preliminary crude estimates have been made here.

The use of a polar stereographic projection is not well adapted to hemispheric (or global) scales: because of the distortion introduced by the projection, the gridcells around the equator will have half the size of the gridcells at the poles. This means that an unnecessary large amount of the computational effort will be spend to describe the areas close to the equator. This projection is adopted here because it allows a straightforward comparison to existing results in the EMEP grid and also is simpler in terms of adaptations of our present code. The polar stereographic projection is however to be considered as a temporary solution and alternative projections will be considered in the future.

When the global grid is defined we will reconsider the meteorological input to use. If the grid of the meteorological driver and the chemistry transport model are different, improved interpolation methods should be introduced. For example a first improvement would be to interpolate from the ERA-40 spherical harmonics, since

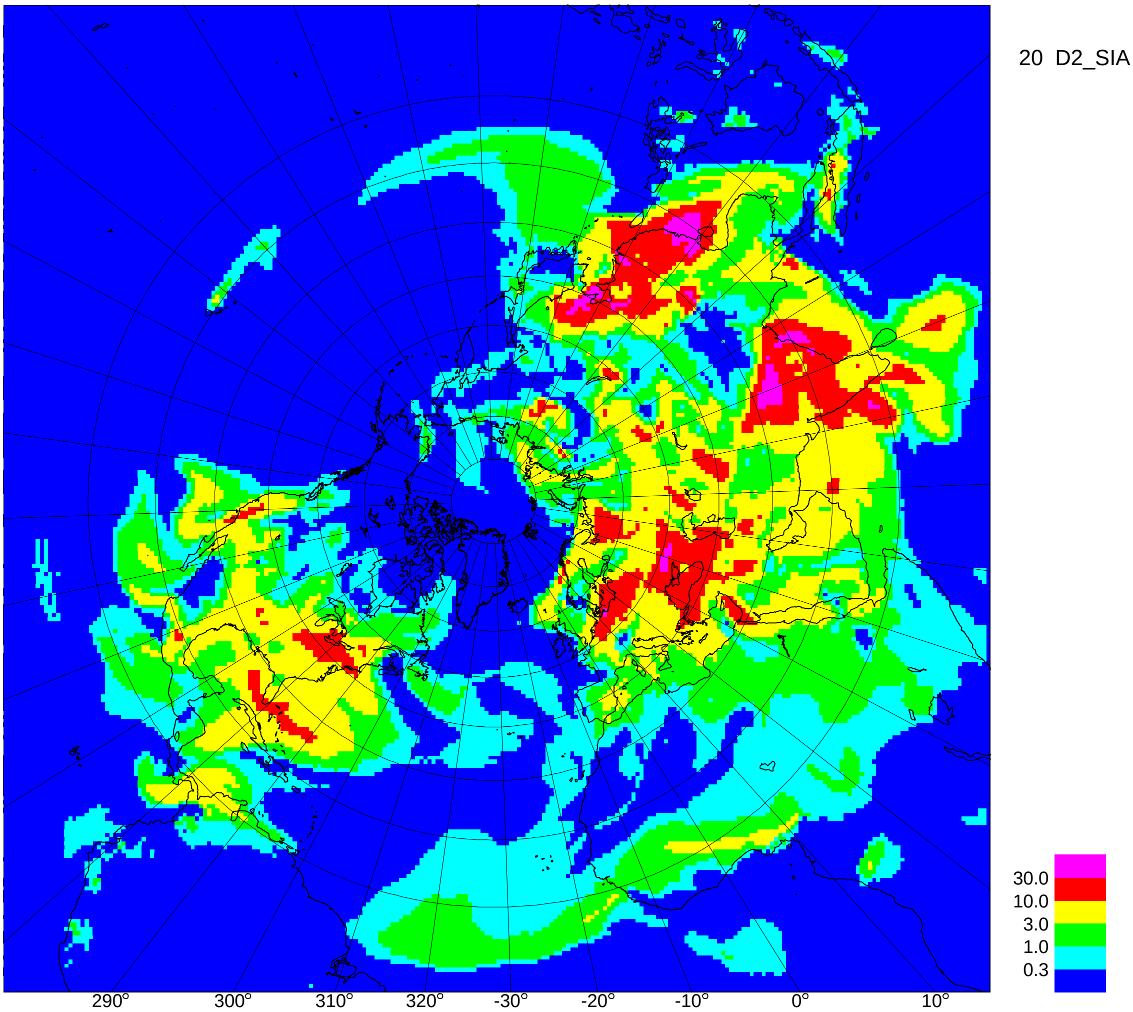

Figure 8.9: Hemispheric map in polarstereographic projection showing anthropogenic SIA concentrations (μg m^{-3}) after one week simulation

this is originally the grid which is used to calculate the ERA-40 data. In view of the central importance of the quality of the input meteorological data, we will also consider recalculating the meteorological input data in the final grid projection (as dedicated runs) in the future.

The verification of the use of ERA-40 data in Europe does not validate its use for hemispheric applications. The hemispheric transport processes are different than in the European/regional scales and we will need to gather experience on the use of meteorological data at these scales.

The meteorological driver is only one (important) part of a model aiming at describing air pollution at global scales. Other input data like emissions and landuse have to be introduced and their quality assessed. Furthermore every module of the EMEP model (chemistry, advection, deposition ...) will have to be reconsidered and its adequacy to the new application evaluated. New processes will have to be introduced: convection, wind blown dust, biomass burning, followed by a careful evaluation of the Eulerian model results and its ability to describe intercontinental pollution transport.

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APPENDIX A

National emissions and projections

This Appendix contains the national emission data and the different projections used throughout this report for main pollutants and primary particle emissions. The actual gridded emission data used in the EMEP Unified model calculations will be available in autumn 2005 on http://webdab.emep.int

Table A:1: National total emission and projections Emissions of sulphur (2000, 2002, 2003, 2010, 2020) used for modelling at the MSC-W (Gg of SO_2 per year)

Area/Year	2000 Baseline	2002 UNECE	2003 UNECE	2010 CLE	2020 CLE	D23-1	D23-2	D23-3	2020 MFR
Albania	32	58	58	30	31	31	31	31	5
Armenia	8	8	10	4	4	4	4	4	4
Austria	38	33	34	30	26	23	23	22	22
Azerbaijan	15	15	15	15	15	15	15	15	15
Belarus	351	143	131	349	295	295	295	295	22
Belgium	187	158	153	99	83	59	57	51	51
Bosnia and Herzegovina	420	419	419	411	380	380	380	380	22
Bulgaria	1313	965	968	979	651	651	651	651	59
Croatia	108	67	67	69	65	65	65	65	29
Cyprus	50	51	45	17	8	8	8	8	3
Czech Republic	251	237	232	121	53	34	33	32	26
Denmark	28	25	31	18	13	12	11	9	10
Estonia	91	88	101	44	10	7	5	5	3
Finland	79	82	99	61	62	59	52	49	46
France	646	500	492	414	345	191	188	165	148
Georgia	9	6	6	9	9	9	9	9	9
Germany	641	611	616	450	332	267	263	240	220
Greece	478	509	509	168	110	89	71	64	40
Hungary	487	359	347	266	88	23	20	19	32
Iceland	27	27	27	29	29	29	29	29	29
Ireland	132	96	76	33	19	14	12	11	10
Italy	755	665	665	376	281	153	133	122	117
Kazakhstan	237	237	237	237	237	237	237	237	237
Latvia	17	9	8	11	8	6	3	3	2
Lithuania	43	43	43	33	22	9	7	7	11
Luxembourg	4	3	3	3	2	1	1	1	1
Malta	26	26	26	12	2	2	2	2	1
Netherlands	85	66	65	60	64	45	43	43	41
Norway	27	22	23	21	18	18	18	18	13
Poland	1515	1455	1564	1046	554	201	201	195	223
Portugal	232	280	205	103	81	53	44	39	33
Republic of Moldova	114	15	21	117	102	102	102	102	11
Romania	838	833	833	668	182	182	182	182	34
Russian Federation	2425	2130	2130	2464	2014	2014	2014	2014	534
Serbia and Montenegro	396	382	396	277	167	167	167	167	26
Slovakia	124	103	106	54	33	20	18	16	13
Slovenia	97	71	66	22	16	6	6	6	8
Spain	1486	1518	1353	416	335	214	183	176	155
Sweden	58	50	52	59	50	50	47	46	39
Switzerland	20	19	18	16	13	13	13	13	7
TFYR of Macedonia	90	166	150	82	72	72	72	72	5
Turkey	2122	2112	2112	1708	1154	1154	1154	1154	313
Ukraine	1404	1329	1252	1145	842	842	842	842	211
United Kingdom	1189	1002	979	366	209	157	135	130	102
North Africa	413	1054	413	413	413	413	413	413	413
Remaining Asian areas	854	1592	854	805	805	805	805	805	805
Baltic Sea	243	240	228	174	225	225	225	225	90
Black Sea	84	60	57	107	138	138	138	138	31
Mediterranean Sea	1244	1250	1189	1602	2003	2003	2003	2003	464
North Sea	461	477	454	329	423	423	423	423	169
Remaining N-E Atlantic Ocean	397	947	901	510	632	632	632	632	146
Natural marine emissions	743	743	743	743	743	743	743	743	743
Volcanic emissions	2000	2000	2000	2000	2000	2000	2000	2000	2000
TOTAL	25137	25356	23582	19595	16468	15366	15230	15124	7805

Table A:2: National total emission and projections Emissions of nitrogen oxides (2000, 2002, 2003, 2010, 2020) used for modelling at the MSC-W (Gg of NO_2 per year)

Area/Year	2000 Baseline	2002 UNECE	2003 UNECE	2010 CLE	2020 CLE	D23-1	D23-2	D23-3	2020 MFR
Albania	22	29	29	28	36	36	36	36	6
Armenia	10	13	15	13	13	13	13	13	13
Austria	192	220	229	160	127	107	100	96	91
Azerbaijan	43	43	43	43	43	43	43	43	43
Belarus	248	137	140	271	291	291	291	291	50
Belgium	333	300	297	232	190	142	135	123	112
Bosnia and Herzegovina	53	55	55	54	58	58	58	58	11
Bulgaria	191	197	209	147	102	102	102	102	45
Croatia	87	69	69	94	104	104	104	104	19
Cyprus	27	22	22	21	18	14	11	11	10
Czech Republic	320	318	324	187	113	81	71	68	60
Denmark	207	201	209	147	105	84	79	78	65
Estonia	37	40	39	28	15	10	10	9	8
Finland	213	208	219	151	117	89	80	73	63
France	1444	1275	1220	1089	819	622	575	567	461
Georgia	30	44	44	30	30	30	30	30	30
Germany	1657	1493	1428	1182	808	698	665	634	600
Greece	321	318	318	266	209	169	156	148	120
Hungary	188	180	180	135	83	61	52	49	42
Iceland	28	28	28	30	30	30	30	30	30
Ireland	129	125	120	99	63	50	45	45	39
Italy	1388	1267	1267	1006	663	538	491	472	363
Kazakhstan	50	50	50	50	50	50	50	50	50
Latvia	35	37	37	29	15	11	11	10	9
Lithuania	49	51	53	41	27	21	19	17	15
Luxembourg	33	17	17	28	18	13	13	13	11
Malta	9	9	9	6	4	2	2	2	2
Netherlands	402	371	364	315	240	219	193	191	167
Norway	211	211	220	193	166	166	166	166	109
Poland	843	796	796	616	364	275	246	230	209
Portugal	265	286	265	214	156	127	115	108	97
Republic of Moldova	64	25	30	64	63	63	63	63	14
Romania	331	349	349	283	186	186	186	186	94
Russian Federation	2535	2566	2566	2758	3040	3040	3040	3040	725
Serbia and Montenegro	166	158	158	168	173	173	173	173	32
Slovakia	106	105	98	72	60	45	40	38	34
Slovenia	58	60	56	39	24	20	18	17	16
Spain	1328	1420	1411	970	681	515	483	455	398
Sweden	252	208	206	200	150	119	104	103	75
Switzerland	97	94	89	71	55	55	55	55	33
TFYR of Macedonia	38	37	50	41	43	43	43	43	9
Turkey	942	951	951	852	729	729	729	729	369
Ukraine	1146	588	523	1184	1250	1250	1250	1250	253
United Kingdom	1750	1578	1570	1085	817	648	584	549	474
North Africa	96	863	96	96	96	96	96	96	96
Remaining Asian areas	169	1026	169	79	79	79	79	79	79
Baltic Sea	354	370	352	458	517	517	517	517	302
Black Sea	120	90	86	155	199	199	199	199	102
Mediterranean Sea	1837	1723	1639	2383	2711	2711	2711	2711	1582
North Sea	670	681	648	862	971	971	971	971	568
Remaining N-E Atlantic Ocean	575	1331	1266	740	834	834	834	834	488
Natural marine emissions	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0
TOTAL	21700	22633	20628	19467	17757	16547	16165	15976	8693

Table A:3: National total emission and projections Emissions of ammonia (2000, 2002, 2003, 2010, 2020) used for modelling at the MSC-W (Gg of NH_3 per year)

Area/Year	2000 Baseline	2002 UNECE	2003 UNECE	2010 CLE	2020 CLE	D23-1	D23-2	D23-3	2020 MFR
Albania	22	32	32	26	26	26	26	26	13
Armenia	15	12	15	25	25	25	25	25	25
Austria	54	54	54	56	54	45	39	36	27
Azerbaijan	25	25	25	25	25	25	25	25	25
Belarus	128	128	120	147	147	147	147	147	70
Belgium	81	79	77	79	76	63	58	47	47
Bosnia and Herzegovina	17	23	23	17	17	17	17	17	9
Bulgaria	92	56	52	124	124	124	124	124	72
Croatia	33	51	51	33	33	33	33	33	14
Cyprus	6	7	6	6	6	5	4	4	3
Czech Republic	74	72	82	68	65	48	43	43	36
Denmark	91	102	98	81	78	60	53	49	40
Estonia	10	9	8	11	12	8	7	7	5
Finland	35	33	33	34	32	28	26	25	22
France	728	777	753	733	702	545	455	442	387
Georgia	97	97	97	97	97	97	97	97	97
Germany	638	606	601	624	603	490	451	438	441
Greece	55	73	73	54	52	44	40	38	34
Hungary	78	65	67	83	85	53	48	44	39
Iceland	3	3	3	3	3	3	3	3	3
Ireland	127	119	116	129	121	108	102	99	84
Italy	434	447	447	421	399	314	293	281	248
Kazakhstan	18	18	18	18	18	18	18	18	18
Latvia	12	14	15	14	16	12	11	10	7
Lithuania	50	51	34	55	57	50	45	43	39
Luxembourg	7	7	7	6	6	5	5	4	4
Malta	1	5	1	1	1	1	1	1	1
Netherlands	157	136	128	144	140	110	104	103	103
Norway	26	23	23	23	23	23	23	23	15
Poland	309	325	325	328	333	221	217	200	150
Portugal	68	94	93	69	67	62	59	52	40
Republic of Moldova	36	27	28	45	44	44	44	44	21
Romania	223	164	164	285	285	285	285	285	143
Russian Federation	714	600	600	835	834	834	834	834	401
Serbia and Montenegro	66	79	79	69	69	69	69	69	32
Slovakia	32	31	30	32	33	24	23	19	17
Slovenia	18	19	19	20	20	14	13	12	9
Spain	394	382	396	382	370	284	247	231	197
Sweden	53	56	56	51	49	43	39	36	33
Switzerland	66	67	52	63	60	60	60	60	35
TFYR of Macedonia	15	16	16	15	15	15	15	15	6
Turkey	275	321	321	241	466	466	466	466	176
Ukraine	486	270	242	619	619	619	619	619	283
United Kingdom	315	311	300	323	310	223	216	212	206
North Africa	235	385	235	235	235	235	235	235	235
Remaining Asian areas	278	430	278	278	278	278	278	278	278
Baltic Sea	0	0	0	0	0	0	0	0	0
Black Sea	0	0	0	0	0	0	0	0	0
Mediterranean Sea	0	0	0	0	0	0	0	0	0
North Sea	0	0	0	0	0	0	0	0	0
Remaining N-E Atlantic Ocean	0	0	0	0	0	0	0	0	0
Natural marine emissions	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0
TOTAL	6696	6701	6293	7025	7129	6303	6041	5920	4194

Table A:4: National total emission and projections Emissions of non-methane volatile organic compounds (2000, 2002, 2003, 2010, 2020) used for modelling at the MSC-W (Gg of NMVOC per year)

Area/Year	2000 Baseline	2002 UNECE	2003 UNECE	2010 CLE	2020 CLE	D23-1	D23-2	D23-3	2020 MFR
Albania	29	34	34	36	41	41	41	41	19
Armenia	16	14	28	28	28	28	28	28	28
Austria	191	182	182	152	138	130	120	113	94
Azerbaijan	9	9	9	9	9	9	9	9	9
Belarus	229	229	308	262	260	260	260	260	121
Belgium	242	230	226	150	144	118	115	114	109
Bosnia and Herzegovina	40	42	42	46	51	51	51	51	23
Bulgaria	136	123	119	114	107	107	107	107	39
Croatia	102	88	88	105	106	106	106	106	49
Cyprus	13	16	16	6	6	6	6	6	4
Czech Republic	244	203	203	157	119	97	83	83	74
Denmark	128	145	158	73	58	52	45	45	39
Estonia	37	38	40	30	17	15	15	15	11
Finland	171	151	145	124	97	90	90	88	63
France	1541	1475	1400	1012	923	846	778	720	660
Georgia	19	29	29	19	19	19	19	19	19
Germany	1522	1492	1460	1057	809	739	682	682	618
Greece	280	268	268	168	144	110	104	104	79
Hungary	151	155	155	95	90	73	67	62	53
Iceland	10	10	10	7	7	7	7	7	7
Ireland	88	81	78	55	46	35	33	31	29
Italy	1728	1343	1343	995	731	676	663	624	552
Kazakhstan	50	50	50	50	50	50	50	50	50
Latvia	33	77	79	24	28	23	23	20	16
Lithuania	63	72	74	49	43	39	38	36	22
Luxembourg	13	15	15	9	8	7	7	7	6
Malta	4	2	4	2	2	2	2	2	1
Netherlands	264	230	225	213	203	161	153	153	145
Norway	374	345	300	122	82	82	82	82	61
Poland	582	576	576	418	320	296	284	284	215
Portugal	261	278	271	177	162	147	133	132	116
Republic of Moldova	41	28	29	43	42	42	42	42	19
Romania	379	474	327	348	329	329	329	329	111
Russian Federation	2650	2777	2777	2760	3000	3000	3000	3000	1165
Serbia and Montenegro	142	129	129	154	156	156	156	156	64
Slovakia	88	82	82	67	64	59	56	56	32
Slovenia	54	49	46	30	20	19	18	18	12
Spain	1116	1090	1098	790	692	571	550	547	492
Sweden	305	303	303	220	174	153	153	149	136
Switzerland	147	143	111	99	88	88	88	88	59
TFYR of Macedonia	26	17	17	32	36	36	36	36	17
Turkey	774	726	726	656	820	820	820	820	272
Ukraine	744	282	318	738	821	821	821	821	335
United Kingdom	1457	1166	1089	935	878	766	720	683	652
North Africa	96	2527	96	96	96	96	96	96	96
Remaining Asian areas	204	2208	204	186	186	186	186	186	186
Baltic Sea	13	8	8	17	22	22	22	22	22
Black Sea	4	2	2	6	7	7	7	7	7
Mediterranean Sea	68	36	34	88	114	114	114	114	114
North Sea	25	16	15	32	41	41	41	41	41
Remaining N-E Atlantic Ocean	21	26	25	27	35	35	35	35	35
Natural marine emissions	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0
TOTAL	16924	20091	15370	13089	12471	11786	11492	11326	7199

Table A:5: National total emission and projections Emissions of carbon monoxide (2000, 2002, 2003, 2010, 2020) used for modelling at the MSC-W (Gg of CO per year)

Area/Year	2000 Baseline	2002 UNECE	2003 UNECE	2010 CLE	2020 CLE	D23-1	D23-2	D23-3	2020 MFR
Albania	102	102	101	160	160	160	160	160	160
Armenia	110	106	120	104	104	104	104	104	104
Austria	859	775	802	727	727	727	727	727	727
Azerbaijan	293	293	293	293	293	293	293	293	293
Belarus	717	712	733	837	837	837	837	837	837
Belgium	1100	915	888	306	306	306	306	306	306
Bosnia and Herzegovina	193	193	193	160	160	160	160	160	160
Bulgaria	667	700	716	568	568	568	568	568	568
Croatia	402	309	309	480	480	480	480	480	480
Cyprus	83	83	85	83	83	83	83	83	83
Czech Republic	648	546	579	475	475	475	475	475	475
Denmark	579	590	591	358	358	358	358	358	358
Estonia	202	178	183	126	126	126	126	126	126
Finland	526	600	564	644	644	644	644	644	644
France	6640	6105	5897	4795	4795	4795	4795	4795	4795
Georgia	222	218	218	222	222	222	222	222	222
Germany	4768	4300	4155	4245	4245	4245	4245	4245	4245
Greece	1531	1169	1169	1237	1237	1237	1237	1237	1237
Hungary	633	620	600	492	492	492	492	492	492
Iceland	40	40	40	19	19	19	19	19	19
Ireland	280	254	239	204	204	204	204	204	204
Italy	5207	4476	4476	3651	3651	3651	3651	3651	3651
Kazakhstan	279	279	279	279	279	279	279	279	279
Latvia	273	290	295	185	185	185	185	185	185
Lithuania	282	224	225	228	228	228	228	228	228
Luxembourg	49	49	49	42	42	42	42	42	42
Malta	21	21	21	21	21	21	21	21	21
Netherlands	679	626	609	623	623	623	623	623	623
Norway	568	553	509	1552	1552	1552	1552	1552	1552
Poland	3463	3528	3528	2863	2863	2863	2863	2863	2863
Portugal	675	692	644	1794	1794	1794	1794	1794	1794
Republic of Moldova	100	107	139	192	192	192	192	192	192
Romania	2325	1194	1194	1034	1034	1034	1034	1034	1034
Russian Federation	10811	11517	11517	9806	9806	9806	9806	9806	9806
Serbia and Montenegro	553	553	553	573	573	573	573	573	573
Slovakia	290	312	308	240	240	240	240	240	240
Slovenia	68	89	81	199	199	199	199	199	199
Spain	2774	2320	2285	3362	3362	3362	3362	3362	3362
Sweden	833	724	697	624	624	624	624	624	624
Switzerland	394	383	368	346	346	346	346	346	346
TFYR of Macedonia	77	81	139	214	214	214	214	214	214
Turkey	3778	3778	3778	3778	3778	3778	3778	3778	3778
Ukraine	2672	2780	2766	3055	3055	3055	3055	3055	3055
United Kingdom	4025	3336	2768	1924	1924	1924	1924	1924	1924
North Africa	336	336	336	336	336	336	336	336	336
Remaining Asian areas	449	449	449	131	131	131	131	131	131
Baltic Sea	33	30	29	43	15	15	15	15	15
Black Sea	11	8	8	15	8	8	8	8	8
Mediterranean Sea	173	146	139	225	3	3	3	3	3
North Sea	63	62	59	81	91	91	91	91	91
Remaining N-E Atlantic Ocean	54	117	111	70	133	133	133	133	133
Natural marine emissions	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0
TOTAL	61910	57868	56831	54022	53837	53837	53837	53837	53837

Table A:6: National total emission and projections Emissions of fine Particulate Matter (2000, 2002, 2003, 2010, 2020) used for modelling at the MSC-W (Gg of $PM_{2.5}$ per year)

Area/Year	2000 Baseline	2002 UNECE	2003 UNECE	2010 CLE	2020 CLE	D23-1	D23-2	D23-3	2020 MFR
Albania	6	7	6	5	6	6	6	6	2
Armenia	5	5	5	5	5	5	5	5	5
Austria	36	26	26	31	27	24	22	22	20
Azerbaijan	19	19	19	19	19	19	19	19	19
Belarus	36	37	35	34	39	39	39	39	7
Belgium	42	34	34	28	24	17	17	17	16
Bosnia and Herzegovina	20	20	20	17	16	16	16	16	3
Bulgaria	57	56	56	46	40	40	40	40	12
Croatia	19	6	6	14	16	16	16	16	4
Cyprus	3	3	3	2	2	2	2	2	1
Czech Republic	71	49	38	34	18	13	13	13	12
Denmark	22	22	22	16	13	12	11	11	10
Estonia	22	25	21	13	6	5	5	5	2
Finland	36	39	38	31	27	26	26	26	16
France	286	261	267	202	165	122	113	112	101
Georgia	8	8	8	8	8	8	8	8	8
Germany	167	168	166	133	111	90	90	90	83
Greece	49	49	50	49	41	31	31	28	23
Hungary	60	24	27	26	22	11	9	9	8
Iceland	3	3	3	3	3	3	3	3	3
Ireland	14	11	11	11	9	8	8	7	6
Italy	207	207	202	131	99	77	75	74	69
Kazakhstan	11	11	11	11	11	11	11	11	11
Latvia	7	3	3	6	4	3	3	3	2
Lithuania	17	17	17	14	12	9	9	6	5
Luxembourg	3	3	3	3	2	2	2	2	2
Malta	1	1	1	0	0	0	0	0	0
Netherlands	35	26	24	27	26	23	22	22	21
Norway	27	58	54	19	16	16	16	16	11
Poland	212	142	142	147	102	62	60	59	53
Portugal	46	46	45	38	37	33	24	23	21
Republic of Moldova	23	1	3	21	14	14	14	14	2
Romania	106	106	104	86	66	66	66	66	20
Russian Federation	882	882	876	864	896	896	896	896	169
Serbia and Montenegro	44	44	44	39	42	42	42	42	8
Slovakia	18	28	25	14	14	7	7	7	6
Slovenia	15	10	7	10	6	4	3	3	3
Spain	165	144	140	110	90	72	64	63	56
Sweden	67	45	48	47	39	38	38	25	23
Switzerland	10	11	11	7	6	6	6	6	5
TFYR of Macedonia	9	10	9	8	8	8	8	8	2
Turkey	302	302	223	258	264	264	264	264	93
Ukraine	315	315	310	273	293	293	293	293	43
United Kingdom	125	92	87	79	67	55	54	54	48
North Africa	0	0	0	0	0	0	0	0	0
Remaining Asian areas	0	0	0	0	0	0	0	0	0
Baltic Sea	21	21	21	27	29	29	29	29	35
Black Sea	7	7	7	9	12	12	12	12	12
Mediterranean Sea	108	108	108	140	179	179	179	179	182
North Sea	40	40	40	51	54	54	54	54	66
Remaining N-E Atlantic Ocean	34	34	34	44	56	56	56	56	57
Natural marine emissions	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0
TOTAL	3839	3586	3461	3212	3063	2845	2808	2781	1381

Table A:7: National total emission and projections Emissions of Particulate Matter (2000, 2002, 2003, 2010, 2020) used for modelling at the MSC-W (Gg of PM_{10} per year)

Area/Year	2000 Baseline	2002 UNECE	2003 UNECE	2010 CLE	2020 CLE	D23-1	D23-2	D23-3	2020 MFR
Albania	9	9	8	7	8	8	8	8	3
Armenia	7	7	7	7	7	7	7	7	7
Austria	49	45	46	43	39	36	34	34	28
Azerbaijan	30	30	30	30	30	30	30	30	30
Belarus	56	56	51	49	54	54	54	54	13
Belgium	68	64	65	48	41	34	34	34	27
Bosnia and Herzegovina	48	48	47	37	34	34	34	34	5
Bulgaria	92	92	90	80	68	68	68	68	18
Croatia	29	7	7	20	22	22	22	22	5
Cyprus	3	5	5	3	3	3	3	3	2
Czech Republic	109	70	51	52	33	27	27	27	21
Denmark	32	30	30	26	23	22	21	21	17
Estonia	42	35	30	18	9	7	7	7	3
Finland	43	55	55	37	34	33	33	33	22
France	368	496	505	281	245	202	193	193	153
Georgia	12	12	12	12	12	12	12	12	12
Germany	255	255	254	219	191	171	171	170	148
Greece	65	66	66	67	57	48	48	44	33
Hungary	86	43	48	37	34	22	21	21	14
Iceland	3	3	3	3	3	3	3	3	3
Ireland	21	15	17	18	16	15	14	14	11
Italy	270	270	264	182	151	128	127	126	105
Kazakhstan	22	22	22	22	22	22	22	22	22
Latvia	10	5	5	8	6	5	5	5	3
Lithuania	20	20	20	18	15	13	13	10	7
Luxembourg	4	4	4	4	3	3	3	3	3
Malta	1	1	1	1	1	1	1	1	0
Netherlands	56	43	40	50	49	46	46	46	38
Norway	32	64	60	24	22	22	22	22	15
Poland	299	303	303	206	155	115	113	112	87
Portugal	58	58	58	48	48	44	35	34	28
Republic of Moldova	41	5	6	38	24	24	24	24	4
Romania	161	161	151	135	99	99	99	99	33
Russian Federation	1382	1382	1352	1388	1408	1408	1408	1408	282
Serbia and Montenegro	92	92	89	76	82	82	82	82	13
Slovakia	28	36	33	22	22	15	15	15	10
Slovenia	21	13	9	14	8	7	6	6	4
Spain	229	215	208	160	142	124	116	115	91
Sweden	78	67	70	58	49	48	48	35	30
Switzerland	15	22	22	13	12	12	12	12	8
TFYR of Macedonia	21	21	20	16	15	15	15	15	3
Turkey	414	414	420	365	387	387	387	387	117
Ukraine	518	518	499	457	481	481	481	481	90
United Kingdom	197	150	140	130	116	104	103	103	84
North Africa	0	0	0	0	0	0	0	0	0
Remaining Asian areas	0	0	0	0	0	0	0	0	0
Baltic Sea	22	22	22	29	30	30	30	30	37
Black Sea	8	8	7	10	13	13	13	13	13
Mediterranean Sea	114	114	114	148	189	189	189	189	192
North Sea	42	42	42	54	57	57	57	57	70
Remaining N-E Atlantic Ocean	36	36	36	47	59	59	59	59	60
Natural marine emissions	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0
TOTAL	5618	5551	5445	4814	4629	4411	4374	4347	2021

APPENDIX B

Source-Receptor relationships: Tables for 2010

The source-receptor (SR) relationships presented in this Appendix give the change in air concentrations or depositions resulting from a change in emissions from each emitter country.

In order to account for variability in future meteorological conditions, average SR matrices are given here. The calculations are based on five meteorological years (1996, 1997, 1998, 2000 and 2003) and use the same EMEP Unified model version and the same CLE 2010 emissions for all five years.The 2010 emissions are projections according to Current Legislation (CLE) and the projected national totals are documented in Appendix A.

For each country, reductions in six different pollutants have been calculated separately: with an emission reduction of 15% for SO_x, NO_x, NH_3, NMVOC, PPM_{fine} or PPM_{coarse} respectively.

The deposition tables show the contribution from one country to another. They have been calculated adding the differences obtained by a 15% reduction for all emissions in one country multiplied by a factor of 100/15, in order to arrive at total estimates, as recommended in EMEP status report 1/2004.

For the concentrations and indicator tables, the differences obtained by the 15% emission reduction of the relevant pollutants are given directly. Thus, the tables should be interpreted as the predictions of this reduction scenario from the expected chemical conditions in 2010.

The SR tables in the following aim to respond to two fundamental questions about transboundary air pollution:

1. Where do the pollutants emitted by a country or region end up?
2. Where do the pollutants in a given country or region come from?

Each column answers the first question. The numbers within a column give the change in the value of each pollutant (or indicator) for each receiver country caused by the emissions in the country given at the top of the column.

Each row answers the second question. The numbers given in each row show which emitter countries were responsible for the change in pollutants in the country given at the beginning of each row.

Overview over SR tables presented in this Appendix:

Acidification and eutrophication

- Deposition of OXS (oxidised sulphur). The contribution from SO_x, NO_x, NH_3 and VOC emissions have been summed up and scaled to a 100% reduction.
- Deposition of OXN (oxidised nitrogen). The contribution from SO_x, NO_x, NH_3 and VOC emissions have been summed up and scaled to a 100% reduction.
- Deposition of RDN (reduced nitrogen). The contribution from SO_x, NO_x, NH_3 and VOC emissions have been summed up and scaled to a 100% reduction.

Ground Level Ozone

- $AOT40_f^{3m}$. Effect of a 15% reduction in NO_x emissions.
- $AOT40_f^{3m}$. Effect of a 15% reduction in VOC emissions.
- SOMO35. Effect of a 15% reduction in NO_x emissions.
- SOMO35. Effect of a 15% reduction in VOC emissions.

Particulate Matter

- $PM_{2.5}$. Effect of a 15% reduction in PPM emissions.
- $PM_{2.5}$. Effect of a 15% reduction in SO_x emissions.

- $PM_{2.5}$. Effect of a 15% reduction in NO_x emissions.
- $PM_{2.5}$. Effect of a 15% reduction in NH_3 emissions.
- $PM_{2.5}$. Effect of a 15% reduction in VOC emissions.
- $PM_{2.5}$. Effect of a 15% reduction in all emissions. The contribution from a 15% reduction in PPM, SO_x, NO_x, NH_3 and VOC emissions have been summed up

Table B.1: Average 2010 country-to-country blame matrices for **oxidised sulphur** deposition.
Units: 100 Mg of S. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	40	0	0	0	14	0	26	0	0	22	0	1	1	0	0	1	0	2	0	0	15	1	3	0	0	12	0	0	AL
AM	0	7	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	AM
AT	0	0	39	0	15	3	9	2	4	9	0	17	59	0	0	4	0	14	4	0	1	7	19	0	0	30	0	0	AT
AZ	0	2	0	16	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5	0	AZ
BA	2	0	2	0	362	1	16	1	0	44	0	4	6	0	0	4	0	5	1	0	3	20	22	0	0	25	0	0	BA
BE	0	0	0	0	0	76	0	0	0	0	0	1	18	0	0	4	0	46	12	0	0	0	1	0	0	1	0	0	BE
BG	5	0	1	0	32	0	891	4	0	59	0	3	4	0	0	2	0	2	1	0	25	3	19	0	0	12	2	0	BG
BY	1	0	2	0	21	2	50	424	0	17	0	11	21	1	4	2	3	7	6	0	3	3	31	0	0	6	4	13	BY
CH	0	0	1	0	2	2	1	0	20	1	0	1	14	0	0	6	0	23	3	0	0	1	1	0	0	22	0	0	CH
CS	11	0	2	0	130	1	76	2	0	303	0	5	7	0	0	3	0	5	1	0	9	11	47	0	0	24	1	0	CS
CY	0	0	0	0	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	CY
CZ	0	0	9	0	12	4	7	2	1	8	0	116	71	0	0	3	0	12	5	0	1	4	26	0	0	8	0	0	CZ
DE	0	0	10	0	11	86	7	5	13	6	0	66	884	4	1	26	1	176	72	0	1	3	17	2	0	22	0	1	DE
DK	0	0	0	0	1	4	0	1	0	1	0	3	21	9	0	2	0	7	13	0	0	0	2	0	0	1	0	0	DK
EE	0	0	0	0	3	1	4	14	0	2	0	2	6	1	15	1	4	2	3	0	0	0	3	0	0	1	0	3	EE
ES	0	0	1	0	7	2	4	0	1	3	0	2	7	0	0	678	0	38	7	0	1	2	4	1	0	13	0	0	ES
FI	0	0	1	0	8	3	10	33	0	5	0	5	16	2	22	3	92	7	11	0	1	1	10	0	0	2	2	5	FI
FR	0	0	2	0	14	45	9	1	10	6	0	8	86	1	0	191	0	740	58	0	2	4	9	3	0	51	0	0	FR
GB	0	0	0	0	1	15	1	1	0	1	0	3	25	1	0	17	0	51	425	0	0	0	3	17	0	2	0	0	GB
GE	0	2	0	4	1	0	7	1	0	1	0	0	0	0	0	0	0	0	0	9	1	0	1	0	0	1	2	0	GE
GL	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	3	0	0	0	0	0	2	0	0	0	GL
GR	11	0	1	0	26	0	275	2	0	29	0	2	3	0	0	3	0	3	1	0	170	2	10	0	0	19	1	0	GR
HR	1	0	3	0	86	1	13	1	1	26	0	5	7	0	0	4	0	6	1	0	2	64	30	0	0	28	0	0	HR
HU	1	0	7	0	75	1	35	2	1	55	0	11	14	0	0	3	0	6	2	0	3	21	213	0	0	19	0	0	HU
IE	0	0	0	0	0	2	0	0	0	0	0	1	4	0	0	4	0	7	23	0	0	0	1	41	0	0	0	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	4	0	0	0	0	1	23	0	0	0	IS
IT	4	0	6	0	98	3	43	3	6	35	0	8	26	0	0	28	0	53	4	0	10	28	28	0	0	546	1	0	IT
KZ	0	1	0	3	10	1	37	16	0	7	0	2	4	0	1	1	1	2	1	2	2	1	7	0	0	3	228	1	KZ
LT	0	0	1	0	6	1	11	28	0	5	0	5	12	1	2	1	1	4	4	0	1	1	8	0	0	2	1	32	LT
LU	0	0	0	0	0	2	0	0	0	0	0	0	3	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	LU
LV	0	0	0	0	4	1	8	32	0	3	0	3	10	1	3	1	2	3	4	0	0	1	6	0	0	1	1	17	LV
MD	0	0	0	0	6	0	37	4	0	5	0	1	2	0	0	0	0	1	0	0	2	1	6	0	0	2	1	0	MD
MK	8	0	0	0	10	0	41	0	0	20	0	1	1	0	0	1	0	1	0	0	25	1	4	0	0	6	0	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MT
NL	0	0	0	0	0	36	0	0	0	0	0	2	29	0	0	3	0	26	20	0	0	0	1	1	0	1	0	0	NL
NO	0	0	1	0	3	7	3	8	0	2	0	4	27	4	2	5	4	14	40	0	0	1	5	2	1	2	1	2	NO
PL	1	0	7	0	44	11	41	38	2	33	0	77	133	5	2	7	3	26	22	0	3	9	91	1	0	15	2	7	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	34	0	2	1	0	0	0	0	0	0	1	0	0	PT
RO	5	0	3	0	111	2	402	13	1	126	0	11	16	0	0	5	0	8	3	0	16	11	90	0	0	27	4	1	RO
RU	4	3	7	16	107	10	337	499	2	75	2	35	76	4	47	14	44	32	31	17	21	14	105	1	1	32	304	24	RU
SE	0	0	1	0	10	8	11	25	1	7	0	11	51	11	7	5	20	18	33	0	1	2	15	1	0	4	2	6	SE
SI	0	0	3	0	11	0	5	0	0	6	0	2	5	0	0	2	0	3	0	0	1	14	8	0	0	20	0	0	SI
SK	1	0	4	0	25	1	16	2	0	19	0	15	12	0	0	2	0	4	1	0	2	6	92	0	0	7	0	0	SK
TR	3	2	1	2	27	1	270	11	0	26	12	3	6	0	1	5	0	4	1	3	41	3	15	0	0	20	7	1	TR
UA	3	0	5	1	92	4	317	128	1	75	0	23	37	1	3	7	3	13	9	1	16	12	120	0	0	26	23	6	UA
ATL	0	0	4	0	21	50	18	51	3	11	0	28	144	6	13	339	31	222	411	0	1	4	31	70	106	16	7	6	ATL
BAS	0	0	3	0	19	13	20	50	1	13	0	21	94	18	23	6	32	26	34	0	2	3	30	1	0	6	2	16	BAS
BLS	3	0	2	1	45	1	438	31	0	45	1	7	12	0	1	3	1	5	2	2	19	5	33	0	0	14	12	2	BLS
MED	27	0	12	0	365	8	719	14	6	165	25	24	51	1	1	204	1	181	15	0	240	64	100	1	0	589	4	1	MED
NOS	0	0	2	0	8	72	5	13	2	5	0	23	165	14	2	33	2	186	484	0	1	2	15	14	2	7	1	2	NOS
ASI	0	2	0	12	6	0	27	7	0	5	10	1	2	0	1	1	0	1	0	3	4	1	3	0	0	3	65	0	ASI
NOA	2	0	1	0	28	1	59	1	1	13	1	2	6	0	0	44	0	20	2	0	18	4	8	0	0	48	0	0	NOA
SUM	136	18	146	60	1880	483	4312	1478	81	1300	57	575	2200	86	153	1712	251	2019	1781	41	663	336	1289	160	137	1698	686	150	SUM
EMC	106	18	125	59	1439	345	3145	1470	69	1074	31	484	1774	51	166	1132	222	1412	852	38	403	260	1103	75	30	1072	665	136	EMC
EU	20	0	94	0	373	306	498	194	40	232	4	358	1494	36	54	1021	125	1252	726	0	197	106	563	69	2	767	11	74	EU
emis	150	20	152	75	2055	493	4894	1746	82	1384	86	603	2249	90	218	2082	307	2071	1831	45	841	347	1329	164	147	1878	1185	167	emis
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table B.1 Cont.: Average 2010 country-to-country blame matrices for **oxidised sulphur** deposition. Units: 100 Mg of S. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	1	23	0	0	0	4	0	10	1	0	0	0	4	4	0	0	1	28	0	0	3	9	60	1	290	42	AL
AM	0	0	0	0	0	0	0	1	0	1	2	0	0	0	87	2	0	0	0	2	0	24	1	11	37	0	183	2	AM
AT	0	0	1	1	0	2	0	36	0	10	3	0	9	4	2	7	1	1	0	17	4	0	2	28	22	2	389	243	AT
AZ	0	0	0	0	0	0	0	1	0	2	18	0	0	0	89	9	0	0	1	2	0	55	1	20	45	0	275	4	AZ
BA	0	0	1	3	0	0	0	17	0	13	2	0	2	2	3	6	0	0	0	35	1	0	4	18	37	2	665	95	BA
BE	1	0	0	0	0	14	0	3	0	0	0	0	0	0	0	0	2	0	0	2	23	0	0	11	1	2	223	178	BE
BG	0	0	13	24	0	0	0	25	0	196	17	0	1	3	32	54	0	1	12	31	1	2	4	26	99	3	1609	100	BG
BY	0	2	15	2	0	1	1	236	0	54	90	3	1	6	16	159	1	10	3	9	5	2	2	40	33	3	1327	364	BY
CH	0	0	0	0	0	1	0	3	1	1	0	0	0	0	1	1	1	0	0	11	3	0	2	19	7	1	152	79	CH
CS	0	0	3	17	0	0	0	36	0	71	5	0	1	5	7	18	0	1	1	37	1	0	5	25	82	2	960	150	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	5	0	3	1	2	6	1	38	5	CY
CZ	0	0	1	1	0	2	0	91	0	11	3	1	2	9	1	7	1	3	0	7	5	0	1	20	8	2	467	362	CZ
DE	4	0	1	1	0	61	1	140	2	11	10	3	2	4	2	13	10	34	0	21	92	0	4	107	19	18	1975	1584	DE
DK	0	0	0	0	0	3	1	19	0	1	2	2	0	0	0	2	1	24	0	1	22	0	0	13	1	6	165	87	DK
EE	0	2	1	0	0	1	0	25	0	5	25	2	0	1	1	10	0	15	0	1	2	0	0	9	4	2	170	71	EE
ES	0	0	0	1	0	1	0	7	54	4	1	0	1	1	1	3	43	1	0	155	6	0	25	166	11	23	1273	818	ES
FI	0	2	3	1	0	2	3	74	0	12	213	19	0	2	5	31	2	47	1	3	8	1	1	57	14	9	746	279	FI
FR	2	0	1	1	1	13	0	28	12	7	3	1	2	2	2	6	48	2	0	135	98	0	19	203	32	41	1901	1257	FR
GB	0	0	0	0	0	9	0	16	2	2	3	1	0	1	0	3	37	3	0	5	115	0	1	111	2	43	920	587	GB
GE	0	0	1	0	0	0	0	2	0	4	14	0	0	0	152	12	0	0	4	4	0	26	1	19	63	1	334	6	GE
GL	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0	1	1	0	0	1	0	0	142	1	5	170	10	GL
GR	0	0	6	47	1	0	0	15	0	58	10	0	0	2	40	28	0	0	6	112	1	2	8	30	181	6	1111	231	GR
HR	0	0	1	2	0	0	0	20	0	12	2	0	6	3	2	6	0	1	0	39	1	0	3	15	22	2	417	118	HR
HU	0	0	2	3	0	1	0	67	0	53	5	0	5	23	4	20	0	1	1	22	1	0	3	19	24	1	730	378	HU
IE	0	0	0	0	0	1	0	3	1	0	1	0	0	0	0	1	12	0	0	1	7	0	0	43	0	17	171	87	IE
IS	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	2	0	0	0	2	0	0	47	0	15	105	12	IS
IT	0	0	3	7	3	1	0	35	2	28	6	0	9	4	8	15	3	1	1	308	4	0	29	100	703	14	2218	769	IT
KZ	0	0	7	2	0	0	0	24	0	27	206	1	0	1	103	124	0	1	4	7	1	58	2	124	99	1	1124	52	KZ
LT	0	2	2	1	0	1	0	94	0	11	23	2	0	2	2	21	1	11	0	2	4	0	0	14	7	2	330	177	LT
LU	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	16	13	LU
LV	0	12	2	1	0	1	0	58	0	8	23	3	0	1	2	19	0	13	0	2	3	0	0	14	7	3	277	130	LV
MD	0	0	69	1	0	0	0	15	0	47	9	0	0	1	7	48	0	0	3	4	0	1	1	7	15	1	299	30	MD
MK	0	0	1	58	0	0	0	4	0	13	1	0	0	1	4	4	0	0	1	12	0	0	1	7	41	1	267	42	MK
MT	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	4	1	MT
NL	0	0	0	0	0	66	0	6	0	0	1	0	0	0	0	1	2	1	0	1	43	0	0	12	1	4	258	190	NL
NO	0	0	1	0	0	4	29	43	0	5	53	13	0	1	1	8	8	17	0	2	34	0	1	100	6	28	490	178	NO
PL	0	1	5	3	0	7	1	1559	1	54	43	6	4	26	5	81	3	39	1	16	20	0	3	62	26	9	2557	2015	PL
PT	0	0	0	0	0	0	0	0	116	0	0	0	0	0	0	0	17	0	0	8	0	0	2	32	1	6	222	155	PT
RO	0	0	49	17	1	1	0	112	0	1036	35	1	2	14	41	152	1	2	16	46	2	3	6	54	132	4	2582	313	RO
RU	0	9	84	17	1	5	4	504	1	299	5026	20	5	21	639	1518	6	47	42	62	21	131	14	744	619	28	11730	1050	RU
SE	0	2	2	1	0	6	13	133	0	15	94	98	1	3	3	26	5	101	0	4	34	0	1	91	10	20	911	435	SE
SI	0	0	0	0	0	0	0	7	0	4	1	0	24	1	1	2	0	0	0	14	0	0	1	7	9	1	153	75	SI
SK	0	0	1	2	0	1	0	107	0	23	4	0	2	47	2	14	0	1	0	8	1	0	1	12	12	1	448	297	SK
TR	0	0	17	12	1	0	0	31	0	90	70	0	1	2	3232	137	0	1	56	186	1	294	41	182	758	17	5596	148	TR
UA	0	1	129	13	1	2	1	398	1	334	267	3	3	26	149	1697	1	10	40	48	7	14	8	122	191	10	4403	710	UA
ATL	1	2	4	2	0	24	26	208	73	28	892	29	2	7	10	66	1163	43	1	44	202	2	10	6931	50	2414	13826	1718	ATL
BAS	0	6	4	2	0	8	5	305	1	26	104	46	1	6	5	47	4	334	1	7	38	0	2	74	14	26	1501	699	BAS
BLS	0	0	70	12	0	1	0	79	0	232	200	1	1	5	421	477	0	3	252	52	2	29	8	66	172	28	2799	192	BLS
MED	0	0	28	63	31	3	0	146	15	228	46	1	14	14	737	135	17	5	36	4586	12	99	348	516	2021	234	12153	1675	MED
NOS	1	1	1	1	0	52	13	149	3	9	21	14	1	4	1	18	49	41	0	11	787	0	3	267	10	181	2698	1246	NOS
ASI	0	0	3	2	0	0	0	11	0	15	112	0	0	1	620	69	0	1	3	43	0	1019	19	160	230	5	2470	40	ASI
NOA	0	0	3	6	4	0	0	15	4	22	4	0	1	1	42	12	3	0	2	387	2	8	369	202	176	30	1553	179	NOA
SUM	14	46	538	348	47	296	100	4918	293	3091	7679	273	106	257	6497	5092	1447	819	492	6546	1618	1774	960	11110	6122	3276	87651	19675	SUM
EMC	11	43	439	272	15	212	58	4206	203	2603	7388	197	88	226	5342	4458	217	436	206	1853	593	1646	592	3366	3901	407		14583	EMC
EU	10	23	32	70	7	191	20	2525	193	317	473	140	63	132	94	309	188	300	13	851	495	7	104	1163	1101	232		10422	EU
emis	14	54	583	409	59	301	105	5231	513	3342	8350	296	111	268	8541	5725	1759	871	536	8010	1645	4025	2065	0	10000	3715	93218	21406	emis
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table B.2: Average 2010 country-to-country blame matrices for **oxidised nitrogen** deposition. Units: 100 Mg of N. **Emitters →, Receptors ↓**.

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	5	0	1	0	2	0	3	0	0	8	0	1	3	0	0	3	0	4	1	0	17	2	2	0	0	23	0	0	AL
AM	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	AM
AT	0	0	51	0	1	7	1	1	8	3	0	15	86	1	0	6	0	28	8	0	1	6	6	0	0	65	0	0	AT
AZ	0	2	0	26	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	1	0	AZ
BA	1	0	7	0	20	2	2	1	1	18	0	6	18	1	0	6	0	10	3	0	4	14	9	0	0	55	0	0	BA
BE	0	0	0	0	0	16	0	0	0	0	0	1	15	1	0	6	0	41	24	0	0	0	0	1	0	2	0	0	BE
BG	3	0	4	0	4	1	58	3	1	24	0	5	13	1	0	3	0	6	3	0	29	3	9	0	0	19	0	0	BG
BY	0	0	7	0	1	6	4	107	2	5	0	13	53	8	2	4	6	18	17	0	2	3	10	1	0	13	1	9	BY
CH	0	0	2	0	0	4	0	0	15	0	0	1	20	0	0	9	0	37	6	0	0	0	0	0	0	41	0	0	CH
CS	5	0	8	0	13	2	11	1	2	68	0	8	22	1	0	6	0	10	3	0	13	10	18	0	0	49	0	0	CS
CY	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	CY
CZ	0	0	22	0	1	9	1	1	4	3	0	43	104	3	0	5	0	28	13	0	1	4	9	1	0	21	0	0	CZ
DE	0	0	27	0	1	97	1	4	23	2	0	43	606	17	0	38	2	261	153	0	1	2	6	6	1	61	0	1	DE
DK	0	0	1	0	0	6	0	1	1	0	0	2	27	4	0	3	1	13	29	0	0	0	1	1	0	2	0	0	DK
EE	0	0	1	0	0	2	0	7	0	1	0	2	14	4	3	1	7	5	7	0	0	0	1	0	0	2	0	2	EE
ES	0	0	3	0	1	6	0	0	2	1	0	2	18	1	0	692	0	80	22	0	1	2	1	2	0	28	0	0	ES
FI	0	0	3	0	0	7	0	19	1	1	0	6	44	15	9	4	84	18	28	0	0	1	3	2	0	6	0	5	FI
FR	0	0	9	0	1	51	1	1	14	2	0	8	125	4	0	299	0	560	137	0	2	4	4	9	0	105	0	0	FR
GB	0	0	2	0	0	17	0	1	1	0	0	3	38	6	0	26	1	71	276	0	0	0	1	28	1	6	0	0	GB
GE	0	2	0	6	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	8	1	0	0	0	0	1	0	0	GE
GL	0	0	0	0	0	1	0	0	0	0	0	0	3	1	0	1	0	2	7	0	0	0	0	1	1	0	0	0	GL
GR	6	0	3	0	3	1	30	1	1	14	0	3	10	1	0	5	0	7	2	0	98	3	4	0	0	33	0	0	GR
HR	1	0	10	0	7	2	2	1	2	9	0	6	19	1	0	7	0	13	3	0	2	20	9	0	0	62	0	0	HR
HU	1	0	16	0	7	3	4	2	2	19	0	13	33	1	0	5	0	13	5	0	3	16	32	0	0	42	0	0	HU
IE	0	0	0	0	0	3	0	0	0	0	0	1	6	1	0	6	0	13	33	0	0	0	0	13	0	1	0	0	IE
IS	0	0	0	0	0	1	0	0	0	0	0	0	4	1	0	1	0	4	12	0	0	0	0	2	6	1	0	0	IS
IT	3	0	26	0	14	8	5	1	15	18	0	11	66	2	0	58	0	109	13	0	13	28	13	1	0	597	0	0	IT
KZ	0	1	2	6	0	2	3	10	1	2	0	3	12	2	0	1	2	5	4	3	2	1	2	0	0	6	25	1	KZ
LT	0	0	2	0	0	3	1	15	1	1	0	5	28	7	1	2	3	10	12	0	1	1	3	1	0	5	0	4	LT
LU	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	1	0	5	2	0	0	0	0	0	0	0	0	0	LU
LV	0	0	2	0	0	3	1	15	1	1	0	4	25	7	2	2	5	8	11	0	0	1	2	1	0	4	0	4	LV
MD	0	0	1	0	0	0	3	2	0	2	0	1	4	0	0	1	0	1	1	0	2	1	2	0	0	3	0	0	MD
MK	3	0	1	0	1	0	6	0	0	8	0	1	3	0	0	1	0	2	1	0	20	1	2	0	0	10	0	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MT
NL	0	0	0	0	0	13	0	0	0	0	0	1	19	1	0	4	0	25	35	0	0	0	0	1	0	2	0	0	NL
NO	0	0	2	0	0	14	0	4	1	1	0	5	58	22	1	7	6	35	91	0	0	0	1	5	1	4	0	1	NO
PL	1	0	25	0	4	24	4	27	6	12	0	58	235	25	1	12	5	62	56	0	3	9	27	3	0	37	0	5	PL
PT	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	62	0	6	3	0	0	0	0	0	0	1	0	0	PT
RO	3	0	13	0	11	4	40	8	2	45	0	14	42	2	0	7	1	17	8	0	18	11	31	0	0	47	0	1	RO
RU	3	5	25	21	5	27	27	238	9	23	1	41	194	33	18	20	74	78	81	23	19	11	33	5	1	68	41	26	RU
SE	0	0	6	0	0	18	1	16	2	2	0	12	100	42	4	8	32	42	85	0	1	1	5	4	1	12	0	6	SE
SI	0	0	7	0	1	1	1	0	1	2	0	2	10	0	0	3	0	5	1	0	1	7	3	0	0	32	0	0	SI
SK	0	0	9	0	3	2	2	1	1	8	0	13	25	1	0	2	0	9	4	0	2	6	19	0	0	17	0	0	SK
TR	3	3	5	4	2	2	30	7	2	13	9	5	20	2	0	8	1	11	6	6	44	3	7	0	0	28	1	1	TR
UA	2	1	18	2	7	10	30	72	4	26	0	28	93	9	2	10	5	32	24	2	17	11	37	1	0	50	4	6	UA
ATL	0	0	18	0	0	119	0	19	13	2	0	32	368	66	4	332	45	476	891	0	1	3	7	125	48	53	0	6	ATL
BAS	0	0	9	0	1	21	1	26	3	3	0	19	141	38	7	10	33	50	74	0	1	3	8	4	0	18	0	8	BAS
BLS	2	1	7	2	3	3	35	17	2	17	1	9	32	3	1	4	2	11	7	5	20	5	12	0	0	24	1	2	BLS
MED	21	0	50	1	32	26	71	7	23	71	17	33	164	8	0	400	1	344	60	1	253	54	38	4	0	836	0	1	MED
NOS	0	0	7	0	0	64	1	8	5	1	0	16	192	39	1	46	4	197	567	0	1	1	4	33	2	18	0	2	NOS
ASI	1	3	1	27	0	1	3	5	1	2	13	2	8	1	0	2	1	4	3	6	8	1	2	0	0	7	8	1	ASI
NOA	4	0	10	0	5	6	14	2	5	14	2	6	34	2	0	119	0	75	17	0	58	8	6	1	0	152	0	0	NOA
SUM	70	22	423	99	154	619	398	654	180	455	45	505	3158	381	57	2258	326	2865	2847	62	659	258	388	258	65	2672	83	95	SUM
EMC	47	21	338	97	119	399	292	642	138	364	27	409	2342	248	62	1472	305	1817	1292	55	386	195	325	95	15	1738	82	89	EMC
EU	12	0	215	1	39	299	52	115	87	91	2	250	1637	143	21	1250	142	1420	958	1	128	91	139	74	4	1083	1	29	EU
emis	85	40	487	131	164	707	447	824	217	511	64	569	3598	447	84	2953	460	3316	3303	91	811	287	412	301	91	3062	153	125	emis
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table B.2 Cont.: Average 2010 country-to-country blame matrices for **oxidised nitrogen** deposition. Units: 100 Mg of N. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	5	0	1	0	2	0	2	1	0	0	1	1	3	0	0	1	38	1	0	0	5	0	0	137	58	AL
AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	14	1	0	0	0	1	0	1	0	7	0	0	37	1	AM
AT	1	0	0	0	0	8	1	14	0	3	2	1	8	3	0	5	1	3	0	15	10	0	0	11	0	0	382	309	AT
AZ	0	0	0	0	0	0	0	1	0	0	18	0	0	0	15	6	0	0	1	1	0	4	0	14	0	0	98	4	AZ
BA	0	0	0	1	0	2	0	10	0	4	1	0	2	3	1	5	1	2	0	44	3	0	0	8	0	0	267	139	BA
BE	1	0	0	0	0	9	1	2	1	0	0	0	0	0	0	0	4	1	0	1	27	0	0	8	0	0	165	120	BE
BG	0	0	6	8	0	2	0	14	0	46	15	1	1	3	13	48	0	2	15	34	3	0	0	10	0	0	412	115	BG
BY	1	4	6	1	0	10	4	92	0	16	84	9	2	7	4	112	2	29	3	7	17	0	0	12	0	0	713	293	BY
CH	1	0	0	0	0	4	0	1	1	0	0	0	0	0	0	0	1	0	0	10	6	0	0	8	0	0	170	127	CH
CS	0	0	1	6	0	3	0	19	0	16	4	1	2	6	2	14	1	3	1	42	4	0	0	10	0	0	389	173	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	8	0	0	0	1	0	0	23	4	CY
CZ	1	0	0	0	0	12	1	32	0	3	3	2	3	5	0	6	1	7	0	6	16	0	0	8	0	0	382	314	CZ
DE	17	1	0	0	0	121	9	54	4	3	9	9	2	3	1	11	17	44	0	18	186	0	0	53	0	1	1916	1529	DE
DK	1	0	0	0	0	10	3	7	0	0	2	3	0	0	0	1	2	18	0	1	34	0	0	6	0	0	183	112	DK
EE	0	3	0	0	0	3	2	12	0	1	16	8	0	1	0	8	1	26	0	1	8	0	0	3	0	0	155	79	EE
ES	1	0	0	0	0	6	1	3	90	1	1	1	1	1	0	2	53	2	0	199	21	0	3	106	0	0	1352	958	ES
FI	1	5	1	0	0	13	16	36	0	3	83	47	1	2	1	25	3	96	0	2	30	0	0	20	0	0	640	337	FI
FR	9	0	0	0	0	41	4	13	23	2	3	2	3	2	1	5	69	7	0	148	173	0	2	103	0	1	1950	1407	FR
GB	1	0	0	0	0	23	6	9	4	1	3	3	0	1	0	3	44	9	0	4	143	0	0	59	0	3	795	516	GB
GE	0	0	0	0	0	0	0	1	0	1	14	0	0	0	27	7	0	0	3	2	0	1	0	10	0	0	91	6	GE
GL	0	0	0	0	0	1	2	1	0	0	1	1	0	0	0	0	1	1	0	0	3	0	0	91	0	0	121	19	GL
GR	0	0	3	11	0	2	0	7	0	17	7	0	1	2	20	25	1	1	9	142	2	0	1	13	0	0	491	179	GR
HR	0	0	0	1	0	2	0	10	0	4	1	0	4	3	1	5	1	2	0	46	3	0	0	6	0	0	265	153	HR
HU	0	0	1	1	0	4	1	32	0	13	4	1	5	11	1	14	1	3	1	21	5	0	0	7	0	0	343	221	HU
IE	0	0	0	0	0	4	1	1	1	0	0	0	0	0	0	0	13	1	0	1	18	0	0	18	0	0	138	84	IE
IS	0	0	0	0	0	2	1	1	0	0	0	1	0	0	0	0	2	1	0	0	6	0	0	19	0	0	68	31	IS
IT	1	0	1	3	1	9	1	18	4	9	4	1	12	4	3	11	5	4	1	400	14	0	3	51	1	0	1563	968	IT
KZ	0	1	3	1	0	3	1	12	0	9	255	2	0	2	20	97	1	5	5	5	4	3	0	89	0	0	614	65	KZ
LT	0	3	1	0	0	6	2	34	0	3	16	7	0	2	0	16	1	28	0	2	13	0	0	4	0	0	244	138	LT
LU	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	17	14	LU
LV	0	5	1	0	0	6	3	25	0	3	19	9	0	1	0	16	1	33	0	1	13	0	0	4	0	0	237	125	LV
MD	0	0	9	0	0	1	0	7	0	12	9	0	0	1	3	33	0	1	4	3	1	0	0	2	0	0	112	26	MD
MK	0	0	0	8	0	0	0	2	0	3	1	0	0	1	1	3	0	0	1	14	1	0	0	4	0	0	99	43	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	1	MT
NL	1	0	0	0	0	20	1	2	1	0	1	1	0	0	0	1	4	2	0	1	39	0	0	10	0	1	186	126	NL
NO	1	1	0	0	0	23	54	19	1	1	13	27	0	1	0	5	9	40	0	2	79	0	0	41	0	1	576	325	NO
PL	3	2	2	1	0	38	8	294	1	15	33	19	5	18	1	56	5	88	1	14	66	0	0	23	0	0	1333	958	PL
PT	0	0	0	0	0	1	0	0	86	0	0	0	0	0	0	0	25	0	0	14	2	0	0	23	0	0	229	163	PT
RO	1	0	15	6	0	6	1	53	1	150	30	2	3	13	13	113	1	7	17	40	8	0	0	19	0	0	828	284	RO
RU	3	17	30	4	0	44	31	211	2	89	3463	53	6	22	140	982	11	119	47	51	76	7	1	320	1	-3	6876	1102	RU
SE	2	4	1	0	0	31	41	61	1	5	38	92	1	3	1	23	9	156	0	4	103	0	0	36	0	1	1011	571	SE
SI	0	0	0	0	0	1	0	3	0	1	1	0	6	1	0	2	0	0	0	15	1	0	0	3	0	0	114	78	SI
SK	0	0	0	1	0	3	0	41	0	6	3	1	3	9	1	9	0	3	0	8	5	0	0	5	0	0	224	162	SK
TR	0	0	9	5	0	3	1	17	1	32	78	1	1	3	902	123	2	4	75	208	5	10	4	94	1	0	1802	176	TR
UA	1	3	38	4	0	16	5	163	1	96	241	9	4	21	48	716	3	29	43	42	24	1	0	43	0	-1	2052	560	UA
ATL	10	4	1	0	0	165	163	80	93	3	175	71	3	6	1	38	623	112	1	48	565	0	1	2798	0	16	7603	2975	ATL
BAS	2	7	2	0	0	35	19	91	1	8	51	59	2	5	1	36	7	207	1	6	88	0	0	26	0	1	1132	642	BAS
BLS	1	1	22	4	0	5	2	36	0	61	170	3	2	6	145	305	1	9	141	53	8	1	0	3	0	0	1204	189	BLS
MED	4	1	12	22	11	31	5	60	26	68	34	4	18	15	306	109	31	17	48	3362	59	5	37	230	4	1	7036	2406	MED
NOS	5	1	0	0	0	93	52	52	6	3	14	25	1	3	1	12	63	72	0	9	464	0	0	115	0	8	2208	1376	NOS
ASI	0	0	2	1	0	2	1	6	0	6	126	1	0	1	237	56	1	3	7	90	3	43	4	172	0	0	875	67	ASI
NOA	1	0	2	5	3	7	2	11	10	15	11	1	3	3	46	22	10	3	7	811	13	1	44	286	0	-1	1859	527	NOA
SUM	77	65	175	102	16	831	448	1668	361	738	5060	480	107	193	1979	3090	1031	1203	434	5996	2375	78	104	5016	13	27	51720	21354	SUM
EMC	56	62	141	76	5	523	225	1421	236	606	4930	358	83	162	1532	2672	311	880	247	2524	1236	72	65	1882	8	1		14250	EMC
EU	44	23	14	19	2	371	102	699	217	91	246	207	51	68	39	239	260	533	15	1026	931	0	10	574	3	7		9474	EU
emis	86	88	196	124	18	960	587	1873	650	860	7583	610	120	220	2592	3604	1581	1393	471	7252	2625	240	292	0	0	0	57764	25322	emis
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table B.3: Average 2010 country-to-country blame matrices for **reduced nitrogen** deposition.
Units: 100 Mg of N. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	62	0	1	0	0	0	4	0	0	10	0	1	2	0	0	2	0	3	0	0	10	1	2	0	0	11	0	0	AL
AM	0	78	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	AM
AT	0	0	158	0	1	4	2	1	24	3	0	24	160	1	0	6	0	24	4	0	1	5	12	1	0	121	0	0	AT
AZ	0	13	0	76	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	45	0	0	0	0	0	0	0	0	AZ
BA	2	0	5	0	46	1	4	1	2	14	0	4	10	0	0	6	0	7	1	0	2	18	12	0	0	40	0	0	BA
BE	0	0	0	0	0	151	0	0	1	0	0	0	23	1	0	5	0	88	12	0	0	0	0	2	0	1	0	0	BE
BG	6	0	2	0	1	0	333	3	1	24	0	2	7	0	0	3	0	4	1	1	28	2	9	0	0	14	0	1	BG
BY	1	0	4	0	2	2	9	479	2	6	0	9	40	6	1	3	2	13	6	1	1	3	12	1	0	13	1	41	BY
CH	0	0	2	0	0	3	0	0	200	0	0	1	31	0	0	9	0	62	3	0	0	0	0	0	0	99	0	0	CH
CS	18	0	5	0	9	1	24	1	2	193	0	5	13	1	0	5	0	7	1	0	5	10	30	0	0	34	0	0	CS
CY	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	CY
CZ	0	0	36	0	1	4	2	1	8	2	0	163	166	3	0	4	0	22	5	0	0	3	11	1	0	23	0	1	CZ
DE	0	0	29	0	1	95	1	4	92	2	0	39	2451	27	0	32	1	298	61	0	0	2	5	9	0	66	0	2	DE
DK	0	0	1	0	0	4	0	1	1	0	0	2	62	150	0	2	0	13	11	0	0	0	1	2	0	2	0	1	DK
EE	0	0	1	0	0	1	1	7	1	1	0	1	12	3	24	1	2	4	3	0	0	0	1	0	0	2	0	7	EE
ES	0	0	2	0	0	3	1	0	3	1	0	1	13	1	0	1388	0	128	8	0	1	1	2	2	0	22	0	0	ES
FI	0	0	2	0	1	3	2	18	2	2	0	4	35	10	8	3	127	14	11	0	0	1	4	2	0	6	1	11	FI
FR	1	0	5	0	1	56	2	1	45	2	0	4	106	3	0	285	0	2962	55	0	1	3	3	14	0	114	0	1	FR
GB	0	0	1	0	0	17	0	1	2	0	0	2	42	5	0	19	0	140	985	0	0	0	1	105	0	5	0	0	GB
GE	0	19	0	16	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	261	0	0	0	0	0	1	0	0	GE
GL	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	0	1	3	0	0	0	0	1	0	0	0	0	GL
GR	16	0	2	0	1	0	45	2	1	11	0	2	5	0	0	4	0	4	1	1	149	2	5	0	0	16	0	0	GR
HR	1	0	10	0	7	1	3	1	2	8	0	4	13	0	0	6	0	9	1	0	1	65	18	0	0	57	0	0	HR
HU	1	0	22	0	3	1	8	2	3	20	0	11	24	1	0	5	0	9	1	0	2	25	202	0	0	41	0	1	HU
IE	0	0	0	0	0	2	0	0	0	0	0	0	6	1	0	5	0	23	42	0	0	0	0	412	0	1	0	0	IE
IS	0	0	0	0	0	1	0	0	0	0	0	0	4	1	0	1	0	4	6	0	0	0	0	3	7	1	0	0	IS
IT	5	0	15	0	2	3	8	2	27	11	0	6	44	1	0	43	0	75	4	0	6	16	12	1	0	1566	0	1	IT
KZ	0	5	1	5	1	1	5	7	1	2	0	1	6	1	0	1	0	3	1	18	1	1	2	0	0	5	34	1	KZ
LT	0	0	2	0	0	2	2	34	1	2	0	4	25	5	1	2	1	7	4	0	0	1	3	1	0	5	0	153	LT
LU	0	0	0	0	0	5	0	0	0	0	0	0	5	0	0	1	0	10	1	0	0	0	0	0	0	0	0	0	LU
LV	0	0	1	0	0	1	1	21	1	1	0	3	20	5	3	1	2	6	4	0	0	1	2	1	0	4	0	40	LV
MD	0	0	1	0	0	0	6	2	0	2	0	1	3	0	0	1	0	1	0	1	1	0	2	0	0	3	0	1	MD
MK	13	0	1	0	0	0	10	0	0	12	0	1	2	0	0	1	0	1	0	0	13	1	2	0	0	6	0	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MT
NL	0	0	0	0	0	52	0	0	1	0	0	0	68	1	0	3	0	40	18	0	0	0	0	2	0	1	0	0	NL
NO	0	0	2	0	0	9	1	6	1	1	0	4	58	28	1	6	3	34	43	0	0	0	2	7	0	4	0	3	NO
PL	1	0	19	0	2	10	9	44	9	10	0	90	262	24	1	10	2	45	20	0	2	7	30	3	0	36	0	21	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	58	0	7	1	0	0	0	0	0	0	1	0	0	PT
RO	6	0	8	0	3	2	92	9	3	45	0	9	29	2	0	8	0	12	3	2	11	8	53	0	0	40	1	2	RO
RU	5	25	15	27	9	11	56	229	9	25	1	26	134	20	11	19	27	53	31	235	12	10	39	4	0	65	32	46	RU
SE	0	0	4	0	1	9	3	17	3	2	0	9	103	58	3	6	18	35	30	0	0	1	6	5	0	11	0	12	SE
SI	0	0	11	0	1	0	1	0	1	2	0	2	8	0	0	3	0	4	0	0	0	12	4	0	0	43	0	0	SI
SK	1	0	13	0	2	1	4	2	2	6	0	18	21	1	0	2	0	6	1	0	1	5	39	0	0	17	0	1	SK
TR	4	19	2	7	2	1	36	7	1	9	7	2	11	1	0	7	0	7	2	36	19	2	6	0	0	20	2	1	TR
UA	5	2	11	2	5	4	52	97	5	24	0	19	68	6	1	10	2	21	9	13	10	9	47	1	0	47	2	14	UA
ATL	1	0	12	0	3	65	4	29	16	4	0	22	287	49	4	261	19	845	626	1	1	4	12	406	14	49	2	12	ATL
BAS	1	0	6	0	1	11	4	28	4	4	0	14	218	124	12	8	29	42	27	0	1	2	9	5	0	16	0	33	BAS
BLS	3	4	4	3	2	1	63	15	2	14	1	5	18	2	0	4	1	6	2	44	11	3	11	0	0	21	1	3	BLS
MED	35	1	26	1	10	9	78	9	23	45	18	16	79	3	0	356	1	296	16	3	89	34	34	2	0	583	1	2	MED
NOS	0	0	5	0	1	95	1	8	8	1	0	11	346	115	1	36	1	485	547	0	0	1	4	61	0	16	0	5	NOS
ASI	1	13	0	21	0	0	1	3	0	1	4	1	3	0	0	1	0	1	0	34	1	0	1	0	0	3	4	1	ASI
NOA	3	0	3	0	0	1	6	1	3	4	0	2	10	0	0	58	0	41	3	0	5	3	4	0	0	42	0	0	NOA
SUM	195	181	449	174	119	643	889	1097	511	528	36	543	5057	660	73	2699	241	5920	2615	725	388	264	655	1057	23	3294	84	418	SUM
EMC	156	176	400	170	103	468	745	1076	461	464	17	485	4213	385	69	2041	219	4272	1414	679	287	222	593	585	8	2622	81	397	EMC
EU	27	1	323	1	16	424	93	159	226	78	4	385	3663	301	41	1888	154	3963	1283	3	164	86	344	562	0	2105	2	251	EU
emis	214	206	462	206	143	654	1017	1209	516	571	52	562	5137	670	89	3144	278	6039	2656	799	441	273	680	1061	25	3465	148	455	emis
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table B.3 Cont.: Average 2010 country-to-country blame matrices for **reduced nitrogen** deposition. Units: 100 Mg of N. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	5	0	0	0	1	0	4	1	0	0	0	1	3	0	0	0	-1	0	0	2	2	0	0	130	33	AL
AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	27	2	0	0	0	0	0	32	0	2	0	0	187	1	AM
AT	0	0	0	0	0	6	0	12	0	6	2	1	19	2	0	7	0	0	0	1	1	0	1	7	0	0	620	555	AT
AZ	0	0	0	0	0	0	0	1	0	1	22	0	0	0	15	5	0	0	0	0	0	39	1	4	0	0	224	3	AZ
BA	0	0	1	1	0	1	0	6	0	7	2	0	2	2	1	6	0	0	0	1	0	0	2	4	0	0	211	99	BA
BE	4	0	0	0	0	36	0	1	1	0	0	0	0	0	0	0	0	0	0	0	-3	0	0	1	0	0	324	324	BE
BG	0	0	6	11	0	1	0	8	0	101	13	0	1	2	6	42	0	0	-1	0	0	1	3	6	0	0	645	84	BG
BY	0	6	9	1	0	6	1	111	0	37	62	4	1	6	3	216	0	-1	0	2	1	1	1	9	0	0	1134	288	BY
CH	0	0	0	0	0	3	0	1	1	0	0	0	0	0	0	1	0	0	0	1	0	0	1	5	0	0	426	216	CH
CS	0	0	1	8	0	1	0	10	0	44	4	0	2	5	1	15	0	0	0	1	0	0	3	6	0	0	467	126	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	1	0	0	0	10	4	CY
CZ	1	0	0	0	0	8	0	45	0	6	2	1	3	7	0	7	0	0	0	1	0	0	1	4	0	0	545	505	CZ
DE	16	0	1	0	0	284	1	63	3	5	3	4	2	2	0	12	1	-5	0	3	-12	0	2	19	0	1	3625	3491	DE
DK	0	0	0	0	0	13	1	8	0	1	1	3	0	0	0	2	0	-3	0	0	-3	0	0	3	0	0	278	275	DK
EE	0	6	1	0	0	2	1	12	0	3	9	4	0	1	0	9	0	0	0	0	1	0	0	2	0	0	122	86	EE
ES	0	0	0	0	0	4	0	3	98	2	1	0	1	0	0	2	-4	0	0	-15	1	0	13	30	-1	-2	1713	1678	ES
FI	0	4	2	0	0	7	4	36	0	7	42	20	1	2	1	29	0	1	0	1	3	0	0	13	0	0	441	310	FI
FR	6	0	0	0	0	31	0	8	19	4	1	1	2	1	0	5	-5	0	0	2	-18	0	11	40	0	-2	3771	3678	FR
GB	1	0	0	0	0	23	0	7	3	1	1	1	0	0	0	3	-3	0	0	1	-10	0	1	19	0	-4	1373	1359	GB
GE	0	0	0	0	0	0	0	1	0	2	31	0	0	0	44	8	0	0	0	0	0	16	1	4	0	0	408	4	GE
GL	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	47	11	GL
GR	0	0	3	9	0	1	0	6	0	25	7	0	1	1	11	23	0	0	0	-2	0	1	7	7	0	0	366	197	GR
HR	0	0	0	0	0	1	0	6	0	6	1	0	12	2	0	5	0	0	0	0	0	0	2	4	0	0	250	142	HR
HU	0	0	1	1	0	2	0	15	0	51	3	0	8	29	1	18	0	0	0	1	0	0	2	4	0	0	519	375	HU
IE	0	0	0	0	0	3	0	1	1	0	0	0	0	0	0	1	-2	0	0	0	-2	0	0	8	0	-2	502	497	IE
IS	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	10	0	0	44	23	IS
IT	0	0	2	2	1	4	0	10	3	15	4	1	14	3	2	14	1	0	0	-16	1	0	18	21	-1	0	1945	1812	IT
KZ	0	0	3	0	0	1	0	9	0	13	150	1	0	1	19	60	0	0	1	1	0	28	1	25	0	0	420	37	KZ
LT	0	6	1	0	0	4	1	54	0	7	17	4	1	2	0	22	0	-2	0	0	1	0	0	4	0	0	378	285	LT
LU	6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	28	LU
LV	0	35	1	0	0	3	1	28	0	5	12	5	0	1	0	18	0	-1	0	0	1	0	0	3	0	0	235	167	LV
MD	0	0	82	0	0	0	0	4	0	52	7	0	0	1	1	69	0	0	0	0	0	0	0	2	0	0	244	19	MD
MK	0	0	0	33	0	0	0	1	0	5	1	0	0	0	1	4	0	0	0	0	0	0	1	2	0	0	112	28	MK
MT	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	MT
NL	1	0	0	0	0	302	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0	1	0	0	487	490	NL
NO	1	1	0	0	0	17	77	23	1	3	9	16	0	1	0	8	1	2	0	1	4	0	0	23	0	0	404	263	NO
PL	1	2	4	1	0	27	2	1198	1	34	25	11	5	34	1	91	1	-6	0	3	1	0	2	14	0	1	2104	1851	PL
PT	0	0	0	0	0	0	0	0	184	0	0	0	0	0	0	0	-3	0	0	-1	0	0	1	5	0	-1	255	254	PT
RO	0	0	39	5	0	3	0	30	1	1014	25	1	3	11	7	160	0	0	-1	2	1	1	4	13	0	0	1670	228	RO
RU	1	14	39	4	0	21	6	189	2	165	4079	22	5	16	126	921	2	9	4	9	11	63	10	159	2	3	7058	784	RU
SE	1	3	2	0	0	21	20	66	1	11	23	174	1	3	1	29	1	-1	0	1	3	0	1	21	0	0	719	578	SE
SI	0	0	0	0	0	1	0	2	0	2	0	0	44	1	0	2	0	0	0	0	0	0	1	2	0	0	149	124	SI
SK	0	0	1	0	0	2	0	36	0	16	2	0	3	61	0	14	0	0	0	1	0	0	1	3	0	0	284	224	SK
TR	0	0	8	3	0	1	0	13	1	40	58	1	1	2	887	95	0	1	-1	2	1	181	25	41	-2	0	1567	105	TR
UA	0	2	88	4	0	9	1	156	1	257	202	4	4	25	28	2254	0	0	-2	5	2	6	6	28	1	1	3568	472	UA
ATL	4	3	2	0	0	99	41	97	77	17	101	29	3	6	2	54	-14	12	0	6	20	1	4	1517	0	-7	4819	2985	ATL
BAS	1	11	3	0	0	31	6	148	1	16	32	73	1	4	1	44	1	-16	0	2	-2	0	1	16	0	-1	973	825	BAS
BLS	0	1	26	3	0	2	0	23	0	117	146	1	1	3	82	318	0	1	-11	3	1	12	5	15	0	-1	993	121	BLS
MED	1	1	12	12	5	11	1	40	15	91	33	2	16	10	190	99	1	2	-1	-71	4	55	211	108	-2	-4	2612	1632	MED
NOS	3	1	1	0	0	184	19	51	4	5	7	16	1	2	0	17	-1	-5	0	2	-29	0	1	52	0	-5	2078	1992	NOS
ASI	0	0	1	0	0	0	0	3	0	6	84	0	0	0	47	27	0	0	-1	-10	0	814	8	24	-9	-1	1091	22	ASI
NOA	0	0	1	1	0	2	0	6	4	10	3	0	1	1	5	10	0	0	0	-30	1	2	494	36	-6	-2	730	184	NOA
SUM	49	99	344	107	9	1179	184	2553	425	2215	5230	403	160	255	1518	4748	-18	-9	-11	-90	-21	1254	848	2383	-20	-22	53307	29878	SUM
EMC	41	97	305	92	3	869	120	2282	328	1992	5163	298	138	233	1244	4308	-4	-1	1	-30	-11	1187	627	701	-19	-3		22754	EMC
EU	37	58	19	15	2	783	30	1613	315	201	154	230	104	151	22	307	-10	-16	1	-17	-39	3	61	231	-3	-8		19149	EU
emis	50	115	367	121	12	1189	190	2701	570	2344	6470	422	164	264	1981	5097	0	0	0	0	0	2289	1935	0	0	0	57451	31331	emis
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table B.4: Average 2010 country-to-country blame matrices for $\mathbf{AOT40}_f^{\mathbf{3m}}$.
Units: ppb.h per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	
AL	305	0	42	1	70	4	105	14	11	301	0	29	85	3	1	91	3	134	14	1	210	67	60	4	1	455	1	AL
AM	1	99	2	42	1	0	5	6	1	4	2	2	8	1	0	8	1	9	2	20	6	1	2	1	0	10	4	AM
AT	2	0	484	0	11	5	6	13	61	21	0	83	485	4	1	83	4	278	23	0	7	55	44	8	2	437	1	AT
AZ	0	11	1	91	1	0	3	5	1	2	1	1	5	0	0	4	1	5	2	17	3	1	1	0	0	6	6	AZ
BA	15	0	99	1	416	4	35	16	14	237	0	62	159	4	1	89	4	159	19	1	38	229	130	5	2	424	1	BA
BE	0	0	10	0	1	-210	1	5	8	2	0	11	129	4	1	49	4	395	-3	0	1	2	3	14	2	29	0	BE
BG	17	0	33	1	29	3	582	30	7	184	0	30	84	4	1	43	4	67	14	2	150	31	70	3	1	127	3	BG
BY	0	0	9	0	2	2	4	307	3	6	0	16	71	9	3	12	7	37	16	0	1	5	16	3	1	17	3	BY
CH	1	0	47	0	4	4	3	5	401	6	0	13	272	2	0	127	3	711	21	0	6	12	7	7	2	399	0	CH
CS	40	0	61	1	114	3	112	18	10	686	0	47	116	4	1	70	4	110	16	1	69	82	120	4	1	285	2	CS
CY	6	2	8	3	8	1	33	11	3	24	474	7	25	2	1	25	3	34	7	6	97	8	12	2	1	59	2	CY
CZ	1	0	155	0	7	1	5	20	23	18	0	310	523	8	1	47	5	199	25	0	4	28	62	8	2	108	1	CZ
DE	0	0	41	0	2	-18	2	11	39	4	0	38	624	6	1	49	5	299	23	0	2	6	9	11	2	77	0	DE
DK	0	0	3	0	1	-10	1	16	2	1	0	7	92	-10	2	13	9	48	46	0	1	1	4	16	3	6	0	DK
EE	0	0	2	0	0	1	0	25	1	1	0	3	30	12	29	5	13	16	18	0	0	1	1	4	1	3	1	EE
ES	1	0	5	0	2	2	2	1	4	3	0	3	23	1	0	1172	1	227	19	0	3	4	2	6	1	49	0	ES
FI	0	0	1	0	0	0	0	7	0	0	0	1	12	5	6	2	27	7	7	0	0	0	1	2	0	1	0	FI
FR	1	0	13	0	3	8	2	3	33	4	0	8	132	2	0	225	2	1052	22	0	4	7	4	10	2	111	0	FR
GB	0	0	2	0	0	-8	0	2	1	0	0	3	27	5	1	15	4	63	-133	0	0	1	1	25	3	5	0	GB
GE	1	7	3	30	2	1	9	11	1	6	1	3	11	1	0	6	2	9	3	92	6	2	4	1	0	10	3	GE
GL	0	0	0	0	0	0	0	1	0	0	0	0	3	1	0	2	2	4	8	0	0	0	0	2	4	1	0	GL
GR	56	0	27	1	31	3	241	20	7	121	0	21	64	3	1	61	3	82	13	2	693	31	39	3	1	237	2	GR
HR	6	0	165	0	120	5	19	16	19	102	0	78	230	4	1	89	4	187	22	1	19	499	166	6	2	469	1	HR
HU	3	0	169	0	33	4	22	27	15	101	0	116	245	6	1	53	5	130	24	1	9	168	523	6	2	205	2	HU
IE	0	0	2	0	0	-5	0	2	1	0	0	2	11	3	0	15	3	54	23	0	0	1	1	56	2	5	0	IE
IS	0	0	0	0	0	-1	0	1	0	0	0	0	3	1	0	4	1	8	11	0	0	0	0	5	5	1	0	IS
IT	6	0	77	0	29	5	15	8	50	39	0	23	150	2	0	153	3	412	20	1	27	68	32	6	2	1083	1	IT
KZ	0	0	2	1	1	1	2	18	1	2	0	3	13	2	1	5	4	10	5	1	1	1	3	1	0	6	53	KZ
LT	0	0	6	0	2	1	2	134	2	4	0	12	74	20	3	11	6	34	24	0	1	3	8	5	1	10	2	LT
LU	0	0	12	0	1	15	1	5	11	2	0	15	239	3	1	55	3	424	16	0	2	3	4	12	2	38	0	LU
LV	0	0	3	0	1	1	1	64	1	2	0	6	46	16	6	8	8	23	21	0	1	1	4	5	1	6	1	LV
MD	2	0	23	1	11	3	34	62	5	33	0	24	80	6	2	23	6	45	17	2	11	17	50	4	1	48	4	MD
MK	112	0	37	1	46	3	202	17	9	324	0	29	82	3	1	75	3	103	13	1	219	47	66	3	1	278	2	MK
MT	11	0	23	0	19	4	23	7	9	35	0	12	47	2	0	113	2	200	14	1	66	25	17	4	1	437	1	MT
NL	0	0	8	0	1	-112	1	5	5	2	0	10	42	5	1	25	4	106	0	0	1	2	3	11	2	17	0	NL
NO	0	0	1	0	0	-1	0	6	0	0	0	2	30	10	1	6	3	20	27	0	0	0	1	6	1	2	0	NO
PL	1	0	32	0	5	1	4	61	7	13	0	72	261	16	1	25	6	85	27	0	2	14	44	7	2	40	1	PL
PT	0	0	1	0	1	2	1	1	2	1	0	1	9	1	0	584	1	80	20	0	1	1	1	7	1	13	0	PT
RO	5	0	40	1	27	3	72	32	7	114	0	43	104	5	1	38	4	70	15	1	18	38	115	4	1	104	3	RO
RU	0	0	1	1	0	0	1	13	0	1	0	1	6	1	1	2	2	4	2	1	1	0	1	1	0	2	2	RU
SE	0	0	1	0	0	-1	0	7	0	0	0	2	29	13	2	5	6	17	19	0	0	0	1	4	1	2	0	SE
SI	3	0	284	0	23	5	10	14	29	39	0	61	289	4	1	87	4	219	18	1	10	259	74	6	2	640	1	SI
SK	2	0	98	0	16	4	15	34	13	55	0	153	238	7	1	44	5	111	23	1	7	54	285	6	2	125	2	SK
TR	5	3	10	4	7	1	53	21	3	27	5	10	32	2	1	21	3	29	8	9	50	8	16	2	1	43	3	TR
UA	1	0	23	1	8	2	15	104	5	25	0	31	91	6	2	22	6	49	16	1	5	19	68	4	1	49	3	UA
ATL	0	0	1	0	0	0	0	2	1	0	0	1	13	2	1	84	2	74	12	0	0	0	1	8	1	4	0	ATL
BAS	0	0	2	0	0	-1	0	16	1	1	0	4	42	15	9	5	13	19	24	0	0	1	2	6	1	3	0	BAS
BLS	3	2	11	4	6	1	82	43	2	25	1	14	42	4	2	14	6	25	11	17	26	8	21	2	1	31	4	BLS
MED	14	0	36	1	31	4	56	11	14	54	6	19	72	2	1	192	3	260	16	1	155	54	29	4	1	459	1	MED
NOS	0	0	2	0	0	-11	0	10	1	1	0	3	43	10	1	11	7	46	24	0	0	1	2	18	3	4	0	NOS
ASI	1	2	1	10	1	0	3	2	0	2	4	1	3	0	0	5	0	5	1	3	4	1	1	0	0	6	2	ASI
NOA	4	0	10	0	8	2	10	3	5	14	0	5	23	1	0	122	1	138	9	0	29	10	7	3	1	174	0	NOA
EMC	3	0	19	1	8	0	15	22	8	21	0	14	71	4	2	68	5	99	10	1	12	13	18	3	1	67	1	EMC
EU	2	0	38	0	5	-1	7	15	14	10	0	26	145	7	2	161	8	223	17	0	16	15	23	6	1	126	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	

Table B.4 Cont.: Average 2010 country-to-country blame matrices for **AOT40$_f^{3m}$**.
Units: ppb.h per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	
AL	2	1	1	11	93	1	3	8	56	7	93	54	7	11	22	23	91	19	11	13	340	13	0	7	295	3195	1246	AL
AM	1	0	0	3	1	0	0	2	8	1	10	72	2	1	2	205	41	3	2	11	23	2	20	2	170	820	69	AM
AT	3	6	1	2	2	0	-4	14	58	7	20	36	11	81	19	4	39	31	13	2	80	18	0	3	247	2810	2127	AT
AZ	1	0	0	2	1	0	0	1	5	1	6	97	1	0	1	59	28	2	2	6	11	1	19	1	152	567	43	AZ
BA	3	2	1	6	13	1	2	11	81	8	61	48	10	25	36	9	72	22	14	4	224	15	0	5	282	3119	1365	BA
BE	2	18	1	1	0	0	-156	18	17	6	4	19	9	1	2	2	13	55	9	1	16	-100	0	1	221	619	337	BE
BG	4	1	2	42	50	0	3	9	78	4	312	121	10	7	28	34	268	15	15	64	98	13	1	3	267	2970	771	BG
BY	23	1	8	6	0	0	2	10	118	1	19	216	13	2	12	3	175	13	28	3	7	13	0	0	146	1371	401	BY
CH	1	5	1	1	1	0	-5	11	17	9	7	17	7	8	3	4	16	39	6	1	80	21	0	3	257	2569	1667	CH
CS	3	2	2	12	43	1	3	9	86	6	148	59	9	13	40	14	107	18	14	10	158	14	0	5	275	3027	1075	CS
CY	2	0	1	9	8	0	1	5	23	2	39	98	4	2	6	868	98	8	6	46	523	6	5	4	222	2850	798	CY
CZ	5	7	2	2	1	0	-7	17	115	5	22	46	15	18	48	3	45	33	22	1	30	14	0	1	227	2233	1663	CZ
DE	3	12	2	1	0	0	-46	19	53	5	6	29	14	4	5	2	19	43	14	1	22	-12	0	1	222	1657	1220	DE
DK	6	1	4	1	0	0	-20	41	54	2	4	38	28	1	3	1	17	46	-33	0	3	-21	0	0	173	603	307	DK
EE	10	0	19	1	0	0	1	11	24	1	2	74	27	0	1	1	20	12	55	0	1	13	0	0	73	512	220	EE
ES	0	1	0	0	1	0	1	6	4	105	2	6	3	1	1	1	5	82	2	0	130	15	0	5	296	2200	1630	ES
FI	2	0	3	0	0	0	0	6	10	0	1	34	16	0	0	0	6	5	24	0	1	6	0	0	32	226	104	FI
FR	1	8	1	1	1	0	-7	11	13	13	5	13	6	4	2	2	11	59	5	1	91	18	0	2	237	2148	1636	FR
GB	1	1	1	0	0	0	-18	26	9	3	1	10	11	0	1	1	5	61	7	0	3	-56	0	0	143	229	19	GB
GE	1	0	1	6	1	0	1	3	13	1	19	183	3	1	3	80	89	3	5	52	15	3	7	1	120	834	84	GE
GL	0	0	0	0	0	0	0	8	2	0	0	5	3	0	0	0	1	8	2	0	1	4	0	0	75	140	30	GL
GR	3	1	1	24	64	1	3	8	50	5	136	85	7	6	16	51	172	16	11	45	346	11	1	5	271	3100	1343	GR
HR	3	3	1	5	5	0	2	12	82	8	40	45	10	81	43	7	63	26	14	3	227	17	0	3	258	3188	1677	HR
HU	6	3	3	6	3	0	3	14	183	5	93	69	14	48	157	5	123	23	21	4	73	20	0	2	241	2990	1918	HU
IE	1	1	1	0	0	0	-13	20	6	3	1	6	8	0	1	1	4	73	3	0	4	-16	0	0	127	405	175	IE
IS	0	0	0	0	0	0	-1	7	2	1	0	3	3	0	0	0	1	14	1	0	1	5	0	0	58	138	40	IS
IT	2	3	1	3	6	1	2	11	30	12	24	28	7	28	12	8	37	34	7	3	368	19	0	6	282	3146	2090	IT
KZ	3	0	2	2	0	0	1	5	15	1	7	444	5	0	2	3	58	4	8	2	3	4	1	0	182	890	87	KZ
LT	113	1	16	2	0	0	2	14	115	1	9	129	24	1	7	2	67	18	59	1	5	18	0	0	132	1105	496	LT
LU	2	-229	1	1	0	0	-69	15	19	5	4	19	9	2	2	2	13	45	8	1	20	-27	0	1	210	921	583	LU
LV	40	1	53	2	0	0	0	13	50	1	5	91	28	1	3	1	39	16	59	1	3	13	0	0	100	748	332	LV
MD	7	1	3	336	3	0	4	11	128	2	332	171	12	5	29	15	575	13	22	43	26	14	1	1	213	2479	532	MD
MK	3	1	1	15	304	1	2	8	60	6	134	65	8	8	25	23	116	17	11	19	190	12	0	6	293	3010	1034	MK
MT	1	1	1	4	9	20	2	7	23	10	25	25	5	7	7	12	35	28	5	7	167	14	0	10	220	1717	1016	MT
NL	2	3	1	1	0	0	-522	22	20	4	3	17	11	1	2	1	11	40	9	1	8	-136	0	0	161	-205	-360	NL
NO	2	0	1	0	0	0	-1	51	12	1	1	14	20	0	1	0	4	18	11	0	1	14	0	0	73	339	143	NO
PL	12	3	4	3	1	0	1	18	384	3	22	89	21	7	41	2	96	26	52	2	15	20	0	1	189	1740	1097	PL
PT	0	1	0	0	0	0	0	5	2	505	1	4	2	0	0	0	2	157	1	0	37	13	0	2	283	1744	1230	PT
RO	5	2	2	38	6	0	3	10	118	4	635	105	10	9	52	12	294	15	16	22	52	13	1	2	226	2512	767	RO
RU	2	0	1	1	0	0	0	2	7	0	3	207	2	0	1	3	23	2	4	2	2	2	0	0	44	354	39	RU
SE	3	0	2	0	0	0	-1	19	18	1	1	19	45	0	1	0	7	13	30	0	1	10	0	0	63	345	170	SE
SI	3	4	1	3	3	0	0	12	57	8	27	38	9	336	26	5	49	27	12	2	174	16	0	3	238	3138	2148	SI
SK	7	3	3	5	3	0	2	14	270	5	71	78	15	25	307	4	136	23	25	3	43	19	0	1	225	2589	1745	SK
TR	3	0	2	19	8	0	2	6	36	2	73	169	6	2	9	606	197	8	9	91	114	7	5	3	215	1968	295	TR
UA	9	1	3	23	2	0	3	11	169	2	107	197	12	6	48	7	583	14	22	14	22	13	0	1	189	2016	627	UA
ATL	1	1	1	0	0	0	-1	18	4	22	1	10	6	0	0	0	3	59	4	0	7	8	0	0	88	439	235	ATL
BAS	9	1	9	1	0	0	-3	19	37	1	2	46	40	0	1	0	14	18	13	0	2	14	0	0	87	477	241	BAS
BLS	5	1	3	40	4	0	2	10	60	2	114	451	11	2	11	103	466	10	16	229	46	10	2	1	188	2199	309	BLS
MED	2	1	1	10	14	2	2	9	33	13	51	53	7	13	11	110	88	28	8	27	452	15	1	7	240	2693	1342	MED
NOS	4	1	2	0	0	0	-19	60	24	2	2	23	34	0	1	1	9	49	3	0	3	-58	0	0	153	469	208	NOS
ASI	0	0	0	1	1	0	0	1	3	1	4	31	1	0	1	157	13	1	1	4	24	1	31	1	143	475	38	ASI
NOA	0	1	0	1	4	3	1	4	9	11	10	11	2	3	3	11	15	20	2	3	348	8	0	33	206	1289	556	NOA
EMC	4	1	2	4	3	0	-2	8	38	10	31	115	11	5	10	20	55	16	13	6	37	6	1	1	114	996	473	EMC
EU	6	3	3	2	2	0	-7	13	57	24	11	34	20	10	14	3	27	33	21	2	62	9	0	2	161	1378	926	EU
	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	

Table B.5: Average 2010 country-to-country blame matrices for $\mathbf{AOT40_f^{3m}}$.
Units: ppb.h per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	
AL	13	0	11	0	5	9	8	8	6	26	0	13	68	3	0	25	2	47	38	0	14	13	8	1	0	131	0	AL
AM	0	11	1	1	0	1	1	2	1	1	0	1	8	1	0	2	1	5	5	0	1	1	1	0	0	6	0	AM
AT	1	0	50	0	2	19	1	5	13	5	0	18	169	4	0	19	2	69	58	0	1	12	5	2	0	140	0	AT
AZ	0	0	1	1	0	1	0	2	0	1	0	1	7	0	0	1	1	4	4	0	1	1	0	0	0	4	0	AZ
BA	2	0	14	0	10	11	4	7	6	20	0	16	84	3	0	23	1	49	44	0	4	19	9	2	0	113	0	BA
BE	0	0	6	0	0	143	1	5	5	1	0	8	209	7	1	13	2	169	157	0	1	2	2	5	0	23	0	BE
BG	2	0	7	0	2	7	17	10	4	13	0	11	59	3	0	13	2	30	35	0	7	7	6	1	0	48	0	BG
BY	0	0	3	0	0	6	1	39	2	2	0	6	42	4	0	5	2	21	28	0	0	2	2	1	0	12	0	BY
CH	0	0	13	0	1	18	1	4	54	3	0	9	124	4	0	24	1	88	52	0	1	6	2	2	0	184	0	CH
CS	3	0	10	0	4	9	6	7	5	38	0	14	70	3	0	18	2	39	38	0	5	11	9	1	0	79	0	CS
CY	2	1	6	0	3	5	8	11	3	10	3	8	43	2	1	12	2	27	23	1	20	6	5	1	0	44	1	CY
CZ	0	0	23	0	1	25	1	7	9	4	0	54	188	6	0	13	2	69	79	0	1	7	6	3	0	56	0	CZ
DE	0	0	14	0	1	45	1	6	14	2	0	17	320	8	0	13	2	106	106	0	1	3	2	4	0	50	0	DE
DK	0	0	2	0	0	19	0	7	2	1	0	5	94	41	1	5	3	54	115	0	0	1	1	4	0	7	0	DK
EE	0	0	1	0	0	5	0	4	1	0	0	2	23	4	2	2	4	14	28	0	0	0	0	1	0	3	0	EE
ES	0	0	3	0	1	5	1	1	2	2	0	3	26	1	0	140	1	47	35	0	1	2	1	2	0	25	0	ES
FI	0	0	0	0	0	2	0	1	0	0	0	1	9	2	1	1	4	6	13	0	0	0	0	1	0	1	0	FI
FR	0	0	6	0	1	21	1	3	8	2	0	7	91	4	0	40	1	123	69	0	1	4	2	3	0	47	0	FR
GB	0	0	2	0	0	16	0	2	1	0	0	3	53	6	0	5	2	49	187	0	0	1	1	4	0	7	0	GB
GE	0	0	1	1	0	2	1	5	1	1	0	2	13	1	0	2	1	6	8	1	1	1	1	0	0	6	0	GE
GL	0	0	0	0	0	1	0	0	0	0	0	0	4	0	0	1	0	2	4	0	0	0	0	0	0	1	0	GL
GR	5	0	9	0	4	7	8	10	4	16	0	11	58	3	0	19	2	37	35	0	28	9	7	1	0	84	0	GR
HR	1	0	24	0	6	14	3	7	9	16	0	21	117	4	0	25	2	62	53	0	3	50	11	2	0	154	0	HR
HU	1	0	21	0	3	15	3	9	7	15	0	24	114	4	0	15	2	50	56	0	2	19	25	2	0	82	0	HU
IE	0	0	1	0	0	11	0	2	1	0	0	2	32	4	0	4	1	30	97	0	0	1	1	10	0	6	0	IE
IS	0	0	0	0	0	2	0	1	0	0	0	0	6	1	0	1	0	6	13	0	0	0	0	1	0	1	0	IS
IT	2	0	19	0	4	12	3	6	16	10	0	13	100	3	0	39	2	89	48	0	4	18	6	2	0	342	0	IT
KZ	0	0	1	0	0	2	0	6	1	1	0	2	14	1	0	2	1	7	10	0	0	1	1	0	0	5	1	KZ
LT	0	0	2	0	0	8	0	15	1	1	0	5	42	6	1	4	2	22	40	0	0	1	1	2	0	8	0	LT
LU	0	0	7	0	0	78	1	5	7	2	0	10	226	6	0	14	2	154	116	0	1	2	2	4	0	28	0	LU
LV	0	0	2	0	0	6	0	8	1	1	0	3	33	6	1	3	2	19	37	0	0	1	1	1	0	5	0	LV
MD	1	0	6	0	2	7	3	13	3	6	0	10	56	4	1	7	2	25	35	0	2	5	5	2	0	27	1	MD
MK	7	0	8	0	3	8	8	7	4	21	0	11	58	3	0	19	1	36	33	0	18	9	6	1	0	79	0	MK
MT	5	0	14	0	7	11	7	9	9	18	0	13	76	3	0	42	2	92	46	0	16	16	9	2	0	351	0	MT
NL	0	0	5	0	0	88	0	5	5	1	0	9	222	9	1	10	2	123	157	0	0	2	1	4	0	19	0	NL
NO	0	0	1	0	0	5	0	2	0	0	0	1	22	5	0	2	1	14	33	0	0	0	0	1	0	2	0	NO
PL	0	0	9	0	1	15	1	11	4	4	0	19	109	8	1	8	2	45	59	0	1	4	5	2	0	26	0	PL
PT	0	0	1	0	0	4	0	1	1	1	0	1	16	1	0	93	0	32	30	0	0	1	1	2	0	9	0	PT
RO	1	0	7	0	2	8	5	8	4	10	0	11	62	3	0	11	2	30	35	0	2	6	6	1	0	40	0	RO
RU	0	0	0	0	0	1	0	3	0	0	0	1	6	1	0	1	0	3	5	0	0	0	0	0	0	2	0	RU
SE	0	0	1	0	0	5	0	2	0	0	0	1	23	5	0	2	2	14	26	0	0	0	0	1	0	2	0	SE
SI	1	0	36	0	3	15	2	6	11	8	0	19	135	4	0	24	2	69	52	0	2	34	7	2	0	211	0	SI
SK	1	0	15	0	2	14	2	9	5	9	0	25	102	5	0	12	2	43	53	0	1	9	14	2	0	52	0	SK
TR	1	0	4	0	1	4	4	9	2	6	0	6	33	2	0	7	1	18	20	0	6	3	3	1	0	24	1	TR
UA	0	0	6	0	1	7	2	14	3	4	0	10	55	3	0	7	2	25	33	0	1	4	5	1	0	24	0	UA
ATL	0	0	1	0	0	4	0	1	1	0	0	1	15	2	0	19	1	19	33	0	0	0	0	1	0	4	0	ATL
BAS	0	0	1	0	0	7	0	4	1	0	0	2	36	9	1	2	5	20	42	0	0	0	1	2	0	3	0	BAS
BLS	1	0	5	0	1	5	6	16	2	6	0	8	44	3	1	6	2	20	28	1	4	3	4	1	0	22	1	BLS
MED	3	0	12	0	5	9	6	8	8	13	0	12	70	3	0	56	2	69	42	0	18	15	7	2	0	173	0	MED
NOS	0	0	1	0	0	16	0	4	1	0	0	3	55	14	0	4	2	45	115	0	0	1	1	3	0	5	0	NOS
ASI	0	0	1	0	0	1	1	1	0	1	0	1	5	0	0	2	0	3	3	0	1	1	1	0	0	4	0	ASI
NOA	1	0	6	0	2	5	3	3	4	6	0	5	34	1	0	27	1	40	24	0	5	6	3	1	0	73	0	NOA
EMC	0	0	4	0	1	7	1	5	3	2	0	5	41	2	0	11	1	25	25	0	1	3	2	1	0	25	0	EMC
EU	0	0	7	0	1	13	1	4	5	3	0	8	79	4	0	25	2	49	47	0	1	4	2	2	0	47	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	

Table B.5 Cont.: Average 2010 country-to-country blame matrices for **AOT40$_f^{\mathbf{3m}}$**.
Units: ppb.h per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	
AL	1	1	1	2	8	0	12	3	22	3	20	33	5	2	5	5	30	0	1	0	8	1	0	1	200	811	420	AL
AM	0	0	0	0	0	0	1	1	3	0	2	17	1	0	1	9	10	0	0	0	0	0	1	0	31	129	40	AM
AT	1	2	0	1	0	0	24	3	21	2	6	21	6	7	4	1	14	0	1	0	2	3	0	0	157	875	625	AT
AZ	0	0	0	0	0	0	1	0	3	0	2	20	1	0	0	4	8	0	0	0	0	0	1	0	32	107	31	AZ
BA	1	1	0	1	2	0	15	3	25	3	13	28	5	3	5	2	22	0	1	0	5	2	0	0	174	753	431	BA
BE	1	6	1	1	0	0	93	5	12	2	3	15	7	1	1	1	9	1	1	0	1	10	0	0	185	1113	868	BE
BG	1	0	1	4	3	0	11	3	25	2	35	51	5	2	5	8	56	0	1	1	2	1	0	0	158	660	282	BG
BY	2	0	1	1	0	0	10	2	17	1	5	57	4	1	2	1	27	0	1	0	0	1	0	0	85	394	169	BY
CH	1	2	0	0	0	0	21	3	12	3	4	12	5	2	2	1	9	0	1	0	3	3	0	0	136	812	570	CH
CS	1	1	1	2	3	0	13	3	26	2	20	31	5	2	6	3	28	0	1	0	4	2	0	0	156	682	355	CS
CY	1	0	1	3	2	0	7	3	21	2	22	68	4	1	4	147	55	0	1	1	8	1	1	1	233	834	243	CY
CZ	1	1	1	1	0	0	33	4	39	2	6	25	7	3	6	1	16	0	1	0	1	4	0	0	163	871	619	CZ
DE	1	3	1	1	0	0	57	5	21	2	4	18	9	1	2	1	11	1	1	0	1	6	0	0	179	1039	785	DE
DK	2	1	1	0	0	0	31	7	21	1	3	22	19	0	1	1	10	1	4	0	0	7	0	0	141	637	430	DK
EE	1	0	1	0	0	0	8	1	6	0	1	25	6	0	0	0	6	0	1	0	0	1	0	0	46	198	110	EE
ES	0	0	0	0	0	0	6	2	4	19	2	6	2	1	1	0	4	1	0	0	5	1	0	1	129	485	323	ES
FI	0	0	0	0	0	0	3	1	2	0	0	11	3	0	0	0	2	0	1	0	0	1	0	0	21	88	50	FI
FR	1	2	0	0	0	0	22	3	9	4	3	12	5	1	1	1	8	1	1	0	2	3	0	0	141	654	459	FR
GB	1	1	0	0	0	0	25	4	7	1	1	8	6	0	1	0	4	1	1	0	0	6	0	0	87	493	376	GB
GE	0	0	0	1	0	0	2	1	6	0	4	35	2	0	1	5	20	0	0	0	0	0	1	0	44	180	56	GE
GL	0	0	0	0	0	0	1	0	1	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	-11	10	17	GL
GR	1	0	1	3	6	0	10	3	23	2	26	44	5	2	5	9	47	0	1	0	7	1	0	0	191	746	349	GR
HR	1	1	1	1	1	0	19	4	28	3	11	28	6	8	6	2	20	0	1	0	6	2	0	0	203	936	563	HR
HU	2	1	1	1	1	0	22	4	42	2	15	34	6	5	12	2	26	0	1	0	2	2	0	0	176	826	506	HU
IE	1	0	0	0	0	0	17	3	5	1	1	5	5	0	0	0	3	1	1	0	0	4	0	0	55	304	229	IE
IS	0	0	0	0	0	0	2	1	1	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	4	46	36	IS
IT	1	1	0	1	2	0	17	4	18	4	11	24	5	6	5	3	18	0	1	0	10	2	0	1	229	1102	738	IT
KZ	1	0	0	0	0	0	3	1	6	0	2	75	2	0	1	1	16	0	0	0	0	0	0	0	48	215	61	KZ
LT	5	0	1	0	0	0	13	2	17	1	3	34	6	0	2	1	14	0	1	0	0	2	0	0	81	349	189	LT
LU	1	33	1	0	0	0	65	4	13	2	3	15	7	1	2	1	9	1	1	0	1	7	0	0	167	999	772	LU
LV	2	0	3	0	0	0	10	2	10	1	2	28	7	0	1	0	9	0	1	0	0	2	0	0	64	274	153	LV
MD	1	0	1	17	1	0	11	3	27	1	28	59	5	1	4	5	79	0	1	0	1	1	0	0	138	605	239	MD
MK	1	0	1	2	18	0	10	3	21	3	20	33	4	2	5	5	31	0	1	0	5	1	0	0	155	663	328	MK
MT	1	1	1	2	3	82	13	4	23	5	19	34	5	4	6	5	27	1	1	0	53	2	0	2	340	1381	817	MT
NL	1	3	1	0	0	0	157	5	14	2	2	14	8	1	1	1	8	1	1	0	0	10	0	0	172	1065	836	NL
NO	0	0	0	0	0	0	7	5	4	0	1	7	4	0	0	0	2	0	1	0	0	2	0	0	30	155	105	NO
PL	2	1	1	1	0	0	23	4	67	1	6	34	8	2	6	1	21	0	2	0	1	3	0	0	136	655	420	PL
PT	0	0	0	0	0	0	5	2	2	125	1	4	2	0	0	0	2	2	0	0	1	1	0	0	119	464	328	PT
RO	1	1	1	3	1	0	12	3	25	1	45	39	5	2	5	3	40	0	1	0	2	1	0	0	128	573	271	RO
RU	0	0	0	0	0	0	1	0	2	0	1	51	1	0	0	0	6	0	0	0	0	0	0	0	22	111	25	RU
SE	1	0	0	0	0	0	7	2	5	0	1	8	8	0	0	0	3	0	1	0	0	1	0	0	35	160	105	SE
SI	1	1	0	1	1	0	19	3	23	3	8	25	5	25	5	2	17	0	1	0	5	2	0	0	194	987	661	SI
SK	2	1	1	1	1	0	21	3	61	2	11	32	7	3	14	1	23	0	1	0	1	2	0	0	146	713	451	SK
TR	1	0	1	2	1	0	6	2	15	1	14	56	4	1	3	55	48	0	0	1	2	1	0	0	124	497	162	TR
UA	1	0	1	2	0	0	11	3	28	1	13	56	5	1	4	2	77	0	1	0	1	1	0	0	114	530	232	UA
ATL	0	0	0	0	0	0	5	2	2	12	1	5	2	0	0	0	2	1	0	0	0	1	0	0	37	173	121	ATL
BAS	1	0	1	0	0	0	12	3	10	0	1	21	14	0	1	0	5	0	3	0	0	2	0	0	65	278	170	BAS
BLS	2	0	1	4	1	0	8	3	23	1	21	107	5	1	3	22	94	0	1	2	2	1	0	0	164	658	199	BLS
MED	1	1	1	2	2	0	12	3	20	5	17	36	5	3	5	19	33	0	1	0	16	2	0	1	239	957	527	MED
NOS	1	1	1	0	0	0	24	10	10	1	1	14	13	0	1	0	5	1	2	0	0	7	0	0	96	460	316	NOS
ASI	0	0	0	0	0	0	1	0	2	0	2	11	1	0	0	14	6	0	0	0	0	0	0	0	30	97	26	ASI
NOA	0	0	0	1	1	0	6	2	9	4	7	14	2	1	2	3	11	0	0	0	8	1	0	1	152	479	252	NOA
EMC	1	0	0	1	0	0	9	2	10	2	4	33	3	1	1	2	12	0	1	0	1	1	0	0	68	318	179	EMC
EU	1	1	0	0	0	0	17	2	15	6	4	16	6	2	2	1	9	0	1	0	2	2	0	0	103	495	336	EU
	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	

Table B.6: Average 2010 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	
AL	31	0	3	0	7	0	11	1	1	27	0	2	5	0	0	10	0	12	1	0	22	6	5	0	0	42	0	AL
AM	0	16	0	14	0	0	1	1	0	1	1	0	1	0	0	2	0	1	0	7	1	0	0	0	0	2	1	AM
AT	0	0	35	0	1	-1	1	1	5	2	0	8	34	0	0	9	0	24	1	0	1	5	5	1	0	35	0	AT
AZ	0	3	0	45	0	0	1	1	0	1	0	0	1	0	0	1	0	1	0	7	1	0	0	0	0	1	3	AZ
BA	2	0	8	0	40	0	4	1	1	22	0	4	9	0	0	10	0	14	1	0	5	25	11	1	0	40	0	BA
BE	0	0	1	0	0	-72	0	1	1	0	0	1	-2	0	0	6	1	18	-8	0	0	0	0	2	1	3	0	BE
BG	2	0	3	0	3	0	63	3	1	18	0	2	5	0	0	5	0	6	1	0	15	3	6	0	0	11	1	BG
BY	0	0	1	0	0	0	1	36	0	1	0	2	8	1	1	2	2	4	2	0	0	1	2	1	0	2	1	BY
CH	0	0	3	0	1	-1	1	0	34	1	0	1	17	0	0	14	0	71	0	0	1	1	1	1	0	28	0	CH
CS	4	0	5	0	12	0	12	2	1	67	0	4	7	0	0	8	0	10	1	0	7	10	13	0	0	26	0	CS
CY	1	0	1	1	1	0	4	1	0	3	47	1	2	0	0	4	0	4	1	1	12	1	1	0	0	7	0	CY
CZ	0	0	15	0	1	-1	1	2	2	2	0	29	41	0	0	6	1	19	2	0	1	3	6	1	0	10	0	CZ
DE	0	0	3	0	0	-5	0	1	3	1	0	3	33	0	0	6	1	25	0	0	0	1	1	2	0	6	0	DE
DK	0	0	0	0	0	-2	0	2	0	0	0	1	5	-9	0	2	2	5	5	0	0	0	0	2	1	1	0	DK
EE	0	0	0	0	0	0	0	4	0	0	0	0	4	2	5	1	3	2	3	0	0	0	0	1	0	0	0	EE
ES	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	134	0	21	1	0	0	0	0	1	0	4	0	ES
FI	0	0	0	0	0	0	0	1	0	0	0	0	2	1	1	0	5	1	1	0	0	0	0	0	0	0	0	FI
FR	0	0	1	0	0	-1	0	0	2	0	0	0	6	0	0	24	0	102	-1	0	0	1	0	2	0	7	0	FR
GB	0	0	0	0	0	-2	0	0	0	0	0	0	1	0	0	3	1	7	-51	0	0	0	0	4	1	1	0	GB
GE	0	4	0	13	0	0	2	2	0	1	0	0	1	0	0	2	0	2	1	28	1	0	1	0	0	2	1	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	5	0	2	0	3	0	25	2	1	11	0	1	3	0	0	7	0	8	1	0	76	3	3	0	0	22	0	GR
HR	1	0	13	0	15	0	3	2	2	12	0	5	13	0	0	9	0	16	1	0	3	47	15	1	0	41	0	HR
HU	0	0	13	0	4	0	4	3	1	12	0	9	16	0	0	6	1	11	2	0	2	15	53	1	0	18	0	HU
IE	0	0	0	0	0	-1	0	0	0	0	0	0	-1	0	0	3	0	6	0	0	0	0	0	2	1	1	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0	1	0	0	0	IS
IT	1	0	5	0	3	0	2	1	4	4	0	1	6	0	0	16	0	36	1	0	3	6	3	1	0	82	0	IT
KZ	0	0	0	1	0	0	0	2	0	0	0	0	1	0	0	1	1	1	1	0	0	0	0	0	0	1	11	KZ
LT	0	0	1	0	0	0	0	15	0	1	0	1	9	3	1	2	2	4	4	0	0	0	1	1	0	1	0	LT
LU	0	0	1	0	0	-7	0	1	1	0	0	1	10	0	0	8	1	44	-1	0	0	0	0	2	0	5	0	LU
LV	0	0	0	0	0	0	0	9	0	0	0	1	6	2	1	1	2	3	3	0	0	0	1	1	0	1	0	LV
MD	0	0	2	0	1	0	4	7	0	4	0	2	6	1	0	3	1	5	1	0	2	2	5	0	0	5	1	MD
MK	11	0	3	0	4	0	22	1	1	34	0	2	4	0	0	8	0	9	1	0	20	4	5	0	0	24	0	MK
MT	1	0	2	0	2	0	3	1	1	4	0	0	1	0	0	15	0	21	0	0	8	2	1	1	0	47	0	MT
NL	0	0	1	0	0	-19	0	1	0	0	0	1	-4	0	0	3	1	8	-6	0	0	0	0	2	1	2	0	NL
NO	0	0	0	0	0	0	0	1	0	0	0	0	2	1	0	1	1	2	3	0	0	0	0	1	0	0	0	NO
PL	0	0	3	0	1	0	1	8	1	2	0	6	23	2	0	3	1	8	3	0	0	2	4	1	0	4	0	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	0	9	2	0	0	0	0	1	0	2	0	PT
RO	1	0	3	0	3	0	11	4	1	12	0	3	7	0	0	5	1	6	1	0	3	4	11	0	0	10	1	RO
RU	0	0	0	1	0	0	0	3	0	0	0	0	2	0	0	1	1	1	1	1	0	0	0	0	0	1	2	RU
SE	0	0	0	0	0	0	0	1	0	0	0	0	3	1	0	1	2	2	3	0	0	0	0	1	0	0	0	SE
SI	0	0	24	0	2	0	2	1	2	4	0	4	16	0	0	9	0	19	1	0	1	29	7	1	0	47	0	SI
SK	0	0	9	0	2	0	2	3	1	5	0	14	18	0	0	5	1	11	2	0	1	6	29	1	0	12	0	SK
TR	1	1	1	2	1	0	5	2	0	3	1	1	2	0	0	3	0	3	1	2	6	1	1	0	0	5	1	TR
UA	0	0	1	0	1	0	2	11	0	2	0	2	6	1	0	2	1	4	2	0	1	1	4	0	0	4	1	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	1	0	0	0	0	1	1	0	0	ATL
BAS	0	0	0	0	0	-1	0	3	0	0	0	1	4	1	1	1	3	3	4	0	0	0	0	1	0	1	0	BAS
BLS	0	0	1	1	1	0	6	5	0	2	0	1	2	0	0	2	1	2	1	3	3	1	2	0	0	3	1	BLS
MED	1	0	2	0	2	0	5	1	1	4	1	1	2	0	0	17	0	22	1	0	14	3	2	1	0	30	0	MED
NOS	0	0	0	0	0	-3	0	1	0	0	0	0	-1	-1	0	2	1	4	-10	0	0	0	0	3	1	1	0	NOS
ASI	0	1	0	3	0	0	1	1	0	1	2	0	1	0	0	1	0	1	0	1	2	0	0	0	0	1	2	ASI
NOA	1	0	1	0	1	0	4	0	1	3	0	0	2	0	0	11	0	9	1	0	11	1	1	0	0	17	0	NOA
EMC	0	0	1	1	1	0	2	2	1	2	0	1	4	0	0	9	1	9	0	1	3	1	2	1	0	7	1	EMC
EU	0	0	3	0	1	-2	1	2	1	1	0	2	9	0	0	26	1	26	-2	0	3	2	3	1	0	12	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	

Table B.6 Cont.: Average 2010 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	
AL	0	0	0	1	8	0	0	1	3	1	9	5	1	1	2	4	7	3	0	2	41	1	0	1	38	315	109	AL
AM	0	0	0	1	0	0	0	0	1	0	2	17	0	0	0	53	7	1	0	3	7	0	7	1	42	194	12	AM
AT	0	0	0	0	0	0	-2	2	4	1	3	4	1	6	2	1	4	4	1	0	8	0	0	0	32	241	166	AT
AZ	0	0	0	0	0	0	0	1	1	0	1	36	0	0	0	20	8	1	0	2	4	0	10	0	47	203	9	AZ
BA	0	0	0	1	2	0	-1	1	5	1	6	5	1	2	3	2	6	3	1	1	24	0	0	1	36	297	114	BA
BE	0	0	0	0	0	0	-34	3	1	1	1	2	1	0	0	0	1	11	1	0	2	-31	0	0	35	-50	-78	BE
BG	0	0	0	4	4	0	0	1	6	1	37	14	1	1	2	5	26	2	1	8	12	1	0	1	35	311	66	BG
BY	4	0	2	1	0	0	0	3	14	0	3	28	3	0	1	0	19	2	5	1	1	2	0	0	24	180	52	BY
CH	0	0	0	0	0	0	-2	1	1	1	1	2	1	1	0	1	1	6	0	0	8	0	0	0	35	234	138	CH
CS	0	0	0	1	4	0	0	1	6	1	16	7	1	1	4	2	11	3	1	2	17	1	0	1	35	303	95	CS
CY	0	0	0	1	1	0	0	1	2	0	4	12	0	0	0	124	11	2	0	7	90	1	2	2	39	391	83	CY
CZ	1	0	0	0	0	0	-2	3	8	1	3	6	2	2	5	1	5	4	2	0	4	0	0	0	29	214	146	CZ
DE	0	1	0	0	0	0	-10	3	4	1	1	4	2	0	1	0	2	7	0	0	3	-5	0	0	31	128	74	DE
DK	1	0	1	0	0	0	-4	8	5	0	1	5	4	0	0	0	2	7	-12	0	0	-6	0	0	30	59	19	DK
EE	2	0	4	0	0	0	0	3	4	0	1	14	6	0	0	0	3	3	7	0	0	2	0	0	19	97	38	EE
ES	0	0	0	0	0	0	0	1	0	14	0	1	0	0	0	0	0	14	0	0	13	1	0	1	47	257	178	ES
FI	1	0	1	0	0	0	0	3	2	0	0	7	4	0	0	0	1	2	4	0	0	1	0	0	11	50	20	FI
FR	0	0	0	0	0	0	-2	2	1	2	1	1	1	0	0	0	1	15	0	0	9	-2	0	0	40	216	144	FR
GB	0	0	0	0	0	0	-4	4	1	0	0	1	1	0	0	0	1	13	0	0	1	-14	0	0	34	6	-36	GB
GE	0	0	0	1	0	0	0	1	1	0	3	41	0	0	0	31	14	1	1	10	5	0	4	0	34	210	13	GE
GL	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	11	14	1	GL
GR	0	0	0	2	6	0	0	1	3	1	13	9	1	0	1	9	16	3	1	6	45	1	0	1	38	333	132	GR
HR	0	0	0	1	1	0	-1	2	5	1	5	5	1	6	4	1	6	3	1	1	25	0	0	1	32	297	133	HR
HU	1	0	0	1	0	0	0	2	15	1	14	8	2	4	14	1	14	3	2	1	8	1	0	0	29	291	166	HU
IE	0	0	0	0	0	0	-3	3	1	0	0	1	1	0	0	0	0	16	0	0	1	-5	0	0	34	61	9	IE
IS	0	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0	4	0	0	0	1	0	0	19	33	6	IS
IT	0	0	0	0	1	0	-1	1	1	1	2	3	1	2	1	1	3	5	0	1	40	0	0	1	36	277	161	IT
KZ	0	0	0	0	0	0	0	1	1	0	1	45	1	0	0	2	8	1	1	1	1	0	1	0	39	126	10	KZ
LT	17	0	3	0	0	0	0	4	14	0	1	18	5	0	1	0	7	3	9	0	1	3	0	0	24	158	69	LT
LU	0	-51	0	0	0	0	-11	3	2	1	1	2	1	0	0	0	2	9	1	0	3	-6	0	0	33	56	6	LU
LV	7	0	8	0	0	0	0	3	7	0	1	14	5	0	0	0	5	3	9	0	1	3	0	0	21	124	52	LV
MD	1	0	0	29	0	0	0	2	12	0	36	20	2	0	3	2	61	2	2	5	4	1	0	0	30	269	52	MD
MK	0	0	0	1	30	0	0	1	3	1	13	7	1	1	2	4	10	3	0	3	22	0	0	1	39	296	83	MK
MT	0	0	0	0	1	-10	0	1	1	1	2	2	0	0	0	2	2	5	0	1	35	0	0	2	39	198	90	MT
NL	0	0	0	0	0	0	-87	4	2	0	1	3	2	0	0	0	1	8	0	0	1	-37	0	0	30	-77	-93	NL
NO	0	0	0	0	0	0	0	7	1	0	0	2	3	0	0	0	1	3	1	0	0	1	0	0	16	46	14	NO
PL	2	0	1	1	0	0	-1	4	39	0	3	12	4	1	4	0	11	4	6	0	2	2	0	0	28	195	109	PL
PT	0	0	0	0	0	0	0	1	0	44	0	0	0	0	0	0	0	25	0	0	4	1	0	0	48	218	136	PT
RO	1	0	0	6	1	0	0	2	11	0	70	14	1	1	5	2	34	2	1	5	7	1	0	0	31	284	71	RO
RU	1	0	0	0	0	0	0	1	2	0	1	47	1	0	0	2	8	1	1	1	1	1	0	0	19	103	12	RU
SE	1	0	1	0	0	0	-1	5	2	0	0	4	8	0	0	0	1	3	3	0	0	2	0	0	17	65	26	SE
SI	0	0	0	0	0	0	-1	2	3	1	3	4	1	29	2	1	5	4	0	1	16	0	0	0	30	273	165	SI
SK	1	0	0	1	0	0	-1	2	21	1	9	8	2	3	30	1	14	3	2	1	5	1	0	0	29	258	161	SK
TR	0	0	0	2	1	0	0	1	2	0	6	23	1	0	1	105	18	1	1	11	20	0	3	1	41	278	29	TR
UA	1	0	1	4	0	0	0	2	12	0	10	33	2	0	3	2	59	2	3	4	3	1	0	0	29	218	46	UA
ATL	0	0	0	0	0	0	-1	2	0	0	0	1	1	0	0	0	0	13	0	0	0	0	0	0	24	49	7	ATL
BAS	2	0	2	0	0	0	-1	6	6	0	1	8	6	0	0	0	2	4	-22	0	0	2	0	0	23	62	34	BAS
BLS	1	0	0	5	0	0	0	1	5	0	12	60	1	0	1	11	57	2	1	45	6	1	1	0	32	283	27	BLS
MED	0	0	0	1	1	1	0	1	1	2	4	5	0	1	1	19	7	5	0	3	70	1	1	2	39	276	97	MED
NOS	0	0	0	0	0	0	-7	10	1	0	0	2	2	0	0	0	1	12	-1	0	1	-35	0	0	38	24	-6	NOS
ASI	0	0	0	0	0	0	0	0	1	0	1	17	0	0	0	33	5	1	0	2	11	0	10	0	36	138	11	ASI
NOA	0	0	0	0	1	0	0	0	1	1	3	2	0	0	0	7	3	3	0	1	55	1	0	9	63	217	56	NOA
EMC	1	0	0	1	0	0	-1	1	3	1	3	18	1	0	1	10	8	3	1	2	13	0	1	2	32	151	43	EMC
EU	1	0	1	0	0	0	-3	3	6	3	2	5	2	1	1	1	3	8	2	0	9	-2	0	0	32	167	95	EU
	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	

Table B.7: Average 2010 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	
AL	3	0	2	0	1	1	2	1	1	5	0	2	11	0	0	4	0	8	5	0	4	2	1	0	0	22	0	AL
AM	0	5	0	0	0	0	0	1	0	0	0	0	2	0	0	1	0	1	1	0	0	0	0	0	0	2	0	AM
AT	0	0	9	0	0	2	0	1	3	1	0	3	24	1	0	3	0	12	7	0	0	2	1	0	0	21	0	AT
AZ	0	1	0	1	0	0	0	1	0	0	0	0	2	0	0	1	0	1	1	0	0	0	0	0	0	2	0	AZ
BA	0	0	3	0	2	1	1	1	1	4	0	2	13	1	0	4	1	8	6	0	1	4	2	0	0	20	0	BA
BE	0	0	1	0	0	23	0	1	1	0	0	1	28	1	0	2	0	29	26	0	0	0	0	1	0	4	0	BE
BG	1	0	1	0	1	1	4	2	1	3	0	2	9	1	0	2	0	5	5	0	2	1	1	0	0	8	0	BG
BY	0	0	1	0	0	1	0	8	0	0	0	1	6	1	0	1	1	3	4	0	0	0	0	0	0	2	0	BY
CH	0	0	2	0	0	2	0	1	9	1	0	1	19	1	0	4	0	16	7	0	0	1	0	0	0	27	0	CH
CS	1	0	2	0	1	1	1	1	1	10	0	2	12	1	0	3	0	7	5	0	1	3	2	0	0	14	0	CS
CY	0	0	1	0	0	1	1	2	1	2	1	1	7	0	0	2	0	5	4	0	3	1	1	0	0	8	0	CY
CZ	0	0	4	0	0	3	0	1	1	1	0	8	26	1	0	2	0	10	9	0	0	1	1	0	0	8	0	CZ
DE	0	0	2	0	0	6	0	1	2	0	0	3	44	1	0	2	0	16	15	0	0	1	1	1	0	7	0	DE
DK	0	0	0	0	0	3	0	1	0	0	0	1	14	6	0	1	1	7	16	0	0	0	0	1	0	1	0	DK
EE	0	0	0	0	0	1	0	2	0	0	0	0	5	1	1	0	2	3	5	0	0	0	0	0	0	1	0	EE
ES	0	0	1	0	0	1	0	0	0	0	0	0	4	0	0	24	0	8	5	0	0	0	0	0	0	5	0	ES
FI	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	1	1	3	0	0	0	0	0	0	0	0	FI
FR	0	0	1	0	0	3	0	1	1	0	0	1	13	1	0	6	0	23	11	0	0	1	0	0	0	8	0	FR
GB	0	0	0	0	0	2	0	0	0	0	0	1	9	1	0	1	0	9	33	0	0	0	0	1	0	1	0	GB
GE	0	1	0	0	0	0	0	1	0	0	0	0	3	0	0	1	0	2	2	1	0	0	0	0	0	2	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	GL
GR	1	0	2	0	1	1	2	2	1	3	0	2	9	0	0	3	0	6	5	0	8	2	1	0	0	14	0	GR
HR	0	0	4	0	1	2	1	1	1	3	0	3	17	1	0	4	0	10	7	0	1	9	2	0	0	25	0	HR
HU	0	0	3	0	1	2	1	2	1	3	0	3	15	1	0	2	0	7	7	0	0	3	5	0	0	11	0	HU
IE	0	0	0	0	0	2	0	0	0	0	0	0	6	1	0	1	0	6	16	0	0	0	0	2	0	1	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3	0	0	0	0	0	0	0	0	IS
IT	0	0	3	0	1	2	1	1	2	2	0	2	15	1	0	6	0	14	6	0	1	3	1	0	0	55	0	IT
KZ	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	0	1	0	KZ
LT	0	0	0	0	0	1	0	4	0	0	0	1	7	1	0	1	1	3	6	0	0	0	0	0	0	1	0	LT
LU	0	0	1	0	0	11	0	1	1	0	0	2	33	1	0	3	0	27	16	0	0	1	0	1	0	5	0	LU
LV	0	0	0	0	0	1	0	3	0	0	0	1	6	1	0	1	1	3	6	0	0	0	0	0	0	1	0	LV
MD	0	0	1	0	0	1	1	3	0	1	0	1	8	1	0	1	1	4	5	0	0	1	1	0	0	4	0	MD
MK	2	0	2	0	1	1	2	1	1	6	0	2	9	0	0	3	0	6	4	0	5	2	1	0	0	13	0	MK
MT	1	0	3	0	1	2	1	1	1	3	0	2	13	1	0	8	0	16	7	0	3	3	1	0	0	53	0	MT
NL	0	0	1	0	0	11	0	1	1	0	0	1	28	1	0	1	0	18	26	0	0	0	0	1	0	3	0	NL
NO	0	0	0	0	0	1	0	0	0	0	0	0	3	1	0	0	0	2	5	0	0	0	0	0	0	0	0	NO
PL	0	0	1	0	0	2	0	2	1	1	0	3	15	1	0	1	1	6	8	0	0	1	1	0	0	4	0	PL
PT	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	16	0	5	4	0	0	0	0	0	0	2	0	PT
RO	0	0	1	0	1	1	1	2	1	3	0	2	10	1	0	2	1	5	5	0	1	1	1	0	0	7	0	RO
RU	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	0	1	0	RU
SE	0	0	0	0	0	1	0	1	0	0	0	0	5	1	0	0	1	3	5	0	0	0	0	0	0	1	0	SE
SI	0	0	6	0	1	2	0	1	2	2	0	3	20	1	0	4	0	11	7	0	0	6	2	0	0	33	0	SI
SK	0	0	3	0	0	2	0	2	1	2	0	4	15	1	0	2	1	7	7	0	0	2	3	0	0	8	0	SK
TR	0	0	1	0	0	1	1	2	0	1	0	1	5	0	0	2	0	3	3	0	1	1	1	0	0	4	0	TR
UA	0	0	1	0	0	1	0	3	0	1	0	1	7	1	0	1	1	3	4	0	0	1	1	0	0	3	0	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	2	4	0	0	0	0	0	0	1	0	ATL
BAS	0	0	0	0	0	2	0	2	0	0	0	1	9	2	0	1	2	4	9	0	0	0	0	0	0	1	0	BAS
BLS	0	0	1	0	0	1	1	3	0	1	0	1	8	1	0	1	1	4	5	0	1	1	1	0	0	5	0	BLS
MED	1	0	2	0	1	2	2	2	1	3	0	2	12	1	0	9	0	14	7	0	5	3	1	0	0	30	0	MED
NOS	0	0	0	0	0	3	0	1	0	0	0	1	12	2	0	1	0	9	27	0	0	0	0	1	0	1	0	NOS
ASI	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	0	1	1	0	0	0	0	0	0	2	0	ASI
NOA	0	0	1	0	1	1	1	1	1	2	0	1	6	0	0	4	0	6	3	0	2	1	1	0	0	12	0	NOA
EMC	0	0	1	0	0	1	0	1	0	1	0	1	6	0	0	2	0	4	4	0	1	1	0	0	0	5	0	EMC
EU	0	0	1	0	0	2	0	1	1	1	0	1	13	1	0	6	0	10	10	0	0	1	1	0	0	9	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	

Table B.7 Cont.: Average 2010 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of VOC. **Emitters →, Receptors ↓**.

	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	
AL	0	0	0	0	2	0	2	1	4	1	4	7	1	0	1	2	6	0	0	0	1	0	0	0	33	143	70	AL
AM	0	0	0	0	0	0	0	0	1	0	1	6	0	0	0	5	3	0	0	0	0	0	0	0	7	41	11	AM
AT	0	0	0	0	0	0	3	1	4	0	1	4	1	1	1	0	3	0	0	0	0	0	0	0	23	133	93	AT
AZ	0	0	0	0	0	0	0	0	1	0	1	11	1	0	0	3	4	0	0	0	0	0	1	0	14	51	12	AZ
BA	0	0	0	0	0	0	2	1	4	0	3	6	1	1	1	1	5	0	0	0	1	0	0	0	28	132	72	BA
BE	0	1	0	0	0	0	14	1	2	0	1	3	1	0	0	0	2	0	0	0	0	2	0	0	29	174	134	BE
BG	0	0	0	1	1	0	1	1	4	0	8	11	1	0	1	2	10	0	0	0	0	0	0	0	26	120	47	BG
BY	0	0	0	0	0	0	1	0	3	0	1	16	1	0	0	0	6	0	0	0	0	0	0	0	15	75	26	BY
CH	0	0	0	0	0	0	3	1	2	1	1	2	1	0	0	0	2	0	0	0	0	0	0	0	20	127	88	CH
CS	0	0	0	0	1	0	2	1	5	0	4	7	1	1	1	1	6	0	0	0	1	0	0	0	27	127	62	CS
CY	0	0	0	1	0	0	1	0	3	0	4	13	1	0	1	31	9	0	0	0	1	0	1	0	42	155	43	CY
CZ	0	0	0	0	0	0	4	1	6	0	1	4	1	0	1	0	4	0	0	0	0	0	0	0	23	126	87	CZ
DE	0	0	0	0	0	0	8	1	4	0	1	3	1	0	0	0	2	0	0	0	0	1	0	0	26	151	112	DE
DK	0	0	0	0	0	0	4	1	4	0	1	4	3	0	0	0	2	0	1	0	0	1	0	0	20	95	63	DK
EE	0	0	0	0	0	0	1	1	1	0	0	9	2	0	0	0	2	0	0	0	0	0	0	0	11	50	24	EE
ES	0	0	0	0	0	0	1	0	1	4	0	1	0	0	0	0	1	0	0	0	1	0	0	0	20	80	54	ES
FI	0	0	0	0	0	0	1	0	1	0	0	4	1	0	0	0	1	0	0	0	0	0	0	0	5	24	13	FI
FR	0	0	0	0	0	0	3	1	2	1	1	2	1	0	0	0	1	0	0	0	0	1	0	0	22	107	76	FR
GB	0	0	0	0	0	0	4	1	1	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	15	87	66	GB
GE	0	0	0	0	0	0	0	0	1	0	1	10	0	0	0	4	5	0	0	0	0	0	0	0	11	50	14	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	1	2	GL
GR	0	0	0	1	1	0	1	1	4	0	5	9	1	0	1	4	8	0	0	0	2	0	0	0	33	138	61	GR
HR	0	0	0	0	0	0	2	1	5	0	3	6	1	1	1	1	4	0	0	0	1	0	0	0	31	150	86	HR
HU	0	0	0	0	0	0	2	1	7	0	4	6	1	1	2	0	6	0	0	0	0	0	0	0	25	124	71	HU
IE	0	0	0	0	0	0	3	0	1	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	8	53	41	IE
IS	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	10	8	IS
IT	0	0	0	0	0	0	2	1	3	1	2	5	1	1	1	1	4	0	0	0	2	0	0	0	36	178	116	IT
KZ	0	0	0	0	0	0	0	0	1	0	1	12	0	0	0	0	3	0	0	0	0	0	0	0	8	36	9	KZ
LT	1	0	0	0	0	0	2	1	3	0	1	10	1	0	0	0	4	0	0	0	0	0	0	0	14	66	31	LT
LU	0	5	0	0	0	0	8	1	2	0	1	3	1	0	0	0	2	0	0	0	0	1	0	0	26	154	118	LU
LV	1	0	1	0	0	0	2	1	2	0	1	10	2	0	0	0	3	0	0	0	0	0	0	0	12	58	28	LV
MD	0	0	0	4	0	0	1	1	4	0	6	14	1	0	1	1	15	0	0	0	0	0	0	0	22	107	37	MD
MK	0	0	0	1	4	0	1	1	4	0	4	7	1	0	1	2	6	0	0	0	1	0	0	0	26	123	56	MK
MT	0	0	0	0	1	8	2	1	4	1	4	7	1	1	1	2	6	0	0	0	7	0	0	0	58	226	127	MT
NL	0	0	0	0	0	0	20	1	2	0	1	3	1	0	0	0	2	0	0	0	0	2	0	0	27	154	117	NL
NO	0	0	0	0	0	0	1	1	1	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	3	22	15	NO
PL	0	0	0	0	0	0	3	1	11	0	1	7	2	0	1	0	6	0	0	0	0	0	0	0	20	100	60	PL
PT	0	0	0	0	0	0	1	0	1	20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	19	77	54	PT
RO	0	0	0	1	0	0	2	1	5	0	11	10	1	0	1	1	10	0	0	0	0	0	0	0	23	112	46	RO
RU	0	0	0	0	0	0	0	0	1	0	1	21	1	0	0	0	4	0	0	0	0	0	0	0	9	47	10	RU
SE	0	0	0	0	0	0	1	1	1	0	0	3	2	0	0	0	1	0	0	0	0	0	0	0	7	35	22	SE
SI	0	0	0	0	0	0	3	1	4	0	2	5	1	4	1	0	3	0	0	0	1	0	0	0	29	155	101	SI
SK	0	0	0	0	0	0	2	1	9	0	3	6	1	0	3	0	6	0	0	0	0	0	0	0	22	114	68	SK
TR	0	0	0	0	0	0	1	0	2	0	3	11	1	0	0	19	8	0	0	0	0	0	0	0	22	96	27	TR
UA	0	0	0	1	0	0	1	1	4	0	3	19	1	0	1	1	20	0	0	0	0	0	0	0	20	101	30	UA
ATL	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	15	13	ATL
BAS	1	0	0	0	0	0	3	1	3	0	0	7	4	0	0	0	2	0	1	0	0	0	0	0	16	74	43	BAS
BLS	0	0	0	1	0	0	1	1	4	0	5	26	1	0	1	9	21	0	0	0	0	0	0	0	32	143	39	BLS
MED	0	0	0	1	1	0	2	1	4	1	4	9	1	1	1	8	7	0	0	0	5	0	0	0	53	199	97	MED
NOS	0	0	0	0	0	0	5	2	2	0	0	3	2	0	0	0	2	0	0	0	0	2	0	0	18	96	68	NOS
ASI	0	0	0	0	0	0	0	0	1	0	1	7	0	0	0	5	3	0	0	0	0	0	0	0	11	41	11	ASI
NOA	0	0	0	0	0	0	1	0	2	1	2	4	1	0	0	3	4	0	0	0	1	0	0	0	33	99	44	NOA
EMC	0	0	0	0	0	0	1	0	2	0	1	9	1	0	0	2	4	0	0	0	0	0	0	0	16	68	31	EMC
EU	0	0	0	0	0	0	3	1	3	1	1	4	1	0	0	0	2	0	0	0	0	0	0	0	19	96	64	EU
	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	

Table B.8: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM. **Emitters →, Receptors ↓**.

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	
AL	36	0	2	0	4	0	5	0	0	18	0	1	2	0	0	1	0	2	0	0	23	2	2	0	0	13	0	AL
AM	0	31	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	AM
AT	0	0	100	0	1	1	1	0	3	2	0	10	21	0	0	1	0	7	1	0	0	2	6	0	0	18	0	AT
AZ	0	5	0	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	AZ
BA	1	0	5	0	38	0	3	0	0	19	0	3	4	0	0	1	0	3	0	0	2	14	7	0	0	15	0	BA
BE	0	0	2	0	0	177	0	0	1	0	0	3	44	1	0	2	0	112	12	0	0	0	0	1	0	3	0	BE
BG	1	0	2	0	2	0	74	1	0	13	0	1	2	0	0	0	0	1	0	0	10	1	3	0	0	4	0	BG
BY	0	0	1	0	0	0	1	58	0	1	0	2	4	1	1	0	1	2	1	0	0	0	2	0	0	1	0	BY
CH	0	0	4	0	0	1	0	0	34	0	0	1	12	0	0	1	0	27	1	0	0	0	0	0	0	30	0	CH
CS	3	0	4	0	9	0	8	0	0	84	0	3	4	0	0	1	0	2	0	0	4	5	10	0	0	9	0	CS
CY	0	0	0	0	0	0	1	0	0	1	14	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	CY
CZ	0	0	27	0	1	2	1	1	1	2	0	90	38	1	0	1	0	10	2	0	0	2	7	0	0	6	0	CZ
DE	0	0	9	0	0	8	0	1	4	0	0	9	133	2	0	1	0	29	5	0	0	0	1	0	0	5	0	DE
DK	0	0	1	0	0	3	0	1	0	0	0	2	23	52	0	1	1	10	8	0	0	0	1	1	0	1	0	DK
EE	0	0	0	0	0	1	0	5	0	0	0	1	4	2	37	0	12	2	1	0	0	0	0	0	0	0	0	EE
ES	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	76	0	9	1	0	0	0	0	0	0	2	0	ES
FI	0	0	0	0	0	0	0	1	0	0	0	0	1	1	3	0	41	1	1	0	0	0	0	0	0	0	0	FI
FR	0	0	2	0	0	5	0	0	2	0	0	1	11	0	0	8	0	144	4	0	0	0	0	0	0	8	0	FR
GB	0	0	0	0	0	3	0	0	0	0	0	1	6	1	0	1	0	17	72	0	0	0	0	3	0	1	0	GB
GE	0	5	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	0	0	0	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	3	0	1	0	2	0	16	0	0	6	0	1	1	0	0	1	0	1	0	0	66	1	1	0	0	7	0	GR
HR	1	0	11	0	11	0	2	0	0	15	0	5	7	0	0	1	0	5	1	0	2	56	13	0	0	25	0	HR
HU	0	0	16	0	3	1	3	1	0	16	0	9	9	0	0	1	0	4	1	0	1	11	91	0	0	11	0	HU
IE	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	1	0	8	13	0	0	0	0	29	0	0	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	5	0	0	IS
IT	0	0	4	0	2	0	1	0	1	3	0	1	3	0	0	3	0	10	0	0	1	3	2	0	0	135	0	IT
KZ	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	KZ
LT	0	0	1	0	0	1	1	14	0	1	0	2	6	2	2	0	2	3	2	0	0	0	1	0	0	1	0	LT
LU	0	0	3	0	0	29	0	0	1	0	0	3	58	1	0	2	0	116	6	0	0	0	1	0	0	4	0	LU
LV	0	0	1	0	0	1	0	10	0	0	0	2	5	2	5	0	4	3	1	0	0	0	1	0	0	1	0	LV
MD	0	0	2	0	1	0	5	2	0	3	0	2	3	0	0	0	0	2	0	0	1	1	3	0	0	2	0	MD
MK	8	0	2	0	3	0	14	0	0	21	0	1	2	0	0	1	0	2	0	0	36	1	2	0	0	7	0	MK
MT	0	0	1	0	2	0	1	0	0	3	0	1	1	0	0	3	0	7	0	0	3	1	1	0	0	32	0	MT
NL	0	0	2	0	0	46	0	0	1	0	0	3	61	1	0	1	0	45	15	0	0	0	0	1	0	2	0	NL
NO	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	2	0	0	0	0	0	0	0	0	NO
PL	0	0	5	0	1	1	1	4	0	2	0	14	19	2	0	1	1	6	2	0	0	1	5	0	0	3	0	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	29	0	4	1	0	0	0	0	0	0	1	0	PT
RO	0	0	3	0	2	0	12	1	0	11	0	2	3	0	0	0	0	2	0	0	2	2	8	0	0	4	0	RO
RU	0	0	0	1	0	0	0	2	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	RU
SE	0	0	0	0	0	1	0	1	0	0	0	1	4	3	1	0	3	2	2	0	0	0	0	0	0	0	0	SE
SI	0	0	33	0	2	1	1	0	1	5	0	5	10	0	0	1	0	6	1	0	1	22	8	0	0	49	0	SI
SK	0	0	14	0	2	1	2	1	1	6	0	17	11	0	0	1	0	5	1	0	1	4	32	0	0	7	0	SK
TR	0	0	0	1	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	TR
UA	0	0	1	0	1	0	2	5	0	2	0	2	3	0	0	0	1	2	1	0	1	1	3	0	0	2	0	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	3	2	0	0	0	0	0	0	0	0	ATL
BAS	0	0	1	0	0	1	0	2	0	0	0	2	11	8	4	0	11	4	3	0	0	0	1	0	0	1	0	BAS
BLS	0	0	1	1	0	0	7	1	0	2	0	1	1	0	0	0	0	1	0	2	2	0	1	0	0	1	0	BLS
MED	1	0	1	0	2	0	3	0	0	3	0	1	2	0	0	7	0	9	0	0	8	2	1	0	0	21	0	MED
NOS	0	0	1	0	0	5	0	0	0	0	0	1	11	3	0	1	0	19	24	0	0	0	0	1	0	1	0	NOS
ASI	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	ASI
NOA	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	2	0	2	0	0	2	0	0	0	0	5	0	NOA
EMC	0	0	2	2	0	1	1	2	0	2	0	1	5	0	1	3	1	8	2	0	1	1	1	0	0	5	1	EMC
EU	0	0	5	0	0	4	1	1	1	1	0	5	19	2	1	12	4	29	7	0	2	1	4	1	0	14	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	

Table B.8 Cont.: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM. **Emitters →, Receptors ↓**.

	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	SUM	EU	
AL	0	0	0	1	9	0	0	0	3	0	5	3	0	1	1	3	4	0	0	0	14	0	0	0	156	51	AL
AM	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	28	2	0	0	0	0	0	2	0	92	1	AM
AT	0	0	0	0	0	0	1	0	9	0	2	2	1	7	2	0	3	0	0	0	2	1	0	0	207	186	AT
AZ	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	10	3	0	0	0	0	0	5	0	160	1	AZ
BA	0	0	0	1	1	0	0	0	6	0	5	3	0	2	2	1	4	0	0	0	7	0	0	0	151	53	BA
BE	0	4	0	0	0	0	42	0	5	0	0	1	1	0	0	0	1	1	1	0	1	26	0	0	443	410	BE
BG	0	0	0	4	3	0	0	0	5	0	35	9	0	1	1	10	19	0	0	2	3	0	0	0	212	32	BG
BY	8	0	1	2	0	0	0	0	29	0	4	39	2	0	1	1	38	0	2	0	0	1	0	0	210	61	BY
CH	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	2	1	0	0	122	83	CH
CS	0	0	0	1	3	0	0	0	7	0	16	4	0	1	2	2	8	0	0	0	4	0	0	0	198	49	CS
CY	0	0	0	0	0	0	0	0	1	0	2	4	0	0	0	66	5	0	0	1	19	0	1	1	124	22	CY
CZ	0	0	0	0	0	0	2	0	40	0	3	4	1	2	6	0	6	0	1	0	1	2	0	0	263	237	CZ
DE	0	1	0	0	0	0	10	1	16	0	1	2	2	1	1	0	3	1	3	0	1	8	0	0	259	235	DE
DK	1	0	0	0	0	0	5	3	14	0	1	4	11	0	0	0	3	1	24	0	0	17	0	0	191	136	DK
EE	4	0	6	0	0	0	1	1	10	0	1	30	10	0	0	0	8	0	13	0	0	2	0	0	152	91	EE
ES	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	2	0	0	10	1	0	0	114	100	ES
FI	1	0	1	0	0	0	0	1	3	0	0	19	8	0	0	0	3	0	5	0	0	1	0	0	92	61	FI
FR	0	1	0	0	0	0	2	0	2	1	0	1	0	1	0	0	1	2	0	0	4	6	0	0	208	191	FR
GB	0	0	0	0	0	0	4	0	2	0	0	1	1	0	0	0	1	7	1	0	0	16	0	0	140	114	GB
GE	0	0	0	0	0	0	0	0	0	0	1	16	0	0	0	22	4	0	0	1	0	0	1	0	115	2	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	0	0	0	2	4	0	0	0	3	0	9	5	0	0	1	15	10	0	0	1	20	0	0	0	179	85	GR
HR	0	0	0	1	1	0	0	0	9	0	7	3	1	11	3	1	5	0	0	0	11	1	0	0	210	94	HR
HU	0	0	0	1	0	0	1	0	24	0	21	6	1	5	16	1	15	0	1	0	3	1	0	0	274	189	HU
IE	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	10	0	0	0	4	0	0	76	60	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	3	IS
IT	0	0	0	0	0	0	0	0	3	0	2	1	0	3	1	1	2	0	0	0	22	0	0	0	209	168	IT
KZ	0	0	0	0	0	0	0	0	1	0	1	47	0	0	0	1	8	0	0	0	0	0	0	0	72	3	KZ
LT	59	0	4	1	0	0	1	1	35	0	3	25	6	0	1	1	15	0	6	0	0	2	0	0	199	130	LT
LU	0	85	0	0	0	0	10	0	5	0	0	1	1	0	0	0	1	1	1	0	1	7	0	0	340	325	LU
LV	15	0	22	1	0	0	1	1	19	0	2	27	7	0	1	1	11	0	7	0	0	2	0	0	152	90	LV
MD	1	0	0	138	0	0	0	0	13	0	49	20	1	1	2	5	77	0	1	2	1	0	0	0	340	34	MD
MK	0	0	0	1	33	0	0	0	3	0	8	4	0	1	1	4	6	0	0	0	6	0	0	0	167	58	MK
MT	0	0	0	0	0	20	0	0	2	0	2	1	0	1	0	1	2	0	0	0	123	0	0	1	213	73	MT
NL	0	1	0	0	0	0	142	1	8	0	0	2	2	0	0	0	2	1	1	0	0	47	0	0	389	333	NL
NO	0	0	0	0	0	0	0	11	1	0	0	3	4	0	0	0	1	1	1	0	0	3	0	0	33	13	NO
PL	2	0	0	1	0	0	2	1	184	0	5	10	3	1	5	1	17	0	4	0	1	2	0	0	305	255	PL
PT	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	7	0	0	3	1	0	0	148	137	PT
RO	0	0	0	9	1	0	0	0	10	0	128	10	1	1	3	4	29	0	0	1	2	0	0	0	255	41	RO
RU	0	0	0	1	0	0	0	0	2	0	1	167	1	0	0	2	15	0	0	0	0	0	0	0	199	8	RU
SE	1	0	0	0	0	0	1	4	5	0	0	5	35	0	0	0	2	0	7	0	0	3	0	0	81	59	SE
SI	0	0	0	1	0	0	1	0	8	0	4	3	1	84	2	1	4	0	0	0	10	1	0	0	265	209	SI
SK	0	0	0	1	0	0	1	0	53	0	11	5	1	3	44	1	16	0	1	0	2	1	0	0	245	192	SK
TR	0	0	0	1	0	0	0	0	1	0	2	7	0	0	0	113	7	0	0	2	5	0	1	0	149	6	TR
UA	1	0	0	10	0	0	0	0	17	0	12	45	1	0	2	4	207	0	1	2	1	0	0	0	330	37	UA
ATL	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0	0	0	1	0	0	15	9	ATL
BAS	3	0	2	0	0	0	2	2	21	0	1	14	26	0	1	0	5	0	32	0	0	4	0	0	166	103	BAS
BLS	0	0	0	5	0	0	0	0	4	0	11	46	0	0	0	48	51	0	0	15	3	0	0	0	211	14	BLS
MED	0	0	0	1	1	0	0	0	2	0	3	3	0	1	0	18	5	0	0	1	55	0	0	2	153	55	MED
NOS	0	0	0	0	0	0	7	4	5	0	0	1	3	0	0	0	1	2	2	0	0	36	0	0	131	83	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	11	2	0	0	0	2	0	8	0	43	2	ASI
NOA	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	4	2	0	0	0	11	0	0	5	41	14	NOA
EMC	1	0	0	1	0	0	1	1	7	1	4	43	2	0	1	8	14	0	1	0	3	1	1	1	132	45	EMC
EU	2	0	1	0	0	0	4	1	21	4	2	5	6	1	2	1	4	1	3	0	5	4	0	0	181	149	EU
	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	SUM	EU	

Table B.9: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of SO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	20	0	1	0	48	0	65	3	0	47	0	3	5	0	0	3	0	4	1	0	16	5	15	0	0	27	1	0	AL
AM	0	6	0	4	1	0	4	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4	0	AM
AT	0	0	12	0	8	2	7	3	3	7	0	11	40	0	0	3	0	10	3	0	1	4	13	0	0	20	0	0	AT
AZ	0	1	0	8	1	0	4	2	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	9	0	AZ
BA	2	0	2	0	128	1	27	3	0	50	0	6	10	0	0	3	0	5	1	0	3	12	26	0	0	20	0	0	BA
BE	0	0	1	0	2	57	2	2	1	1	0	5	43	1	0	5	0	54	29	0	0	1	3	2	0	3	0	0	BE
BG	2	0	1	0	22	0	217	7	0	31	0	3	5	0	0	1	0	2	1	0	7	2	17	0	0	8	2	1	BG
BY	0	0	0	0	3	1	7	89	0	3	0	2	5	1	3	0	3	1	2	0	0	1	6	0	0	1	3	6	BY
CH	0	0	2	0	3	3	3	1	14	2	0	3	26	0	0	5	0	24	4	0	0	1	3	0	0	24	0	0	CH
CS	4	0	2	0	54	1	59	4	0	94	0	5	8	0	0	2	0	3	1	0	5	6	33	0	0	15	1	0	CS
CY	1	0	0	0	7	0	35	3	0	6	8	1	2	0	0	1	0	1	0	0	11	1	3	0	0	6	1	0	CY
CZ	0	0	5	0	7	3	7	5	1	7	0	38	50	1	0	2	1	9	5	0	1	3	21	0	0	7	1	1	CZ
DE	0	0	2	0	3	9	3	4	2	2	0	11	85	1	0	3	1	22	13	0	0	1	6	1	0	6	0	1	DE
DK	0	0	0	0	2	3	2	6	0	1	0	2	19	5	1	1	1	7	18	0	0	0	3	1	0	1	0	1	DK
EE	0	0	0	0	1	1	3	24	0	1	0	1	4	1	13	0	8	1	4	0	0	0	2	0	0	0	2	3	EE
ES	0	0	0	0	3	1	2	0	0	1	0	1	2	0	0	71	0	11	3	0	0	1	2	0	0	5	0	0	ES
FI	0	0	0	0	0	0	1	8	0	0	0	0	2	0	4	0	13	1	2	0	0	0	1	0	0	0	1	1	FI
FR	0	0	1	0	3	6	2	1	1	2	0	2	16	0	0	15	0	50	11	0	0	1	3	1	0	8	0	0	FR
GB	0	0	0	0	1	3	1	1	0	0	0	1	8	0	0	3	0	9	52	0	0	0	1	4	0	1	0	0	GB
GE	0	1	0	4	1	0	7	3	0	1	0	0	1	0	0	0	0	0	0	4	1	0	1	0	0	0	4	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	5	0	1	0	24	0	140	5	0	23	0	3	4	0	0	3	0	3	1	0	33	3	12	0	0	18	1	0	GR
HR	1	0	4	0	62	1	24	4	1	36	0	9	16	0	0	4	0	7	2	0	3	28	32	0	0	27	1	0	HR
HU	1	0	4	0	25	1	28	7	1	32	0	12	18	0	0	2	0	5	2	0	2	9	77	0	0	12	1	1	HU
IE	0	0	0	0	0	1	0	1	0	0	0	1	3	0	0	2	0	5	19	0	0	0	1	12	0	0	0	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	7	0	0	0	IS
IT	1	0	2	0	30	1	16	2	2	13	0	4	12	0	0	8	0	17	2	0	3	8	12	0	0	75	0	0	IT
KZ	0	0	0	0	1	0	3	6	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	32	0	KZ
LT	0	0	0	0	2	1	5	38	0	2	0	2	6	1	4	1	4	2	4	0	0	0	5	0	0	1	2	15	LT
LU	0	0	1	0	2	24	2	2	1	1	0	6	55	1	0	5	0	49	17	0	0	1	4	1	0	5	0	0	LU
LV	0	0	0	0	2	1	4	34	0	1	0	1	5	1	6	0	5	1	4	0	0	0	3	0	0	0	2	8	LV
MD	0	0	1	0	12	1	41	19	0	11	0	3	6	0	1	1	1	1	1	0	1	2	16	0	0	3	3	1	MD
MK	9	0	1	0	32	0	99	3	0	47	0	3	5	0	0	2	0	3	1	0	18	3	16	0	0	16	1	0	MK
MT	2	0	1	0	33	1	30	1	0	16	0	2	6	0	0	9	0	13	2	0	9	4	10	0	0	82	0	0	MT
NL	0	0	1	0	2	27	2	2	0	1	0	5	48	1	0	4	1	32	34	0	0	1	4	2	0	2	0	0	NL
NO	0	0	0	0	0	0	0	2	0	0	0	0	2	0	1	0	1	1	4	0	0	0	1	0	0	0	0	0	NO
PL	0	0	1	0	6	2	9	17	0	6	0	10	21	1	1	1	1	4	5	0	1	2	17	0	0	3	1	3	PL
PT	0	0	0	0	1	1	1	0	0	1	0	0	2	0	0	61	0	6	3	0	0	0	1	0	0	2	0	0	PT
RO	1	0	1	0	23	1	70	10	0	25	0	4	7	0	0	1	0	2	1	0	2	3	27	0	0	7	2	1	RO
RU	0	0	0	0	1	0	4	13	0	1	0	1	1	0	2	0	2	0	1	0	0	0	2	0	0	0	9	1	RU
SE	0	0	0	0	1	1	1	5	0	1	0	1	3	1	1	0	3	1	5	0	0	0	1	0	0	0	0	1	SE
SI	1	0	7	0	19	2	13	3	1	16	0	10	27	0	0	3	0	9	2	0	1	18	21	0	0	41	0	0	SI
SK	0	0	3	0	13	1	18	8	0	16	0	14	18	0	0	1	0	4	3	0	1	4	54	0	0	7	1	1	SK
TR	0	0	0	0	4	0	29	3	0	4	1	1	1	0	0	1	0	1	0	0	4	0	3	0	0	2	2	0	TR
UA	0	0	0	0	6	0	21	29	0	6	0	3	5	0	1	0	1	1	1	0	1	1	11	0	0	2	5	2	UA
ATL	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2	0	2	3	0	0	0	0	1	1	0	0	0	ATL
BAS	0	0	0	0	1	1	3	12	0	1	0	1	8	2	4	1	6	3	7	0	0	0	3	0	0	1	1	2	BAS
BLS	0	0	0	1	5	0	44	11	0	6	0	2	3	0	1	0	0	1	1	1	3	1	6	0	0	2	5	1	BLS
MED	2	0	1	0	25	1	47	3	0	14	1	2	5	0	0	11	0	12	2	0	12	4	9	0	0	35	1	0	MED
NOS	0	0	0	0	1	3	1	2	0	1	0	1	9	1	0	2	1	9	25	0	0	0	1	2	0	1	0	0	NOS
ASI	0	0	0	1	1	0	6	2	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	6	0	ASI
NOA	1	0	0	0	12	0	26	1	0	7	0	1	2	0	0	6	0	4	1	0	8	1	4	0	0	17	0	0	NOA
EMC	0	0	0	0	6	1	13	8	0	4	0	2	6	0	1	4	1	4	3	0	2	1	4	0	0	6	4	1	EMC
EU	0	0	1	0	6	3	9	5	1	4	0	4	18	1	1	14	2	14	9	0	2	2	8	1	0	10	0	1	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table B.9 Cont.: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of SO_x. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	3	19	1	0	0	22	0	33	7	0	1	2	8	17	0	1	2	67	1	0	3	12	13	4	482	103	AL
AM	0	0	1	0	0	0	0	2	0	3	10	0	0	0	109	9	0	0	1	2	0	31	1	14	12	0	220	5	AM
AT	0	0	1	1	0	1	0	35	0	11	5	0	4	3	1	8	1	2	0	11	3	0	1	13	3	2	256	161	AT
AZ	0	0	1	0	0	0	0	3	0	3	25	0	0	0	54	15	0	0	1	1	0	30	0	19	6	0	188	6	AZ
BA	0	0	2	3	0	0	0	34	0	25	6	0	2	4	4	14	0	1	1	36	1	0	2	11	7	2	458	119	BA
BE	1	0	0	0	0	20	0	22	1	3	4	1	0	1	0	4	6	3	0	3	46	0	0	21	1	12	363	250	BE
BG	0	0	12	7	0	0	0	32	0	106	20	0	1	3	12	56	0	1	10	17	1	1	1	13	7	2	634	84	BG
BY	0	1	3	0	0	0	0	56	0	11	66	1	0	1	2	42	0	6	1	1	2	0	0	14	1	2	352	92	BY
CH	0	0	0	0	0	1	0	8	0	3	1	0	1	1	1	2	2	1	0	10	4	0	1	15	3	2	176	107	CH
CS	0	0	5	6	0	0	0	42	0	54	9	0	1	5	5	24	0	1	1	25	1	0	2	11	8	2	501	124	CS
CY	0	0	3	3	0	0	0	9	0	16	13	0	0	1	277	27	0	0	8	84	0	16	4	14	15	11	588	44	CY
CZ	0	0	1	0	0	2	0	86	0	15	10	1	2	5	1	15	1	4	0	5	6	0	1	13	2	3	348	240	CZ
DE	0	0	1	0	0	7	0	42	0	5	8	1	1	1	1	7	2	7	0	4	18	0	0	16	1	7	308	215	DE
DK	0	0	0	0	0	3	2	31	0	3	12	4	0	1	0	6	3	24	0	1	27	0	0	15	0	14	222	102	DK
EE	0	2	1	0	0	0	1	16	0	3	67	4	0	0	1	17	1	19	0	0	4	0	0	12	0	4	221	60	EE
ES	0	0	0	0	0	0	0	3	11	1	1	0	0	0	0	1	11	0	0	40	3	0	3	25	3	8	214	110	ES
FI	0	0	1	0	0	0	1	8	0	2	75	4	0	0	1	8	1	8	0	0	2	0	0	10	0	3	161	39	FI
FR	0	0	0	0	0	2	0	9	1	3	2	0	0	0	0	3	9	1	0	17	15	0	1	20	2	10	220	127	FR
GB	0	0	0	0	0	2	0	7	0	1	3	1	0	0	0	1	11	2	0	1	22	0	0	22	0	19	178	93	GB
GE	0	0	2	0	0	0	0	4	0	5	24	0	0	0	83	21	0	0	5	2	0	18	1	14	8	1	217	8	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	17	0	GL
GR	0	0	7	12	0	0	0	21	0	47	13	0	1	2	20	36	0	1	6	74	1	1	3	13	13	5	554	103	GR
HR	0	0	3	2	0	1	0	43	0	26	7	0	4	4	3	15	1	2	1	45	2	0	2	11	6	3	442	159	HR
HU	0	0	4	2	0	1	0	91	0	49	13	1	2	12	3	32	0	2	1	15	3	0	1	12	4	2	491	244	HU
IE	0	0	0	0	0	1	0	4	0	0	2	0	0	0	0	1	11	1	0	1	7	0	0	24	0	22	122	50	IE
IS	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	1	0	0	0	1	0	0	13	0	10	42	7	IS
IT	0	0	1	2	1	1	0	19	1	13	4	0	3	2	2	8	1	1	0	89	2	0	4	14	12	5	394	161	IT
KZ	0	0	1	0	0	0	0	6	0	3	70	0	0	0	4	26	0	1	1	1	0	3	0	38	1	0	203	11	KZ
LT	0	2	2	0	0	1	0	54	0	8	53	3	0	1	1	26	1	13	0	1	4	0	0	13	1	4	286	106	LT
LU	4	0	0	0	0	9	0	20	0	3	4	1	0	1	0	4	4	2	0	5	20	0	0	18	2	7	283	203	LU
LV	0	4	1	0	0	1	1	31	0	5	57	3	0	1	1	21	1	14	0	1	4	0	0	12	1	4	241	76	LV
MD	0	0	53	1	0	0	0	58	0	68	38	1	0	3	8	107	0	2	6	6	1	1	1	14	2	2	498	100	MD
MK	0	0	4	28	0	0	0	24	0	48	9	0	1	3	8	23	0	1	2	33	1	0	2	12	11	2	471	93	MK
MT	0	0	2	4	24	1	0	16	1	16	4	0	1	2	4	10	1	1	1	292	2	0	12	15	33	20	684	180	MT
NL	0	0	0	0	0	44	1	30	0	3	7	1	0	1	0	5	6	4	0	3	55	0	0	20	1	15	367	237	NL
NO	0	0	0	0	0	0	3	5	0	1	15	2	0	0	0	2	1	2	0	0	4	0	0	11	0	6	68	20	NO
PL	0	1	2	1	0	1	0	169	0	14	25	2	1	4	2	28	1	10	0	3	6	0	0	13	1	4	400	248	PL
PT	0	0	0	0	0	0	0	2	44	1	0	0	0	0	0	0	26	0	0	14	3	0	2	29	2	14	217	123	PT
RO	0	0	13	2	0	0	0	56	0	151	22	0	1	5	7	63	0	2	5	10	1	1	1	13	4	2	549	118	RO
RU	0	0	1	0	0	0	0	9	0	4	133	1	0	0	5	29	0	1	1	1	0	2	0	22	1	1	249	20	RU
SE	0	0	0	0	0	0	2	11	0	2	23	7	0	0	0	4	1	9	0	0	5	0	0	10	0	5	109	38	SE
SI	0	0	2	1	0	1	0	38	0	19	6	0	19	3	2	12	1	2	0	34	2	0	1	13	5	2	362	188	SI
SK	0	0	2	1	0	1	0	130	0	31	13	1	2	18	2	28	0	3	1	8	3	0	1	12	3	2	433	262	SK
TR	0	0	3	1	0	0	0	8	0	15	16	0	0	1	180	29	0	0	8	17	0	13	2	12	13	2	378	23	TR
UA	0	0	11	1	0	0	0	54	0	28	64	1	0	3	8	146	0	3	5	4	1	1	0	16	2	2	448	87	UA
ATL	0	0	0	0	0	0	0	2	0	0	6	0	0	0	0	1	6	0	0	0	2	0	0	24	0	15	69	13	ATL
BAS	0	1	1	0	0	1	1	26	0	4	36	6	0	1	1	11	1	34	0	1	8	0	0	12	0	8	208	73	BAS
BLS	0	0	11	1	0	0	0	23	0	32	56	0	0	1	48	101	0	1	43	9	1	4	1	14	4	7	452	45	BLS
MED	0	0	3	4	2	0	0	16	1	21	8	0	1	1	43	20	2	1	4	209	2	3	8	15	17	15	583	114	MED
NOS	0	0	0	0	0	2	1	12	0	1	5	1	0	0	0	3	7	4	0	1	35	0	0	16	0	21	171	71	NOS
ASI	0	0	1	0	0	0	0	3	0	3	16	0	0	0	71	12	0	0	1	10	0	40	1	21	10	1	214	8	ASI
NOA	0	0	1	3	1	0	0	7	1	10	3	0	0	1	15	8	1	0	1	72	1	1	18	20	23	5	283	53	NOA
EMC	0	0	2	1	0	1	0	16	1	10	44	1	0	1	21	21	1	2	1	18	3	5	3	18	6	3	253	56	EMC
EU	0	0	1	1	0	2	0	32	3	8	16	2	1	2	2	9	5	5	0	19	9	0	1	16	3	7	261	131	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table B.10: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	26	0	2	0	5	1	9	1	1	27	0	2	7	0	0	1	0	4	1	0	20	4	4	0	0	20	0	0	AL
AM	0	14	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	AM
AT	0	0	56	0	1	4	0	1	15	3	0	16	100	2	0	3	0	27	6	0	1	7	11	0	0	82	0	0	AT
AZ	0	5	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	1	0	AZ
BA	1	0	9	0	24	2	3	1	2	20	0	6	20	1	0	1	0	7	3	0	2	19	10	0	0	31	0	0	BA
BE	0	0	6	0	0	40	0	1	5	1	0	7	126	4	0	8	1	137	63	0	0	1	1	3	0	13	0	0	BE
BG	2	0	4	0	4	1	78	3	1	30	0	5	13	1	0	1	1	5	3	0	13	4	9	0	0	11	0	1	BG
BY	0	0	3	0	1	2	1	72	1	2	0	5	19	3	1	1	4	6	5	0	1	2	5	0	0	4	1	8	BY
CH	0	0	12	0	0	6	0	0	66	1	0	3	71	1	0	6	0	72	9	0	0	2	2	0	0	139	0	0	CH
CS	3	0	8	0	11	2	15	2	2	80	0	7	19	1	0	1	1	6	3	0	6	12	21	0	0	19	0	1	CS
CY	0	0	0	0	0	0	2	0	0	0	5	0	1	0	0	1	0	1	0	0	2	0	0	0	0	1	0	0	CY
CZ	0	0	44	0	1	5	1	2	10	5	0	52	140	3	0	3	1	31	11	0	1	5	17	1	0	27	0	1	CZ
DE	0	0	18	0	0	17	0	2	15	1	0	19	228	8	0	5	1	63	28	0	0	1	3	2	0	27	0	1	DE
DK	0	0	3	0	0	10	0	4	2	1	0	6	84	40	1	2	1	24	31	0	0	0	1	1	0	2	0	1	DK
EE	0	0	1	0	0	1	1	15	0	1	0	2	10	1	6	1	8	3	3	0	0	0	1	0	0	1	0	4	EE
ES	0	0	1	0	0	2	0	0	1	0	0	1	5	0	0	99	0	21	4	0	0	0	0	0	0	5	0	0	ES
FI	0	0	0	0	0	0	0	2	0	0	0	1	3	0	1	0	10	0	1	0	0	0	0	0	0	0	0	1	FI
FR	0	0	5	0	0	14	0	0	9	0	0	3	49	2	0	20	0	146	29	0	0	1	1	2	0	27	0	0	FR
GB	0	0	2	0	0	6	0	1	1	0	0	1	26	2	0	4	0	32	93	0	0	0	0	8	0	2	0	0	GB
GE	0	6	0	7	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	28	0	0	0	0	0	1	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	3	0	1	0	1	0	20	1	0	9	0	1	4	0	0	0	0	2	1	0	32	1	3	0	0	7	0	0	GR
HR	0	0	22	0	12	3	4	2	3	22	0	10	36	2	0	2	0	11	3	0	1	45	23	0	0	64	0	0	HR
HU	1	0	29	0	7	3	7	4	5	37	0	20	53	2	0	1	1	16	6	0	2	29	91	0	0	38	0	1	HU
IE	0	0	1	0	0	5	0	0	1	0	0	2	15	2	0	3	0	21	84	0	0	0	0	27	0	1	0	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	IS
IT	1	0	12	0	2	2	1	1	7	2	0	4	23	1	0	3	0	21	3	0	2	8	3	0	0	195	0	0	IT
KZ	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	KZ
LT	0	0	3	0	1	2	0	45	1	1	0	6	25	5	1	1	5	8	6	0	0	1	4	1	0	3	0	20	LT
LU	0	0	10	0	0	50	0	1	9	1	0	9	165	3	0	7	0	142	40	0	0	1	1	2	0	17	0	0	LU
LV	0	0	1	0	0	1	1	30	1	1	0	3	16	2	2	1	5	5	5	0	0	1	2	0	0	2	0	13	LV
MD	1	0	5	0	2	2	11	11	1	9	0	6	21	2	1	1	1	6	4	0	2	3	13	0	0	9	1	1	MD
MK	10	0	3	0	4	1	20	1	1	36	0	3	9	1	0	1	0	3	2	0	26	4	6	0	0	14	0	0	MK
MT	1	0	1	0	1	0	2	0	0	1	0	0	1	0	0	2	0	3	0	0	2	1	1	0	0	14	0	0	MT
NL	0	0	4	0	0	29	0	2	3	0	0	9	160	9	0	7	1	85	65	0	0	1	1	4	0	9	0	1	NL
NO	0	0	0	0	0	1	0	1	0	0	0	1	4	1	0	0	0	2	2	0	0	0	0	0	0	0	0	0	NO
PL	0	0	12	0	0	4	1	16	3	4	0	24	71	6	1	1	2	16	11	0	1	3	13	1	0	11	0	3	PL
PT	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	56	0	7	1	0	0	0	0	0	0	1	0	0	PT
RO	2	0	8	0	5	2	24	6	2	29	0	8	24	2	0	2	1	7	4	0	4	6	22	0	0	15	0	1	RO
RU	0	0	0	0	0	0	1	4	0	0	0	1	1	0	0	0	1	1	1	1	0	0	1	0	0	1	1	1	RU
SE	0	0	1	0	0	1	0	2	0	0	0	1	10	4	0	1	1	3	3	0	0	0	1	0	0	1	0	0	SE
SI	0	0	46	0	3	2	2	2	7	8	0	12	56	2	0	3	0	19	4	0	1	37	18	0	0	154	0	0	SI
SK	0	0	20	0	2	3	3	4	4	13	0	23	49	2	0	1	1	14	6	0	1	11	54	0	0	22	0	1	SK
TR	0	1	0	0	0	0	2	1	0	1	0	0	1	0	0	0	0	1	0	1	1	0	1	0	0	1	0	0	TR
UA	0	0	4	1	1	2	5	18	1	5	0	5	16	2	1	1	1	5	3	1	1	2	9	0	0	5	1	2	UA
ATL	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	3	3	0	0	0	0	1	0	0	0	0	ATL
BAS	0	0	2	0	0	3	0	7	1	1	0	4	30	7	1	1	3	9	8	0	0	1	1	1	0	2	0	3	BAS
BLS	0	1	1	1	1	0	6	3	0	2	0	1	4	0	0	0	0	1	1	2	1	1	2	0	0	2	1	1	BLS
MED	0	0	1	0	1	0	3	0	1	1	1	0	2	0	0	4	0	6	1	0	2	1	1	0	0	15	0	0	MED
NOS	0	0	1	0	0	6	0	1	1	0	0	3	38	7	0	3	1	28	31	0	0	0	1	2	0	2	0	1	NOS
ASI	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	ASI
NOA	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	2	1	1	0	0	2	0	0	NOA
EMC	0	0	2	0	1	2	2	3	2	2	0	3	15	1	0	5	1	10	5	1	1	1	3	1	0	8	0	0	EMC
EU	0	0	8	0	1	6	1	4	4	2	0	7	50	3	0	18	2	39	18	0	2	2	5	2	0	28	0	1	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table B.10 Cont.: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NO$_x$. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	11	0	1	0	5	0	8	2	1	0	1	1	6	1	1	1	19	1	0	0	6	0	0	200	71	AL
AM	0	0	0	0	0	0	0	1	0	1	3	0	0	0	37	2	0	0	1	1	0	3	0	5	0	0	77	2	AM
AT	1	0	1	0	0	6	1	12	0	5	2	1	8	4	1	6	1	4	0	7	7	0	0	9	0	0	409	340	AT
AZ	0	0	0	0	0	0	0	1	0	1	7	0	0	0	12	2	0	0	1	1	0	3	0	4	0	0	55	2	AZ
BA	0	0	0	1	0	2	1	8	0	7	2	1	3	3	0	6	1	2	0	10	3	0	0	6	0	0	212	106	BA
BE	7	0	0	0	0	61	4	8	1	1	1	2	1	1	0	2	10	6	0	3	79	0	0	28	0	0	634	491	BE
BG	0	0	7	6	0	2	1	12	0	62	9	1	1	3	3	35	1	3	7	6	3	0	0	9	0	0	354	84	BG
BY	0	3	4	0	0	3	2	42	0	11	51	5	1	4	1	79	1	13	1	1	5	0	0	9	0	0	376	120	BY
CH	2	0	0	0	0	7	1	3	1	1	1	1	2	1	0	1	2	2	0	9	9	0	0	9	0	0	439	335	CH
CS	0	0	2	5	0	2	1	15	0	28	5	1	2	6	0	16	1	3	1	8	3	0	0	8	0	0	325	119	CS
CY	0	0	1	0	0	0	0	0	0	0	2	0	0	0	31	2	0	0	1	14	0	1	0	5	0	0	71	9	CY
CZ	1	0	1	0	0	9	2	41	0	6	4	3	4	11	1	12	2	8	0	4	12	0	0	12	0	0	492	405	CZ
DE	4	0	0	0	0	34	2	25	1	1	3	4	1	2	0	5	4	17	0	3	40	0	0	17	0	0	602	488	DE
DK	1	1	0	0	0	21	7	25	0	0	4	14	0	1	0	6	4	56	0	1	62	0	0	13	0	0	428	270	DK
EE	0	5	1	0	0	2	1	11	0	2	18	4	0	1	1	12	1	16	0	0	3	0	0	4	0	0	144	67	EE
ES	0	0	0	0	0	1	0	1	7	0	0	0	0	0	0	0	4	0	0	12	3	0	0	7	0	0	174	146	ES
FI	0	0	0	0	0	1	2	2	0	1	5	4	0	0	0	1	0	5	0	0	1	0	0	2	0	0	45	25	FI
FR	2	0	0	0	0	12	1	3	1	1	0	1	1	1	0	1	5	2	0	7	35	0	0	11	0	0	393	317	FR
GB	1	0	0	0	0	12	2	3	1	0	0	1	0	0	0	0	8	3	0	1	47	0	0	12	0	0	272	194	GB
GE	0	0	0	0	0	0	0	1	0	0	16	0	0	0	31	6	0	0	2	1	0	2	0	5	0	0	111	4	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	GL
GR	0	0	1	6	0	0	0	3	0	10	3	0	1	0	2	6	0	1	2	8	1	0	0	6	0	0	139	56	GR
HR	0	0	1	0	0	3	1	13	0	11	3	1	10	5	0	10	1	4	0	18	4	0	0	8	0	0	358	211	HR
HU	1	0	2	1	0	4	1	40	0	42	7	2	7	22	1	39	1	5	1	10	6	0	0	11	0	0	556	341	HU
IE	0	0	0	0	0	9	1	2	1	0	1	1	0	0	0	1	10	3	0	1	34	0	0	6	0	0	228	172	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	4	2	IS
IT	0	0	0	1	0	2	1	3	0	2	1	1	6	1	0	2	1	1	0	31	3	0	0	9	0	0	354	280	IT
KZ	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	3	0	0	0	0	0	0	0	5	0	0	32	2	KZ
LT	0	6	2	0	0	4	2	50	0	6	30	7	1	3	0	39	1	24	1	1	8	0	0	8	0	0	334	161	LT
LU	9	0	0	0	0	42	3	7	1	1	1	2	1	1	0	2	5	4	0	3	43	0	0	18	0	0	599	509	LU
LV	0	9	1	0	0	3	1	25	0	3	24	5	0	1	0	25	1	17	0	1	5	0	0	6	0	0	220	102	LV
MD	0	1	46	1	0	3	1	30	0	86	29	2	1	5	2	155	1	5	10	4	5	0	0	11	0	0	511	115	MD
MK	0	0	1	25	0	1	0	7	0	15	3	1	0	2	1	9	0	1	2	10	2	0	0	7	0	0	235	79	MK
MT	0	0	0	1	3	0	0	0	0	1	1	0	0	1	1	1	1	0	0	-35	0	0	1	6	0	0	7	27	MT
NL	4	0	0	0	0	55	3	16	1	1	2	3	1	1	0	3	11	14	0	3	92	0	0	30	0	0	626	461	NL
NO	0	0	0	0	0	2	4	2	0	0	1	1	0	0	0	0	0	2	0	0	3	0	0	1	0	0	29	17	NO
PL	1	1	1	0	0	7	2	118	0	7	13	6	2	10	0	40	2	21	0	2	13	0	0	11	0	0	465	323	PL
PT	0	0	0	0	0	1	0	1	33	0	0	0	0	0	0	0	8	0	0	5	1	0	0	6	0	0	125	103	PT
RO	0	0	10	2	0	3	1	27	0	129	14	1	2	7	2	66	1	5	5	5	4	0	0	10	0	0	466	140	RO
RU	0	0	0	0	0	0	0	3	0	1	80	0	0	0	0	18	0	2	1	0	1	0	0	7	0	0	129	10	RU
SE	0	1	0	0	0	2	4	5	0	1	2	8	0	0	0	2	1	9	0	0	5	0	0	3	0	0	72	43	SE
SI	1	0	0	1	0	4	1	14	0	9	3	1	32	5	0	10	1	4	0	26	5	0	0	10	0	0	504	376	SI
SK	1	0	1	1	0	4	1	47	0	19	7	2	4	26	0	32	1	5	0	4	6	0	0	10	0	0	410	283	SK
TR	0	0	0	0	0	0	0	1	0	3	2	0	0	0	44	3	0	0	1	3	0	1	0	5	0	0	75	6	TR
UA	0	1	11	1	0	2	1	30	0	26	59	2	1	5	2	187	1	6	6	2	4	0	0	11	0	0	447	98	UA
ATL	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	2	0	0	0	2	0	0	2	0	0	20	13	ATL
BAS	0	1	1	0	0	6	2	22	0	2	8	7	0	1	0	9	2	15	0	1	12	0	0	6	0	0	176	111	BAS
BLS	0	0	3	1	0	1	0	5	0	13	17	1	0	1	5	33	0	2	11	1	1	0	0	5	0	0	127	22	BLS
MED	0	0	0	0	0	0	0	0	1	2	1	0	0	1	5	1	1	0	0	-10	1	1	0	5	0	0	52	36	MED
NOS	1	0	0	0	0	12	2	7	0	1	2	2	0	1	0	2	4	9	0	1	24	0	0	8	0	0	200	145	NOS
ASI	0	0	0	0	0	0	0	0	0	1	3	0	0	0	13	1	0	0	0	2	0	5	0	5	0	0	31	1	ASI
NOA	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	4	0	0	1	4	0	0	24	7	NOA
EMC	0	1	1	1	0	2	0	8	0	5	21	1	1	1	4	15	1	3	1	3	5	1	0	6	0	0	147	68	EMC
EU	1	0	1	0	0	8	1	18	1	3	4	3	2	2	0	8	4	7	0	6	18	0	0	9	0	0	301	225	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table B.11: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NH_3. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	
AL	72	0	2	0	2	0	6	0	1	17	0	1	5	0	0	1	0	2	0	0	11	2	4	0	0	16	0	AL
AM	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	AM
AT	0	0	48	0	1	3	1	1	7	2	0	14	63	1	0	2	0	13	3	0	0	4	11	0	0	40	0	AT
AZ	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	AZ
BA	2	0	9	0	65	1	4	1	2	23	0	6	19	1	0	1	0	4	1	0	1	26	19	0	0	37	0	BA
BE	0	0	3	0	0	152	0	1	3	0	0	5	84	4	0	3	0	110	40	0	0	1	2	3	0	9	0	BE
BG	2	0	3	0	2	0	102	1	1	17	0	3	9	0	0	0	0	2	1	0	7	2	8	0	0	9	0	BG
BY	0	0	2	0	0	1	2	93	1	1	0	5	19	3	1	1	1	6	3	0	0	1	5	0	0	5	0	BY
CH	0	0	2	0	0	4	0	0	42	0	0	1	30	1	0	3	0	32	4	0	0	1	1	0	0	58	0	CH
CS	6	0	6	0	11	1	12	1	1	90	0	6	15	1	0	1	0	3	1	0	2	9	22	0	0	19	0	CS
CY	0	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	CY
CZ	0	0	19	0	1	6	1	3	4	4	0	91	98	2	0	2	0	20	7	0	0	4	17	1	0	15	0	CZ
DE	0	0	5	0	0	16	0	2	7	1	0	12	211	5	0	2	0	43	16	0	0	1	3	2	0	13	0	DE
DK	0	0	2	0	0	9	0	5	2	1	0	5	87	106	0	1	1	25	26	0	0	0	2	2	0	4	0	DK
EE	0	0	1	0	0	2	1	19	1	1	0	3	23	6	38	1	7	5	4	0	0	0	2	0	0	2	0	EE
ES	0	0	0	0	0	1	0	0	1	0	0	0	3	0	0	78	0	19	2	0	0	0	0	0	0	4	0	ES
FI	0	0	0	0	0	1	0	6	0	0	0	1	6	2	4	0	32	2	1	0	0	0	0	0	0	0	0	FI
FR	0	0	2	0	0	12	0	0	5	0	0	2	32	1	0	10	0	153	16	0	0	1	1	1	0	22	0	FR
GB	0	0	1	0	0	12	0	1	1	0	0	2	34	4	0	2	0	45	140	0	0	0	1	5	0	4	0	GB
GE	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	6	0	1	0	1	0	23	0	0	6	0	1	3	0	0	1	0	1	0	0	50	1	3	0	0	8	0	GR
HR	1	0	14	0	17	1	4	1	2	19	0	9	27	1	0	2	0	7	1	0	1	77	29	0	0	66	0	HR
HU	1	0	13	0	3	2	5	3	2	17	0	15	34	1	0	1	0	8	3	0	0	16	95	0	0	26	0	HU
IE	0	0	0	0	0	6	0	0	1	0	0	1	19	2	0	2	0	26	59	0	0	0	0	51	0	2	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	3	0	0	IS
IT	1	0	5	0	1	1	1	0	3	2	0	2	12	0	0	2	0	9	1	0	1	5	4	0	0	156	0	IT
KZ	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	12	KZ
LT	0	0	2	0	0	2	1	33	1	1	0	5	30	7	1	1	1	8	5	0	0	1	4	1	0	4	0	LT
LU	0	0	4	0	0	66	0	1	4	0	0	6	115	2	0	3	0	111	23	0	0	1	2	2	0	10	0	LU
LV	0	0	1	0	0	2	1	32	1	1	0	4	27	6	5	1	3	7	4	0	0	0	3	1	0	3	0	LV
MD	0	0	2	0	1	1	7	5	1	3	0	4	13	1	0	1	0	3	1	1	1	2	8	0	0	7	0	MD
MK	16	0	2	0	2	0	19	1	1	27	0	2	7	0	0	1	0	2	0	0	18	2	6	0	0	11	0	MK
MT	1	0	1	0	0	0	1	0	0	1	0	0	1	0	0	2	0	3	0	0	1	1	0	0	0	26	0	MT
NL	0	0	2	0	0	49	0	1	2	0	0	6	93	7	0	3	0	66	55	0	0	1	2	3	0	7	0	NL
NO	0	0	0	0	0	1	0	1	0	0	0	1	9	6	0	0	1	4	5	0	0	0	0	0	0	1	0	NO
PL	0	0	5	0	1	4	2	10	2	3	0	18	61	5	0	1	0	13	7	0	0	2	11	1	0	9	0	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	30	0	7	1	0	0	0	0	0	0	1	0	PT
RO	1	0	4	0	2	1	17	3	1	12	0	5	14	1	0	1	0	3	1	0	1	3	15	0	0	11	0	RO
RU	0	0	0	0	0	0	1	7	0	0	0	1	2	0	0	0	1	1	0	1	0	0	1	0	0	1	1	RU
SE	0	0	1	0	0	2	0	3	0	0	0	2	22	11	0	0	3	6	5	0	0	0	1	0	0	1	0	SE
SI	0	0	25	0	2	1	2	1	3	6	0	9	34	1	0	2	0	9	2	0	0	31	19	0	0	91	0	SI
SK	0	0	13	0	2	3	3	4	3	8	0	29	43	2	0	1	0	10	4	0	0	7	53	1	0	20	0	SK
TR	0	0	0	0	0	0	4	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	TR
UA	0	0	2	0	0	1	4	12	1	2	0	4	13	1	0	1	0	3	2	1	0	1	8	0	0	5	0	UA
ATL	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	1	0	7	5	0	0	0	0	1	0	0	0	ATL
BAS	0	0	2	0	0	4	1	10	1	1	0	5	59	24	5	1	9	11	9	0	0	1	3	1	0	3	0	BAS
BLS	0	0	1	0	0	0	14	3	0	2	0	1	4	0	0	0	0	1	0	2	1	1	3	0	0	3	0	BLS
MED	1	0	1	0	1	0	4	0	1	2	1	1	3	0	0	8	0	8	0	0	4	2	1	0	0	29	0	MED
NOS	0	0	1	0	0	19	0	2	1	0	0	3	59	19	0	2	0	51	67	0	0	0	1	3	0	4	0	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	ASI
NOA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	1	0	0	1	0	0	0	0	4	0	NOA
EMC	0	0	1	0	1	2	2	4	1	2	0	2	13	1	0	3	1	10	4	0	1	1	3	0	0	7	1	EMC
EU	0	0	4	0	0	7	1	3	2	1	0	7	44	5	1	13	3	37	17	0	2	2	6	2	0	21	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	

Table B.11 Cont.: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NH_3. **Emitters →, Receptors ↓.**

	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	
AL	0	0	0	1	8	0	0	0	3	0	8	1	0	1	1	0	5	0	0	0	0	0	0	0	1	173	48	AL
AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	4	0	0	20	0	AM
AT	0	0	0	0	0	0	4	0	12	0	6	2	1	8	3	0	7	0	0	0	0	0	0	0	1	259	227	AT
AZ	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	2	1	0	0	0	0	0	2	0	1	21	0	AZ
BA	0	0	0	1	1	0	1	0	10	0	13	2	0	4	4	0	9	0	0	0	0	0	0	0	1	271	121	BA
BE	1	5	0	0	0	0	54	0	10	0	1	1	1	1	1	0	4	0	0	0	0	0	0	0	1	499	486	BE
BG	0	0	0	4	4	0	1	0	6	0	45	6	0	1	2	1	28	0	0	0	0	0	0	0	1	269	51	BG
BY	8	0	2	2	0	0	3	0	47	0	9	36	2	1	3	0	68	0	0	0	0	0	0	0	1	334	117	BY
CH	0	0	0	0	0	0	4	0	2	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	191	144	CH
CS	1	0	0	2	4	0	1	0	11	0	28	3	0	2	5	0	13	0	0	0	0	0	0	0	1	277	95	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	1	0	0	0	0	0	1	0	0	48	24	CY
CZ	1	1	0	1	0	0	8	0	44	0	9	3	1	3	9	0	15	0	0	0	0	0	0	0	1	391	346	CZ
DE	1	2	0	0	0	0	28	0	25	0	3	2	2	1	2	0	8	0	0	0	0	0	0	0	1	416	391	DE
DK	3	0	0	0	0	0	21	2	33	0	2	3	12	0	1	0	8	0	0	0	0	0	0	0	1	366	341	DK
EE	12	0	11	1	0	0	5	1	24	0	4	30	9	0	1	0	18	0	0	0	0	0	0	0	1	232	155	EE
ES	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	115	113	ES
FI	3	0	2	0	0	0	1	1	6	0	1	12	5	0	0	0	5	0	0	0	0	0	0	0	1	94	67	FI
FR	0	1	0	0	0	0	9	0	4	0	1	0	0	1	1	0	2	0	0	0	0	0	0	0	1	278	268	FR
GB	0	0	0	0	0	0	19	0	5	0	1	1	1	0	0	0	2	0	0	0	0	0	0	0	1	283	276	GB
GE	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	4	3	0	0	0	0	0	0	0	0	26	1	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	GL
GR	0	0	0	2	5	0	0	0	2	0	13	2	0	0	1	3	9	0	0	0	0	0	0	0	1	145	71	GR
HR	1	0	0	1	1	0	2	0	14	0	16	2	1	13	5	0	11	0	0	0	0	0	0	0	1	345	192	HR
HU	1	0	0	1	1	0	3	0	30	0	30	4	1	5	20	0	25	0	0	0	0	0	0	0	1	368	258	HU
IE	0	0	0	0	0	0	10	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	187	184	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	5	IS
IT	0	0	0	0	0	0	1	0	3	0	4	1	0	4	1	0	3	0	0	0	0	0	0	0	1	223	201	IT
KZ	0	0	0	0	0	0	0	0	1	0	1	48	0	0	0	0	15	0	0	0	0	0	0	0	5	90	4	KZ
LT	50	0	4	1	0	0	5	0	59	0	7	23	5	0	2	0	31	0	0	0	0	0	0	0	1	300	197	LT
LU	0	37	0	0	0	0	28	0	9	0	2	1	1	1	1	0	4	0	0	0	0	0	0	0	1	436	422	LU
LV	27	0	32	1	0	0	5	1	40	0	5	29	7	0	2	0	28	0	0	0	0	0	0	0	1	279	178	LV
MD	1	0	0	49	0	0	1	0	17	0	49	18	1	1	3	1	102	0	0	0	0	0	0	0	1	305	65	MD
MK	0	0	0	1	49	0	0	0	4	0	13	2	0	1	2	1	8	0	0	0	0	0	0	0	1	198	57	MK
MT	0	0	0	0	0	67	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	111	103	MT
NL	1	1	0	0	0	0	166	0	14	0	2	2	2	1	1	0	5	0	0	0	0	0	0	0	1	494	478	NL
NO	1	0	0	0	0	0	3	9	3	0	0	1	4	0	0	0	1	0	0	0	0	0	0	0	1	52	38	NO
PL	3	0	0	1	0	0	7	0	149	0	9	7	3	2	7	0	27	0	0	0	0	0	0	0	1	372	307	PL
PT	0	0	0	0	0	0	0	0	0	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	85	PT
RO	1	0	0	6	1	0	1	0	13	0	116	8	0	1	4	0	40	0	0	0	0	0	0	0	1	289	77	RO
RU	1	0	0	1	0	0	0	0	4	0	3	130	0	0	0	0	28	0	0	0	0	0	0	0	2	189	15	RU
SE	2	0	1	0	0	0	5	4	12	0	1	3	30	0	0	0	4	0	0	0	0	0	0	0	1	119	103	SE
SI	1	0	0	1	0	0	2	0	12	0	11	2	1	66	4	0	10	0	0	0	0	0	0	0	1	349	278	SI
SK	1	0	0	1	0	0	4	0	62	0	22	4	1	4	70	0	28	0	0	0	0	0	0	0	1	406	320	SK
TR	0	0	0	1	0	0	0	0	1	0	4	1	0	0	0	55	5	0	0	0	0	0	2	0	0	79	5	TR
UA	2	0	0	6	0	0	2	0	24	0	19	38	1	1	4	1	169	0	0	0	0	0	0	0	1	328	73	UA
ATL	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	25	21	ATL
BAS	8	0	4	1	0	0	9	2	47	0	3	12	26	0	1	0	13	0	0	0	0	0	0	0	1	275	230	BAS
BLS	1	0	0	6	0	0	0	0	5	0	25	25	0	0	1	5	72	0	0	0	0	0	0	0	1	180	22	BLS
MED	0	0	0	0	0	1	0	0	1	0	3	1	0	1	0	7	3	0	0	0	0	0	1	3	1	89	60	MED
NOS	1	1	0	0	0	0	33	2	12	0	1	1	4	0	1	0	4	0	0	0	0	0	0	0	1	294	280	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	1	0	0	0	0	0	8	0	1	18	0	ASI
NOA	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	11	1	27	9	NOA
EMC	1	0	0	1	0	0	3	0	8	0	5	32	1	1	1	3	17	0	0	0	0	0	1	2	1	140	65	EMC
EU	2	1	1	0	0	0	9	1	22	1	4	4	5	1	3	0	7	0	0	0	0	0	0	0	1	240	212	EU
	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	

Table B.12: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	
AL	-1	0	0	0	-1	0	-1	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-2	0	AL
AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AM
AT	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-1	0	AT
AZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AZ
BA	0	0	0	0	-1	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-1	0	BA
BE	0	0	2	0	0	10	0	1	1	1	0	1	20	1	0	2	0	18	16	0	0	1	1	1	0	4	0	BE
BG	0	0	0	0	0	0	-2	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	BG
BY	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	BY
CH	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	CH
CS	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	CY
CZ	0	0	2	0	0	0	0	0	1	0	0	1	6	0	0	1	0	3	1	0	0	1	0	0	0	3	0	CZ
DE	0	0	2	0	0	2	0	0	1	0	0	1	11	0	0	1	0	7	4	0	0	1	0	0	0	4	0	DE
DK	0	0	1	0	0	1	0	0	0	0	0	0	6	1	0	1	0	4	2	0	0	0	0	0	0	3	0	DK
EE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	EE
ES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	-1	0	0	0	0	0	0	0	0	0	ES
FI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	FI
FR	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	0	0	3	1	0	0	0	0	0	0	2	0	FR
GB	0	0	1	0	0	1	0	0	0	0	0	0	5	0	0	1	0	5	8	0	0	0	0	0	0	2	0	GB
GE	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	-1	0	GR
HR	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	HR
HU	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	1	1	0	0	2	0	HU
IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	1	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	IS
IT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	8	0	IT
KZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	KZ
LT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	LT
LU	0	0	2	0	0	3	0	1	1	0	0	1	12	0	0	1	0	9	6	0	0	1	0	0	0	4	0	LU
LV	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	LV
MD	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MD
MK	0	0	0	0	0	0	-1	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MT
NL	0	0	2	0	0	9	0	1	1	1	0	1	21	1	0	2	0	20	16	0	0	1	1	1	0	6	0	NL
NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NO
PL	0	0	1	0	0	0	0	0	0	0	0	1	3	0	0	1	0	2	1	0	0	0	0	0	0	2	0	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	-1	0	0	0	0	0	0	0	0	0	PT
RO	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	RO
RU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	RU
SE	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SE
SI	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	1	0	1	0	0	0	1	0	0	0	5	0	SI
SK	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	1	0	0	0	0	0	0	2	0	SK
TR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TR
UA	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ATL
BAS	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	1	0	0	0	0	0	0	1	0	BAS
BLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	BLS
MED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	MED
NOS	0	0	0	0	0	1	0	0	0	0	0	0	5	0	0	1	0	4	3	0	0	0	0	0	0	2	0	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ASI
NOA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NOA
EMC	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	EMC
EU	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	0	0	2	1	0	0	0	0	0	0	2	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	

Table B.12 Cont.: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of VOC. **Emitters →, Receptors ↓**.

	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	
AL	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-10	-16	-3	AL
AM	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-2	0	0	0	0	0	0	0	0	-11	-16	-1	AM
AT	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-7	0	4	AT
AZ	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-1	0	0	0	0	0	0	0	0	-10	-14	-1	AZ
BA	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-8	-11	-2	BA
BE	0	0	0	0	0	0	8	1	2	0	1	3	1	0	0	1	2	0	0	0	0	1	0	0	12	114	89	BE
BG	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	-15	-24	-2	BG
BY	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	-9	1	5	BY
CH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-8	-8	-1	CH
CS	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-11	-12	0	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-7	0	0	0	0	0	0	0	0	-11	-20	-1	CY
CZ	0	0	0	0	0	0	0	0	2	0	1	2	0	0	0	0	2	0	0	0	0	0	0	0	-4	24	21	CZ
DE	0	0	0	0	0	0	2	0	1	0	1	2	1	0	0	0	2	0	0	0	0	0	0	0	1	48	38	DE
DK	0	0	0	0	0	0	1	0	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	27	22	DK
EE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	-2	3	EE
ES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-9	-14	-5	ES
FI	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-2	1	2	FI
FR	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-6	7	11	FR
GB	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	33	27	GB
GE	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	-2	-1	0	0	0	0	0	0	0	-14	-22	-1	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-10	-14	-1	GR
HR	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	-8	-1	3	HR
HU	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	-9	8	11	HU
IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	-4	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	0	IS
IT	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	-5	11	13	IT
KZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	-2	1	KZ
LT	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-8	-3	5	LT
LU	0	1	0	0	0	0	2	0	2	0	1	2	1	0	0	1	2	0	0	0	0	0	0	0	2	57	45	LU
LV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-6	-2	3	LV
MD	0	0	0	1	0	0	0	0	0	0	0	-1	0	0	0	0	1	0	0	0	0	0	0	0	-15	-12	2	MD
MK	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-11	-16	-3	MK
MT	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	-5	-3	1	MT
NL	0	0	0	0	0	0	12	1	3	1	1	3	1	0	0	1	3	0	0	0	0	1	0	0	15	124	95	NL
NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	1	NO
PL	0	0	0	0	0	0	0	0	3	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	-6	15	16	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-9	-12	-4	PT
RO	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-15	-19	-1	RO
RU	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	-5	0	1	RU
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	2	3	SE
SI	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0	-6	13	13	SI
SK	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-7	8	11	SK
TR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	-9	-13	0	TR
UA	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	5	0	0	0	0	0	0	0	-11	4	6	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	-2	0	ATL
BAS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-2	8	8	BAS
BLS	0	0	0	0	0	0	0	0	0	0	-1	-1	0	0	0	0	-1	0	0	0	0	0	0	0	-9	-12	1	BLS
MED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	-7	-8	0	MED
NOS	0	0	0	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	25	20	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	-1	0	-6	-8	0	ASI
NOA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	-6	0	NOA
EMC	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-5	-1	3	EMC
EU	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-4	10	12	EU
	LT	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	SUM	EU	

Table B.13: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM, SO_x, NO_x, NH_3 and VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	153	0	7	0	58	1	85	4	2	108	0	8	19	1	0	6	0	12	3	0	69	13	25	0	0	74	1	1	AL
AM	0	53	0	29	1	0	4	2	0	1	0	0	1	0	0	0	0	0	0	9	1	0	1	0	0	1	4	0	AM
AT	0	0	218	0	10	10	9	5	27	14	0	52	225	3	0	8	1	58	13	0	1	17	42	1	0	159	0	1	AT
AZ	0	11	0	136	1	0	4	3	0	1	0	0	1	0	0	0	0	0	0	17	1	0	1	0	0	1	10	0	AZ
BA	5	0	25	0	253	3	36	5	4	111	0	21	52	2	0	7	1	19	5	0	8	71	63	0	0	102	1	1	BA
BE	0	0	14	0	2	436	3	5	11	3	0	21	317	10	1	20	1	431	161	0	1	3	7	9	1	32	0	1	BE
BG	8	0	9	0	29	2	470	12	2	90	0	11	28	1	0	3	1	9	4	1	37	9	36	0	0	31	2	2	BG
BY	0	0	6	0	4	4	11	314	2	7	0	15	48	7	6	2	8	16	11	1	1	3	19	1	0	11	4	30	BY
CH	0	0	20	0	3	14	3	1	156	3	0	8	138	2	0	15	0	155	17	0	1	4	6	1	0	252	0	0	CH
CS	16	0	19	0	85	3	94	8	3	349	0	21	47	2	0	5	1	15	5	0	17	32	87	0	0	61	1	1	CS
CY	1	0	1	1	7	0	38	3	0	7	50	1	2	0	0	2	0	2	1	1	16	1	4	0	0	9	1	0	CY
CZ	1	0	98	0	10	17	10	11	17	18	0	272	332	8	1	8	2	73	26	0	1	14	62	2	0	58	1	3	CZ
DE	0	0	37	0	3	52	4	9	28	4	0	51	668	17	1	13	2	164	66	0	1	3	14	4	0	56	0	2	DE
DK	0	0	7	0	2	26	2	16	4	3	0	16	219	204	2	6	4	69	84	0	0	1	8	6	0	10	1	6	DK
EE	0	0	2	0	1	4	4	63	1	2	0	6	40	10	94	2	36	12	12	0	0	1	5	1	0	4	2	23	EE
ES	0	0	2	0	3	3	2	0	2	1	0	2	12	0	0	321	0	58	10	0	0	1	2	1	0	16	0	0	ES
FI	0	0	1	0	0	1	1	17	0	1	0	2	12	3	12	1	96	4	5	0	0	0	2	0	0	1	1	5	FI
FR	0	0	10	0	4	38	3	2	18	2	0	9	110	3	0	53	0	495	62	0	1	3	5	4	0	66	0	1	FR
GB	0	0	3	0	1	25	1	2	3	1	0	6	79	8	0	11	1	108	365	0	0	1	2	20	1	10	0	1	GB
GE	0	12	0	32	1	0	8	3	0	1	0	0	1	0	0	0	0	1	0	88	1	0	1	0	0	1	5	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	16	0	4	0	28	1	198	6	1	44	0	5	13	1	0	5	0	7	2	0	180	6	18	0	0	40	1	1	GR
HR	3	0	52	0	101	5	33	7	6	92	0	33	87	3	0	9	1	31	7	0	6	207	97	1	0	182	1	1	HR
HU	2	0	63	0	38	7	43	15	7	101	0	56	116	4	1	6	2	34	12	0	6	66	355	1	0	89	1	3	HU
IE	0	0	1	0	1	14	0	1	1	0	0	3	41	4	0	8	0	60	174	0	0	0	1	119	1	4	0	0	IE
IS	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	1	0	2	5	0	0	0	0	1	14	0	0	0	IS
IT	3	0	23	0	35	4	19	3	14	21	0	10	51	1	0	17	0	57	6	0	6	24	20	0	0	569	0	1	IT
KZ	0	0	0	2	1	0	4	9	0	1	0	1	2	0	1	0	1	1	1	1	0	0	2	0	0	1	57	1	KZ
LT	0	0	6	0	3	6	8	130	2	5	0	16	68	15	8	3	12	21	18	1	1	2	13	1	0	9	3	145	LT
LU	0	0	19	0	3	172	3	4	16	3	0	26	406	7	0	18	1	426	91	0	1	3	8	5	0	39	0	1	LU
LV	0	0	4	0	2	5	6	105	2	3	0	11	53	11	18	2	16	16	15	0	1	1	9	1	0	6	3	63	LV
MD	1	0	10	1	16	4	63	37	2	26	0	15	43	3	1	3	2	13	7	1	5	8	40	1	0	21	4	5	MD
MK	43	0	8	0	40	1	151	5	2	131	0	9	22	1	0	5	0	10	3	0	98	10	30	0	0	47	1	1	MK
MT	4	0	3	0	36	2	34	2	1	20	0	3	10	0	0	17	0	27	3	0	15	7	12	0	0	153	0	0	MT
NL	0	0	11	0	2	160	2	7	8	3	0	24	382	18	1	17	2	247	184	0	1	2	7	10	1	26	0	2	NL
NO	0	0	1	0	0	3	0	4	0	0	0	1	17	8	1	1	3	8	13	0	0	0	1	1	0	1	0	2	NO
PL	1	0	24	0	8	11	12	47	6	15	0	66	176	15	2	5	4	40	26	0	2	9	46	2	0	28	2	11	PL
PT	0	0	1	0	1	2	1	0	1	1	0	1	6	0	0	174	0	24	6	0	0	0	1	1	0	5	0	0	PT
RO	3	0	16	0	32	3	123	19	3	76	0	19	48	2	1	3	1	15	6	1	9	15	72	0	0	36	3	3	RO
RU	0	0	1	2	1	1	5	27	0	2	0	2	6	1	3	0	4	2	2	2	0	1	3	0	0	2	12	3	RU
SE	0	0	2	0	1	4	1	11	1	1	0	4	39	19	3	2	10	13	14	0	0	0	3	1	0	3	0	5	SE
SI	1	0	113	0	25	6	18	6	12	35	0	35	128	3	0	10	1	44	10	0	3	109	66	1	0	340	1	1	SI
SK	1	0	51	0	19	8	26	17	8	43	0	84	124	4	1	5	2	34	14	0	3	27	194	1	0	57	1	3	SK
TR	1	1	1	2	4	0	37	4	0	6	1	1	3	0	0	1	0	1	1	2	8	1	4	0	0	5	2	0	TR
UA	1	0	7	1	8	3	32	64	2	15	0	13	38	3	2	2	4	12	7	2	3	5	31	1	0	15	7	6	UA
ATL	0	0	0	0	0	2	0	1	0	0	0	1	6	1	0	6	1	15	13	0	0	0	0	3	1	1	0	0	ATL
BAS	0	0	5	0	2	9	4	31	2	3	0	12	110	41	13	3	29	28	28	0	1	2	8	2	0	7	1	17	BAS
BLS	1	1	3	2	7	1	70	18	1	12	0	5	13	1	1	1	1	4	3	7	6	2	11	0	0	8	6	2	BLS
MED	4	0	5	0	28	2	56	3	2	19	2	4	13	0	0	30	0	35	3	0	26	9	12	0	0	100	1	0	MED
NOS	0	0	4	0	1	33	1	5	3	1	0	8	122	30	1	8	1	111	150	0	0	1	3	8	1	9	0	2	NOS
ASI	0	1	0	8	1	0	6	2	0	1	2	0	1	0	0	0	0	0	0	1	2	0	1	0	0	1	8	0	ASI
NOA	2	0	1	0	12	1	29	1	0	8	0	1	4	0	0	10	0	9	1	0	13	2	4	0	0	27	0	0	NOA
EMC	1	0	6	2	7	5	18	17	3	10	0	8	39	3	2	16	5	32	14	1	5	4	11	1	0	26	6	3	EMC
EU	1	0	19	0	8	20	12	14	9	9	0	23	134	10	3	58	11	120	52	0	7	7	23	5	0	75	1	6	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table B.13 Cont.: Average 2010 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM, SO_x, NO_x, NH_3 and VOC. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	5	47	1	1	0	33	1	54	13	1	3	5	12	32	1	2	2	100	2	0	3	9	13	4	995	271	AL
AM	0	0	1	0	0	0	0	3	0	3	16	0	0	0	182	13	0	0	2	4	0	39	1	8	12	0	392	8	AM
AT	1	0	2	1	0	13	1	69	1	24	12	3	27	12	2	26	2	6	0	20	11	0	1	16	3	2	1131	918	AT
AZ	0	0	1	0	0	0	0	3	0	3	51	0	0	0	76	22	0	0	2	2	0	39	1	14	6	0	410	9	AZ
BA	0	0	5	6	0	4	1	58	1	51	13	2	10	12	5	33	1	3	1	53	4	0	2	9	7	2	1080	396	BA
BE	17	0	1	0	0	185	5	48	2	6	11	6	2	3	1	13	18	9	0	7	152	0	1	62	1	12	2053	1726	BE
BG	0	0	27	20	0	2	1	55	0	246	44	2	3	9	27	138	1	4	19	27	3	1	2	7	7	2	1445	248	BG
BY	0	8	12	1	0	6	2	174	0	35	193	10	2	9	4	229	1	21	2	3	8	0	0	15	1	2	1272	395	BY
CH	2	0	1	0	0	13	1	14	1	6	3	1	5	2	1	6	3	3	0	21	14	0	1	17	3	2	920	667	CH
CS	0	0	10	18	0	4	1	75	0	126	22	2	6	17	8	62	1	4	2	36	4	0	2	9	8	2	1290	387	CS
CY	0	0	4	3	0	0	0	9	0	19	19	0	0	1	388	34	0	1	10	116	0	19	5	8	15	11	811	99	CY
CZ	2	1	3	1	0	21	3	212	1	33	22	7	11	32	2	49	3	13	0	10	21	0	1	22	2	3	1518	1249	CZ
DE	7	1	1	0	0	81	5	110	1	11	17	10	3	6	1	25	7	27	0	8	66	0	1	35	1	7	1632	1367	DE
DK	2	1	1	0	0	51	14	103	1	7	25	42	1	3	1	24	7	104	0	1	106	0	0	28	0	14	1234	871	DK
EE	0	25	3	0	0	8	4	60	0	10	145	28	0	3	2	55	1	48	0	1	9	0	0	12	0	4	748	376	EE
ES	0	0	0	0	0	2	0	4	28	2	1	0	1	0	0	2	16	1	0	61	7	0	4	23	3	8	603	464	ES
FI	0	3	1	0	0	2	4	20	0	3	112	21	0	1	1	17	1	19	0	0	4	0	0	11	0	3	392	194	FI
FR	5	0	1	0	0	25	1	18	3	5	4	2	3	2	1	7	16	3	0	29	56	0	1	25	2	10	1106	913	FR
GB	1	0	0	0	0	39	3	18	2	3	5	4	1	1	1	5	26	6	0	2	85	0	0	36	0	19	906	704	GB
GE	0	0	2	0	0	0	0	5	0	7	56	0	0	0	139	33	0	1	8	3	0	20	1	6	8	1	448	14	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	20	0	GL
GR	0	0	11	27	1	1	0	29	0	78	23	1	2	4	40	62	1	2	9	102	2	1	4	10	13	5	1002	314	GR
HR	1	0	6	4	0	6	1	78	1	60	16	3	38	17	5	42	1	5	1	74	7	0	2	12	6	3	1355	659	HR
HU	1	1	8	4	0	9	2	186	1	143	32	4	19	70	6	112	2	8	2	27	10	0	1	15	4	2	1697	1044	HU
IE	1	0	0	0	0	21	2	10	1	1	3	2	0	1	0	3	32	3	0	2	45	0	0	26	0	22	609	466	IE
IS	0	0	0	0	0	1	0	2	0	0	2	0	0	0	0	0	2	0	0	0	2	0	0	14	0	10	64	17	IS
IT	1	0	2	3	1	4	1	28	1	21	8	1	16	4	4	16	2	2	1	142	5	0	5	20	12	5	1191	824	IT
KZ	0	0	2	0	0	0	0	9	0	6	182	1	0	0	6	52	0	1	1	1	0	4	0	43	1	0	394	21	KZ
LT	1	17	6	1	0	11	4	199	0	24	131	21	1	7	3	112	2	43	1	2	14	0	0	14	1	4	1116	600	LT
LU	137	0	1	0	0	91	3	43	2	7	8	5	3	3	1	13	10	7	0	9	70	0	1	39	2	7	1715	1505	LU
LV	0	67	4	0	0	9	3	115	0	16	137	22	1	5	2	85	2	37	1	1	11	0	0	13	1	4	889	449	LV
MD	0	1	287	3	0	5	1	118	0	252	104	4	3	13	16	441	1	8	18	10	6	1	1	11	2	2	1643	317	MD
MK	0	0	7	136	0	2	0	38	0	83	17	1	3	7	14	46	1	2	4	49	3	0	3	9	11	2	1054	284	MK
MT	0	0	2	5	114	1	0	18	2	20	6	0	2	2	5	13	2	1	1	381	2	0	14	16	33	20	1012	384	MT
NL	7	1	1	0	0	418	6	70	3	8	16	9	2	3	2	18	19	19	0	5	195	0	1	66	1	15	2000	1605	NL
NO	0	0	0	0	0	5	27	11	0	1	20	12	0	0	0	4	2	5	0	0	10	0	0	12	0	6	182	88	NO
PL	1	2	5	1	0	18	4	623	1	36	56	15	5	27	3	113	3	35	1	6	21	0	1	19	1	4	1556	1148	PL
PT	0	0	0	0	0	1	0	2	219	1	1	0	0	0	0	1	41	0	0	22	5	0	2	26	2	14	564	444	PT
RO	0	1	39	6	0	4	1	105	0	523	53	3	4	19	13	198	1	6	12	17	6	1	1	8	4	2	1540	374	RO
RU	0	1	3	0	0	1	1	19	0	9	513	2	0	1	8	91	0	3	2	1	1	2	0	25	1	1	766	54	RU
SE	0	2	1	0	0	8	13	33	0	3	33	80	0	1	1	12	2	26	0	1	13	0	0	11	0	5	383	246	SE
SI	1	0	4	2	0	8	1	73	1	44	15	3	203	14	4	36	2	5	1	70	8	0	2	18	5	2	1493	1065	SI
SK	1	1	6	2	0	10	2	295	0	83	31	5	12	158	4	105	2	9	1	14	10	0	1	16	3	2	1502	1068	SK
TR	0	0	5	2	0	0	0	10	0	24	27	0	0	1	388	43	0	1	12	25	1	16	2	8	13	2	668	40	TR
UA	0	2	38	1	0	4	1	126	0	85	208	5	2	13	15	714	1	9	13	6	5	1	0	17	2	2	1558	300	UA
ATL	0	0	0	0	0	2	1	3	2	0	8	1	0	0	0	1	10	1	0	1	5	0	0	27	0	15	128	56	ATL
BAS	1	8	2	0	0	18	7	116	0	10	70	65	1	4	1	38	3	81	0	1	24	0	0	16	0	8	833	525	BAS
BLS	0	0	25	2	0	1	1	37	0	81	144	1	1	3	106	257	0	3	69	13	2	5	1	10	4	7	959	104	BLS
MED	0	0	4	5	2	1	0	19	2	29	12	1	3	2	72	30	2	1	5	254	3	4	12	15	17	15	869	264	MED
NOS	1	0	0	0	0	56	9	37	1	3	10	11	1	2	1	10	13	15	0	2	95	0	0	27	0	21	820	599	NOS
ASI	0	0	1	0	0	0	0	3	0	4	31	0	0	0	95	16	0	0	2	14	0	61	2	21	10	1	298	12	ASI
NOA	0	0	2	3	1	0	0	7	1	13	4	0	1	1	21	11	1	0	2	87	1	1	34	21	23	5	369	83	NOA
EMC	1	1	5	2	0	7	2	39	3	24	141	5	2	4	36	67	3	6	2	25	9	8	6	21	6	3	672	238	EMC
EU	2	2	2	2	0	24	4	94	10	17	30	16	5	9	4	29	9	15	1	30	30	0	1	22	3	7	994	728	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

APPENDIX C

Source-Receptor relationships: Tables for 2003

The source-receptor tables in this Appendix are calculated for the meteorological and chemical conditions of 2003.Therefore we can expect differences between these and the SR tables for 2010 presented in Appendix B due both to inter-annual meteorology changes and to changes in the chemical weather conditions resulting from a different European emission regime.

These source-receptor tables are constructed in exactly the same way as those in Appendix B but for the meteorological conditions of 2003 and using the emissions for 2003 documented in Appendix A. For further details on the SR calculations, we refer to the overview description in Appendix B.

Table C.1: 2003 country-to-country blame matrices for **oxidised sulphur** deposition.
Units: 100 Mg of S. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	69	0	0	0	12	0	34	0	0	29	0	1	2	0	0	3	0	1	1	0	54	1	4	0	0	19	0	0	AL
AM	0	18	0	3	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	AM
AT	1	0	46	0	16	5	7	1	4	11	0	39	82	0	0	14	0	16	12	0	3	6	21	0	0	48	0	0	AT
AZ	0	3	0	16	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	5	0	AZ
BA	3	0	2	0	357	1	12	0	0	72	0	8	9	0	0	8	0	5	2	0	6	21	32	0	0	30	0	0	BA
BE	0	0	0	0	0	112	0	0	0	0	0	2	24	0	0	15	0	48	29	0	0	0	0	1	0	1	0	0	BE
BG	8	0	1	0	31	1	856	2	0	77	0	6	6	0	1	4	0	3	3	0	57	3	24	0	0	14	2	0	BG
BY	2	0	2	0	29	4	59	175	0	32	0	20	29	2	11	6	6	8	19	0	8	4	49	1	0	13	2	19	BY
CH	0	0	1	0	2	3	1	0	22	1	0	2	19	0	0	22	0	26	9	0	1	1	2	0	0	35	0	0	CH
CS	18	0	2	0	116	1	77	1	0	386	0	10	9	0	0	7	0	5	3	0	24	10	60	0	0	30	1	0	CS
CY	0	0	0	0	0	0	1	0	0	0	8	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	CY
CZ	1	0	9	0	11	6	7	1	1	11	0	192	84	1	0	9	0	13	15	0	3	3	27	0	0	13	0	0	CZ
DE	0	0	9	0	9	109	3	1	14	8	0	117	1155	7	1	94	2	178	174	0	2	2	16	4	0	32	0	1	DE
DK	0	0	0	0	1	6	0	0	0	1	0	6	29	16	1	8	1	8	34	0	0	0	2	1	0	1	0	0	DK
EE	0	0	0	0	3	1	6	5	0	3	0	3	7	1	33	3	8	3	9	0	1	0	4	0	0	1	0	4	EE
ES	1	0	1	0	10	3	3	0	1	5	0	5	11	0	0	1864	0	45	13	0	5	2	9	1	0	26	0	0	ES
FI	1	0	1	0	11	4	21	12	0	11	0	13	24	3	46	12	137	10	40	0	4	1	18	2	0	6	1	6	FI
FR	1	0	3	0	20	64	6	0	11	10	0	18	111	1	0	687	1	846	141	0	10	5	19	7	0	98	0	0	FR
GB	0	0	0	0	1	25	0	0	0	1	0	5	33	1	0	78	0	62	954	0	0	0	1	35	0	2	0	0	GB
GE	0	4	0	5	1	0	6	0	0	1	1	0	0	0	0	0	0	0	0	8	2	0	1	0	0	1	3	0	GE
GL	0	0	0	0	0	1	0	0	0	0	0	1	2	0	0	2	0	2	13	0	0	0	1	1	2	0	0	0	GL
GR	19	0	1	0	23	0	310	1	0	37	1	4	5	0	0	6	0	3	2	0	478	2	12	0	0	27	1	0	GR
HR	1	0	4	0	85	1	6	0	0	32	0	11	12	0	0	10	0	6	3	0	3	65	48	0	0	40	0	0	HR
HU	2	0	7	0	65	2	28	1	0	70	0	20	16	0	0	8	0	7	4	0	9	18	250	0	0	28	1	1	HU
IE	0	0	0	0	0	4	0	0	0	0	0	1	6	0	0	20	0	12	53	0	0	0	1	89	0	1	0	0	IE
IS	0	0	0	0	1	1	0	0	0	0	0	1	3	0	0	6	0	3	15	0	0	0	1	2	22	1	0	0	IS
IT	10	0	7	0	121	6	42	1	6	71	0	20	45	1	1	73	1	56	13	0	32	29	53	1	0	890	1	1	IT
KZ	1	1	0	4	5	0	25	5	0	5	1	2	3	0	2	2	1	1	3	1	7	0	3	0	0	4	242	1	KZ
LT	0	0	1	0	7	2	12	9	0	9	0	9	15	2	4	3	3	5	11	0	1	1	15	0	0	4	0	40	LT
LU	0	0	0	0	0	3	0	0	0	0	0	0	4	0	0	2	0	5	2	0	0	0	0	0	0	0	0	0	LU
LV	0	0	1	0	5	2	9	10	0	5	0	7	13	2	8	4	5	5	11	0	1	1	8	0	0	3	0	19	LV
MD	0	0	0	0	6	0	27	2	0	7	0	2	3	0	0	1	0	1	2	0	3	1	8	0	0	3	2	0	MD
MK	15	0	0	0	9	0	50	0	0	26	0	1	1	0	0	2	0	1	1	0	80	1	4	0	0	8	0	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	MT
NL	0	0	0	0	0	49	0	0	0	0	0	3	41	0	0	10	0	26	44	0	0	0	0	1	0	1	0	0	NL
NO	0	0	1	0	2	10	1	1	0	2	0	11	40	6	3	18	5	16	123	0	0	0	6	6	1	2	0	1	NO
PL	2	0	8	0	45	15	44	15	2	51	0	126	156	8	7	21	6	29	60	0	9	9	114	2	0	29	2	10	PL
PT	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	90	0	2	1	0	0	0	0	0	0	1	0	0	PT
RO	7	0	3	0	104	3	410	6	1	166	0	20	23	1	2	14	1	9	11	0	39	10	112	0	0	36	5	2	RO
RU	8	6	6	14	98	20	268	192	2	100	4	64	109	7	120	56	82	41	130	11	58	10	122	5	1	48	259	32	RU
SE	0	0	2	0	8	13	9	5	1	9	0	26	71	20	13	25	25	22	96	0	2	1	17	4	0	7	1	5	SE
SI	0	0	5	0	12	1	2	0	0	6	0	5	8	0	0	4	0	3	1	0	1	13	10	0	0	29	0	0	SI
SK	1	0	4	0	25	2	18	1	0	27	0	26	15	0	0	4	0	4	4	0	5	5	94	0	0	12	0	1	SK
TR	5	5	1	2	20	1	213	5	0	31	31	6	7	0	2	11	1	4	5	3	96	2	18	0	0	30	6	1	TR
UA	6	0	5	1	88	8	316	55	1	105	1	49	59	2	11	16	7	15	34	1	37	12	152	1	0	39	23	10	UA
ATL	1	0	6	0	26	102	14	15	5	18	0	68	238	11	22	1391	43	326	1233	0	4	5	43	169	96	39	5	7	ATL
BAS	1	0	4	0	18	20	24	11	1	21	0	47	133	30	45	30	53	35	96	0	5	3	43	3	0	11	1	18	BAS
BLS	5	1	2	1	37	2	385	15	0	55	3	14	15	1	5	6	3	6	12	1	44	4	46	0	0	15	15	2	BLS
MED	66	0	16	0	447	14	827	6	8	306	66	63	85	2	3	610	3	228	54	0	766	71	183	2	0	1158	6	3	MED
NOS	0	0	2	0	7	121	2	2	2	7	0	45	238	22	3	156	4	229	1241	0	1	1	20	31	1	9	1	2	NOS
ASI	1	3	0	12	4	0	19	3	0	5	24	1	2	0	2	2	1	1	2	2	12	0	2	0	0	4	72	0	ASI
NOA	5	0	1	0	32	1	66	1	1	24	2	6	9	0	0	122	0	24	7	0	69	4	14	0	0	102	0	0	NOA
SUM	261	42	165	60	1932	750	4231	563	89	1854	144	1107	3010	149	349	5561	403	2403	4747	30	1949	331	1689	372	124	2953	659	191	SUM
EMC	190	40	136	58	1418	501	3015	567	74	1467	76	894	2357	90	402	3388	362	1598	2175	29	1135	249	1386	169	27	1732	635	175	EMC
EU	40	0	105	0	396	435	528	64	44	346	9	648	1956	64	117	3054	192	1408	1725	0	569	101	694	149	1	1260	9	90	EU
emis	290	50	171	75	2095	767	4842	656	90	1979	227	1161	3081	155	505	6763	494	2461	4893	32	2545	335	1737	382	134	3323	1185	213	emis
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.1 Cont.: 2003 country-to-country blame matrices for **oxidised sulphur** deposition.
Units: 100 Mg of S. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	49	1	0	0	6	0	13	1	0	1	1	4	3	0	0	0	18	0	0	2	8	44	1	384	93	AL
AM	0	0	0	0	0	0	0	1	0	1	3	0	0	0	102	3	0	0	0	1	0	27	1	9	31	0	208	4	AM
AT	0	0	0	2	0	2	0	88	1	9	3	0	24	9	1	9	1	2	0	11	6	0	2	24	18	2	546	411	AT
AZ	0	0	0	0	0	0	0	2	0	2	17	0	0	0	87	10	0	0	0	2	0	62	1	16	35	0	267	6	AZ
BA	0	0	0	4	0	0	0	36	0	22	2	0	5	6	3	9	0	1	0	19	1	0	2	15	28	1	725	150	BA
BE	1	0	0	0	0	14	0	3	1	0	0	0	0	0	0	0	3	0	0	1	27	0	0	9	0	2	296	251	BE
BG	0	0	4	37	0	0	0	42	0	234	19	0	2	6	58	70	0	1	8	18	1	3	3	26	67	2	1701	171	BG
BY	0	2	3	6	0	2	1	328	0	81	78	2	5	15	10	169	2	16	2	6	8	1	1	35	21	3	1295	551	BY
CH	0	0	0	0	0	1	0	5	1	1	0	0	1	0	1	1	2	0	0	8	4	0	2	16	3	1	194	130	CH
CS	0	0	1	28	0	0	0	63	1	115	5	0	4	11	7	22	0	1	1	20	1	0	3	22	46	1	1115	233	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	4	0	4	1	1	6	1	50	10	CY
CZ	0	0	0	2	0	2	0	144	0	7	3	1	6	14	2	7	1	3	0	5	7	0	1	14	10	1	638	540	CZ
DE	4	0	0	1	0	55	1	183	4	7	7	3	5	5	2	11	13	44	0	14	110	0	3	75	11	14	2517	2164	DE
DK	0	0	0	0	0	3	1	26	0	0	2	2	0	1	0	1	2	31	0	1	29	0	0	12	0	6	233	146	DK
EE	0	2	0	1	0	1	0	33	0	8	28	2	1	1	2	11	1	20	0	1	3	0	0	9	4	2	227	119	EE
ES	0	0	0	2	1	1	0	20	108	7	2	0	2	2	1	5	72	1	0	125	7	0	28	173	15	21	2596	2118	ES
FI	0	1	1	2	0	1	3	135	1	27	193	18	2	6	5	32	4	59	0	2	13	0	0	59	11	9	972	491	FI
FR	2	0	0	3	2	13	0	57	32	11	3	1	9	5	3	7	74	3	0	109	121	0	21	184	24	37	2781	2127	FR
GB	0	0	0	0	0	12	0	15	4	1	1	0	0	0	0	1	58	3	0	3	151	0	1	97	1	38	1591	1231	GB
GE	0	0	0	1	0	0	0	3	0	5	17	0	0	0	154	15	0	0	2	3	0	27	1	16	48	1	328	10	GE
GL	0	0	0	0	0	0	0	5	0	0	3	0	0	0	1	0	1	0	0	0	2	0	0	145	3	7	193	28	GL
GR	0	0	1	80	1	0	0	25	0	68	9	0	2	3	64	33	0	1	4	80	1	2	8	31	174	5	1524	570	GR
HR	0	0	0	2	0	0	0	47	0	15	2	0	15	8	1	9	1	1	0	23	1	0	2	13	16	1	486	210	HR
HU	0	0	0	7	0	1	0	112	1	49	4	0	13	44	6	24	1	1	0	13	2	0	1	15	27	1	859	523	HU
IE	0	0	0	0	0	1	0	4	1	0	0	0	0	0	0	1	20	0	0	1	12	0	0	42	1	17	289	194	IE
IS	0	0	0	0	0	0	0	4	0	1	1	0	0	0	0	1	4	0	0	0	3	0	0	51	1	16	140	38	IS
IT	0	0	1	17	6	2	0	91	4	46	5	0	29	13	9	22	4	2	0	219	6	0	23	95	883	13	2969	1343	IT
KZ	0	0	1	2	0	0	0	22	0	18	180	0	0	1	135	121	0	1	2	5	1	74	3	134	96	1	1119	56	KZ
LT	0	2	0	1	0	1	0	123	0	16	20	2	2	5	1	24	1	15	0	2	5	0	0	12	4	2	396	251	LT
LU	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	21	18	LU
LV	0	12	0	1	0	1	0	76	0	13	22	3	1	3	2	20	1	19	0	1	5	0	0	12	5	3	318	184	LV
MD	0	0	16	2	0	0	0	24	0	52	9	0	1	2	7	57	0	1	1	2	1	1	1	7	7	1	260	53	MD
MK	0	0	0	100	0	0	0	6	0	16	1	0	0	1	5	4	0	0	0	8	0	0	1	8	31	1	384	107	MK
MT	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	7	4	MT
NL	0	0	0	0	0	66	0	6	0	0	0	0	0	0	0	0	3	1	0	1	51	0	0	9	0	3	320	250	NL
NO	0	0	0	0	0	4	30	59	1	2	29	8	1	2	1	5	16	20	0	1	48	0	0	102	2	29	616	322	NO
PL	0	1	1	7	0	7	1	2100	1	58	45	5	14	48	5	69	4	49	1	11	26	1	2	50	30	8	3314	2777	PL
PT	0	0	0	0	0	0	0	1	206	0	0	0	0	0	0	0	28	0	0	7	0	0	2	32	0	4	377	303	PT
RO	0	0	10	25	0	1	0	170	1	1263	35	1	8	26	53	189	1	4	9	26	4	4	4	56	82	4	2963	483	RO
RU	0	6	13	30	1	7	6	738	2	339	4521	20	13	38	615	1696	12	74	21	39	38	133	13	705	443	29	11424	1730	RU
SE	0	1	0	1	0	6	14	189	1	12	60	88	3	6	3	12	9	122	0	3	48	0	0	93	5	20	1078	643	SE
SI	0	0	0	1	0	0	0	17	0	4	1	0	51	3	0	3	0	0	0	8	1	0	1	6	8	0	205	139	SI
SK	0	0	0	3	0	1	0	173	0	21	3	0	6	70	4	19	1	1	0	5	2	0	1	10	19	1	593	423	SK
TR	0	0	3	19	1	0	0	47	1	95	66	0	2	4	3906	150	1	2	30	121	1	314	45	154	692	16	6173	267	TR
UA	0	1	24	22	1	3	1	622	1	412	220	3	12	51	116	1712	3	16	20	26	13	13	6	111	99	10	4573	1139	UA
ATL	1	1	0	3	0	34	27	323	155	32	735	21	9	16	11	61	2097	49	0	42	319	2	12	7383	47	2447	17715	4263	ATL
BAS	0	3	0	3	0	9	5	500	1	37	89	42	5	15	6	35	7	434	0	5	56	0	1	72	11	27	2018	1148	BAS
BLS	0	0	13	18	0	1	0	142	0	292	202	1	3	12	459	611	1	5	127	27	4	31	8	64	113	26	2859	337	BLS
MED	0	0	6	136	72	4	0	341	29	358	51	2	49	43	1007	196	30	10	21	3408	20	124	394	542	2281	234	14351	3797	MED
NOS	1	0	0	1	0	62	15	177	7	5	12	11	3	7	1	12	84	49	0	7	1072	0	1	253	4	181	4112	2393	NOS
ASI	0	0	0	3	0	0	0	13	0	15	106	0	0	1	743	71	0	1	2	32	1	1079	23	162	226	5	2658	70	ASI
NOA	0	0	0	12	9	0	0	32	6	32	5	0	3	3	53	16	5	1	1	295	2	8	381	194	190	31	1772	414	NOA
SUM	15	33	99	634	102	320	108	7379	576	3820	6818	241	312	508	7677	5561	2571	1067	255	4790	2236	1913	1008	11378	5925	3285	104750	35429	SUM
EMC	12	32	81	478	29	215	64	6150	383	3149	6696	177	247	426	6207	4757	360	582	108	1305	792	1757	593	3172	3497	386		24248	EMC
EU	11	18	4	130	13	190	21	3620	366	363	412	126	170	238	131	313	302	379	7	627	633	9	97	1063	1257	210		17229	EU
emis	16	38	106	752	128	323	114	7820	1026	4165	7368	261	328	530	10558	6259	3109	1140	285	5945	2270	4270	2065	0	10000	3715	113232	39348	emis
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.2: 2003 country-to-country blame matrices for **oxidised nitrogen** deposition.
Units: 100 Mg of N. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	6	0	2	0	2	0	6	0	0	8	0	2	4	0	0	2	0	3	1	0	23	1	2	0	0	24	0	0	AL
AM	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	AM
AT	0	0	77	0	2	8	1	1	9	3	0	31	109	2	0	7	0	31	12	0	1	4	7	0	0	82	0	0	AT
AZ	0	1	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	0	AZ
BA	1	0	10	0	19	2	2	0	1	19	0	11	19	1	0	5	0	10	3	0	4	9	15	0	0	53	0	0	BA
BE	0	0	0	0	0	27	0	0	0	0	0	1	17	1	0	8	0	43	35	0	0	0	0	1	0	2	0	0	BE
BG	3	0	6	0	4	1	106	1	1	22	0	8	15	1	0	3	1	5	3	1	31	2	12	0	0	18	0	0	BG
BY	0	0	9	0	2	7	6	43	2	6	0	19	60	13	4	3	10	18	21	0	3	3	13	1	0	17	0	15	BY
CH	0	0	3	0	0	4	0	0	20	0	0	1	23	1	0	11	0	37	9	0	0	0	0	0	0	54	0	0	CH
CS	4	0	11	0	12	2	16	1	1	63	0	14	23	1	0	5	0	9	4	0	15	6	25	0	0	46	0	0	CS
CY	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	CY
CZ	0	0	28	0	1	11	1	1	5	3	0	77	116	4	0	5	1	27	18	0	1	2	9	1	0	28	0	0	CZ
DE	0	0	33	0	1	111	0	2	31	2	0	72	711	22	1	53	4	254	221	0	1	2	5	6	0	70	0	1	DE
DK	0	0	1	0	0	7	0	0	1	0	0	4	32	10	0	4	1	14	46	0	0	0	1	2	0	3	0	0	DK
EE	0	0	1	0	0	2	0	4	1	0	0	3	16	6	6	1	15	5	11	0	0	0	1	0	0	3	0	3	EE
ES	0	0	5	0	1	6	0	0	2	1	0	5	23	1	0	1070	0	78	23	0	1	2	2	2	0	38	0	0	ES
FI	0	0	5	0	0	8	1	8	2	1	0	14	55	20	13	5	130	21	44	0	0	1	5	2	0	10	0	5	FI
FR	0	0	17	0	2	64	1	1	19	2	0	17	138	5	0	448	1	631	183	0	2	5	6	10	0	147	0	0	FR
GB	0	0	2	0	0	22	0	1	1	0	0	4	41	5	0	40	1	82	404	0	0	0	1	33	1	7	0	0	GB
GE	0	2	0	7	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	13	1	0	0	0	0	1	0	0	GE
GL	0	0	0	0	0	1	0	0	0	0	0	1	4	1	0	1	0	3	13	0	0	0	0	1	1	1	0	0	GL
GR	6	0	4	0	3	1	46	1	1	12	0	4	11	1	0	5	0	5	3	0	122	2	5	0	0	31	0	0	GR
HR	1	0	15	0	7	2	1	0	2	8	0	12	22	1	0	7	0	12	3	0	2	10	15	0	0	64	0	0	HR
HU	1	0	22	0	6	3	5	1	2	17	0	25	35	1	0	4	1	13	6	0	4	9	49	0	0	44	0	0	HU
IE	0	0	1	0	0	5	0	0	0	0	0	1	7	1	0	11	0	20	44	0	0	0	0	9	0	1	0	0	IE
IS	0	0	1	0	0	3	0	0	1	0	0	1	10	1	0	3	0	9	22	0	0	0	0	3	6	2	0	0	IS
IT	4	0	40	0	17	9	8	1	19	23	0	22	83	3	0	64	1	111	16	0	17	21	23	1	0	810	0	0	IT
KZ	0	1	1	6	0	1	2	4	0	1	0	2	7	2	0	2	3	3	5	5	2	0	1	0	0	4	27	1	KZ
LT	0	0	4	0	0	4	1	6	1	2	0	9	33	11	2	2	6	11	15	0	1	1	4	1	0	7	0	8	LT
LU	0	0	0	0	0	2	0	0	0	0	0	0	3	0	0	1	0	5	2	0	0	0	0	0	0	0	0	0	LU
LV	0	0	2	0	0	3	1	7	1	1	0	6	28	12	3	2	10	9	16	0	0	0	2	1	0	5	0	7	LV
MD	0	0	1	0	0	1	4	1	0	2	0	2	6	1	0	1	0	2	2	0	1	0	2	0	0	3	0	0	MD
MK	3	0	1	0	1	0	10	0	0	8	0	1	3	0	0	1	0	2	1	0	25	1	2	0	0	10	0	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	MT
NL	0	0	0	0	0	19	0	0	0	0	0	1	21	1	0	6	0	26	49	0	0	0	0	1	0	1	0	0	NL
NO	0	0	3	0	0	16	0	1	2	0	0	10	75	31	1	10	6	36	157	0	0	0	2	9	1	5	0	1	NO
PL	1	0	37	0	4	27	6	11	8	13	0	92	261	36	2	12	11	61	80	0	3	7	35	3	0	53	0	8	PL
PT	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	87	0	5	3	0	0	0	0	0	0	2	0	0	PT
RO	3	0	21	0	11	5	63	4	3	41	0	27	52	4	0	7	2	19	12	1	19	9	47	1	0	55	0	1	RO
RU	2	5	27	18	4	37	25	121	8	18	1	58	222	47	27	26	114	86	129	29	17	7	31	7	1	62	35	31	RU
SE	0	0	9	0	0	22	0	4	3	1	0	25	126	61	4	12	36	44	141	0	0	1	6	6	0	15	0	5	SE
SI	0	0	13	0	1	1	0	0	1	2	0	5	13	0	0	3	0	5	1	0	1	4	4	0	0	36	0	0	SI
SK	0	0	12	0	3	3	3	1	2	8	0	24	29	1	0	2	1	9	6	0	2	4	24	0	0	20	0	0	SK
TR	2	4	5	4	2	2	35	3	1	9	9	7	19	2	0	9	1	10	8	9	38	2	7	0	0	29	1	1	TR
UA	2	0	24	1	6	14	39	38	4	24	0	50	118	14	3	8	11	32	36	2	15	8	45	2	0	49	3	10	UA
ATL	0	0	39	0	-1	173	0	6	22	1	0	73	533	89	3	568	50	629	1338	0	0	4	6	159	43	97	0	4	ATL
BAS	0	0	14	0	1	22	1	9	5	3	0	35	166	62	9	14	52	53	102	0	1	2	11	4	0	23	0	10	BAS
BLS	2	1	9	2	2	4	44	10	2	13	1	14	35	4	1	3	3	10	12	7	18	3	14	1	0	19	1	2	BLS
MED	25	0	77	1	38	29	105	3	29	80	17	63	191	12	0	559	3	363	84	2	319	46	57	5	1	1101	0	1	MED
NOS	0	0	8	0	1	87	0	2	6	1	0	24	220	46	1	73	5	232	877	0	0	1	5	42	2	20	0	2	NOS
ASI	0	3	1	29	0	1	3	2	0	2	13	2	7	1	0	3	2	4	4	9	8	0	1	0	0	7	8	0	ASI
NOA	5	0	13	0	6	6	24	2	5	16	2	11	41	2	0	160	1	74	20	0	79	7	9	1	0	200	0	1	NOA
SUM	73	24	616	99	158	786	571	303	229	437	45	896	3785	538	81	3338	481	3173	4244	88	778	189	513	319	58	3381	80	122	SUM
EMC	47	23	478	96	118	487	422	303	169	342	27	709	2741	358	94	2129	467	1923	1904	79	442	134	430	111	13	2142	78	117	EMC
EU	13	0	313	0	42	366	76	48	111	91	2	444	1909	204	31	1853	217	1512	1378	1	157	66	190	81	3	1418	1	40	EU
emis	88	46	697	131	167	905	636	426	272	481	66	987	4346	635	119	4294	666	3714	4778	134	968	210	547	364	85	3855	153	160	emis
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.2 Cont.: 2003 country-to-country blame matrices for **oxidised nitrogen** deposition.
Units: 100 Mg of N. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	8	0	0	0	3	0	4	1	0	0	1	2	1	0	0	0	21	0	0	0	0	0	0	129	67	AL
AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	15	1	0	0	0	1	0	2	0	1	0	0	35	2	AM
AT	1	0	0	0	0	9	1	26	0	2	2	1	10	4	0	2	2	3	0	9	7	0	0	0	0	0	466	419	AT
AZ	0	0	0	0	0	0	0	0	0	0	15	0	0	0	14	2	0	0	0	1	0	10	0	1	0	0	81	3	AZ
BA	0	0	0	1	0	2	0	17	0	7	1	1	3	5	1	3	1	1	0	21	2	0	0	0	0	0	254	162	BA
BE	1	0	0	0	0	12	1	1	1	0	0	0	0	0	0	0	5	1	0	1	21	0	0	4	0	0	184	151	BE
BG	0	0	4	9	0	2	0	18	0	69	18	1	1	5	20	24	1	2	10	18	2	0	0	-2	0	0	451	135	BG
BY	0	6	3	1	0	12	4	115	0	21	65	9	2	9	2	48	3	26	1	4	13	0	0	-1	0	0	619	366	BY
CH	0	0	0	0	0	4	0	1	1	0	0	0	1	0	0	0	1	0	0	6	4	0	0	0	0	0	188	153	CH
CS	0	0	1	7	0	3	1	29	0	29	3	1	3	8	2	6	1	2	1	21	2	0	0	-1	0	0	378	199	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	5	0	0	0	0	0	0	21	4	CY
CZ	1	0	0	0	0	13	1	49	0	2	3	2	4	6	0	2	2	6	0	4	11	0	0	1	0	0	449	401	CZ
DE	9	1	0	0	0	127	7	66	4	2	7	9	3	3	1	4	22	35	0	11	124	0	0	17	0	1	2057	1788	DE
DK	0	0	0	0	0	12	3	8	0	0	1	3	0	0	0	0	4	14	0	0	26	0	0	1	0	0	201	148	DK
EE	0	4	0	0	0	3	3	13	0	2	13	9	0	1	0	3	1	23	0	0	6	0	0	0	0	0	162	105	EE
ES	0	0	0	0	0	4	1	7	112	1	1	0	2	1	0	1	88	1	0	151	12	0	3	-9	0	0	1640	1382	ES
FI	0	6	1	0	0	13	21	52	0	5	74	50	1	4	0	7	6	72	0	2	21	0	0	3	0	0	689	463	FI
FR	5	0	0	0	0	43	3	23	30	3	3	3	6	3	1	3	101	4	0	99	121	0	2	15	0	1	2169	1782	FR
GB	1	0	0	0	0	29	5	8	5	1	3	3	0	0	0	1	75	5	0	3	118	0	0	29	0	2	935	689	GB
GE	0	0	0	0	0	0	0	1	0	1	16	0	0	0	25	3	0	0	2	2	0	3	0	1	0	0	83	6	GE
GL	0	0	0	0	0	2	1	2	0	0	1	1	0	0	0	0	2	1	0	0	3	0	0	15	0	0	53	30	GL
GR	0	0	2	14	0	1	0	8	0	21	6	0	1	2	28	10	1	1	6	89	1	0	1	-1	0	0	454	205	GR
HR	0	0	0	1	0	2	0	18	0	5	1	1	7	5	0	3	1	1	0	24	2	0	0	1	0	0	255	188	HR
HU	0	0	0	2	0	4	1	47	0	12	3	1	7	17	1	7	1	2	0	11	3	0	0	1	0	0	370	285	HU
IE	0	0	0	0	0	4	1	1	1	0	0	0	0	0	0	0	23	1	0	1	16	0	0	5	0	0	156	108	IE
IS	0	0	0	0	0	3	1	1	0	0	0	0	0	0	0	0	5	1	0	0	5	0	0	6	0	0	85	61	IS
IT	1	0	1	5	2	10	1	36	4	14	4	1	17	9	3	6	6	4	1	254	8	0	2	4	1	0	1685	1279	IT
KZ	0	1	1	0	0	2	2	8	0	5	233	2	0	1	23	33	1	3	2	4	2	8	0	31	0	0	442	47	KZ
LT	0	4	0	0	0	7	2	43	0	5	13	8	1	3	0	7	2	24	0	1	10	0	0	-1	0	0	255	181	LT
LU	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	18	15	LU
LV	0	7	0	0	0	6	3	28	0	3	15	11	0	2	0	6	2	29	0	1	10	0	0	-1	0	0	238	159	LV
MD	0	0	2	0	0	1	0	10	0	16	8	0	0	1	2	17	0	1	2	2	1	0	0	0	0	0	95	35	MD
MK	0	0	0	11	0	0	0	3	0	4	1	0	0	1	2	1	0	0	0	8	0	0	0	0	0	0	103	51	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	1	MT
NL	1	0	0	0	0	27	1	1	1	0	0	1	0	0	0	0	6	1	0	1	30	0	0	5	0	0	201	156	NL
NO	1	0	0	0	0	25	66	19	1	0	7	21	0	1	0	0	17	27	0	1	61	0	0	8	0	0	620	428	NO
PL	1	3	1	1	0	44	9	379	1	15	31	20	8	23	2	20	8	72	0	9	48	0	0	4	0	0	1471	1201	PL
PT	0	0	0	0	0	0	0	1	105	0	0	0	0	0	0	0	43	0	0	10	1	0	0	-2	0	0	261	207	PT
RO	0	1	7	7	0	7	1	74	1	237	31	2	5	21	17	57	2	6	10	22	6	0	0	-3	0	0	920	383	RO
RU	2	22	13	5	0	55	39	242	2	85	3356	58	6	23	125	459	21	94	22	28	57	14	1	58	1	-2	5979	1331	RU
SE	1	3	0	0	0	36	54	74	1	2	24	91	1	4	0	3	14	116	0	2	82	0	0	7	0	0	1039	724	SE
SI	0	0	0	0	0	1	0	6	0	1	1	0	11	2	0	1	0	0	0	8	1	0	0	0	0	0	125	103	SI
SK	0	0	0	1	0	4	1	61	0	6	3	1	4	15	1	5	1	3	0	4	3	0	0	1	0	0	268	219	SK
TR	0	0	4	4	0	3	1	20	1	37	74	1	1	4	978	54	2	3	42	123	3	23	5	0	1	0	1605	178	TR
UA	1	4	17	5	0	20	5	232	1	119	205	10	6	30	35	345	4	26	23	20	18	1	0	1	0	-1	1688	735	UA
ATL	8	2	0	0	0	212	163	95	125	2	132	57	5	8	1	6	1158	72	0	35	439	0	1	558	0	17	6934	4275	ATL
BAS	1	7	1	0	0	35	24	125	1	6	35	67	2	7	0	8	11	182	0	4	66	0	0	3	0	1	1186	823	BAS
BLS	0	1	12	4	0	7	2	45	0	83	165	3	2	7	134	158	2	7	72	28	7	2	1	-24	0	0	955	215	BLS
MED	2	0	7	32	18	31	6	100	29	85	30	4	27	24	367	47	49	15	30	2393	40	11	37	-34	4	0	6565	3117	MED
NOS	3	1	0	0	0	117	55	48	7	1	7	21	1	3	1	3	103	47	0	6	400	0	0	37	0	5	2520	1842	NOS
ASI	0	0	1	1	0	1	1	6	0	5	114	1	0	1	266	20	1	2	4	63	2	104	5	42	0	0	755	66	ASI
NOA	0	0	1	8	4	6	2	17	9	19	12	1	3	4	58	10	15	2	5	547	8	2	45	99	0	-1	1562	665	NOA
SUM	45	75	79	130	26	961	495	2189	446	939	4738	477	155	268	2141	1399	1811	937	235	4078	1824	183	106	881	12	23	50057	27738	SUM
EMC	30	76	61	94	7	587	268	1862	284	774	4673	370	119	224	1640	1205	498	692	134	1616	907	170	67	343	8	0		18119	EMC
EU	23	28	5	25	3	411	118	939	267	97	205	214	77	99	50	89	411	417	8	676	683	1	9	84	3	5		12175	EU
emis	52	113	92	152	28	1107	669	2423	807	1062	7030	627	170	298	2895	1593	2703	1071	262	4988	1972	514	292	0	0	0	60852	32727	emis
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.3: 2003 country-to-country blame matrices for **reduced nitrogen** deposition.
Units: 100 Mg of N. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	75	0	1	0	0	0	2	0	0	12	0	1	2	0	0	1	0	1	0	0	16	1	1	0	0	9	0	0	AL
AM	0	48	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	AM
AT	1	0	145	0	1	4	1	1	17	3	0	33	157	2	0	7	0	24	4	0	1	8	8	0	0	133	0	0	AT
AZ	0	5	0	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	AZ
BA	2	0	5	0	58	1	1	1	1	17	0	5	12	0	0	4	0	5	1	0	2	29	11	0	0	29	0	0	BA
BE	0	0	0	0	0	131	0	0	1	0	0	0	20	1	0	6	0	80	8	0	0	0	0	1	0	1	0	0	BE
BG	7	0	2	0	2	1	128	2	1	28	0	4	9	1	0	2	0	3	1	3	34	3	8	0	0	11	0	0	BG
BY	1	0	4	0	3	3	6	401	2	9	0	10	43	8	0	2	2	13	7	1	2	5	12	1	0	19	0	29	BY
CH	0	0	2	0	0	2	0	0	152	0	0	1	28	0	0	10	0	57	3	0	0	1	0	0	0	111	0	0	CH
CS	19	0	4	0	12	1	9	1	1	209	0	6	12	1	0	3	0	5	1	0	8	14	24	0	0	23	0	0	CS
CY	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	CY
CZ	0	0	29	0	0	4	1	1	6	2	0	174	141	3	0	4	0	20	4	0	1	4	7	1	0	28	0	0	CZ
DE	0	0	26	0	0	75	0	3	72	2	0	43	2125	28	0	39	1	263	43	0	1	3	3	7	0	66	0	1	DE
DK	0	0	1	0	0	4	0	1	1	0	0	2	57	169	0	3	0	15	10	0	0	0	0	2	0	2	0	0	DK
EE	0	0	1	0	0	1	1	6	1	1	0	2	11	4	18	1	3	5	4	0	0	0	1	0	0	3	0	4	EE
ES	1	0	3	0	0	2	0	0	2	2	0	2	14	0	0	1389	0	119	6	0	2	3	3	2	0	30	0	0	ES
FI	0	0	3	0	1	3	3	14	2	2	0	8	40	14	5	5	125	18	18	0	1	1	4	3	0	11	0	7	FI
FR	1	0	6	0	2	49	1	1	40	3	0	5	99	4	0	310	0	2846	40	0	3	6	4	11	0	157	0	0	FR
GB	0	0	1	0	0	17	0	0	2	0	0	1	35	4	0	21	0	153	793	0	0	0	0	89	0	4	0	0	GB
GE	0	10	0	17	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	265	0	0	0	0	0	1	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	1	0	3	6	0	0	0	0	2	0	1	0	0	GL
GR	18	0	2	0	1	0	17	1	1	12	0	2	7	0	0	3	0	3	1	1	200	3	4	0	0	14	0	0	GR
HR	1	0	9	0	9	1	0	1	1	8	0	6	16	1	0	5	0	7	1	0	1	99	17	0	0	47	0	0	HR
HU	2	0	19	0	4	1	3	1	1	20	0	12	21	1	0	4	0	7	1	0	2	35	145	0	0	36	0	0	HU
IE	0	0	0	0	0	3	0	0	0	0	0	0	6	1	0	8	0	36	28	0	0	0	0	345	0	2	0	0	IE
IS	0	0	1	0	0	2	0	0	1	0	0	1	8	1	0	2	0	9	10	0	0	0	0	4	8	3	0	0	IS
IT	9	0	15	0	7	5	3	2	23	18	0	10	57	2	0	35	0	71	5	0	9	28	13	1	0	1627	0	0	IT
KZ	0	3	0	6	1	0	2	5	0	1	0	1	3	1	0	1	1	1	1	19	2	0	1	0	0	2	36	1	KZ
LT	0	0	2	0	1	2	1	26	1	2	0	5	26	7	0	1	1	10	4	0	0	1	3	1	0	7	0	91	LT
LU	0	0	0	0	0	4	0	0	0	0	0	0	4	0	0	1	0	9	1	0	0	0	0	0	0	0	0	0	LU
LV	0	0	1	0	0	1	1	17	1	1	0	4	21	7	2	1	2	8	4	0	0	1	2	1	0	4	0	22	LV
MD	0	0	1	0	0	0	1	2	0	2	0	1	4	0	0	1	0	2	1	1	1	1	2	0	0	2	0	0	MD
MK	15	0	0	0	0	0	5	0	0	14	0	1	2	0	0	1	0	1	0	0	19	1	1	0	0	5	0	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MT
NL	0	0	0	0	0	42	0	0	1	0	0	0	66	1	0	3	0	36	11	0	0	0	0	1	0	0	0	0	NL
NO	0	0	2	0	0	9	0	3	2	0	0	7	70	35	0	7	2	37	61	0	0	1	2	11	0	5	0	1	NO
PL	1	0	20	0	3	9	3	36	8	12	0	93	230	27	1	10	2	43	17	0	2	13	23	3	0	53	0	13	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	48	0	4	0	0	0	0	0	0	0	2	0	0	PT
RO	5	0	9	0	6	2	33	8	2	46	0	12	33	3	0	7	0	12	5	4	12	14	41	1	0	43	1	1	RO
RU	5	13	11	26	8	16	23	190	7	24	1	30	154	30	9	20	30	63	54	211	10	10	28	7	0	56	27	32	RU
SE	0	0	4	0	1	10	1	8	3	2	0	14	110	70	2	9	15	40	38	0	1	2	5	6	0	13	0	6	SE
SI	0	0	11	0	1	1	0	0	1	1	0	3	11	0	0	2	0	3	1	0	0	17	3	0	0	38	0	0	SI
SK	1	0	10	0	2	1	2	1	1	8	0	20	20	1	0	2	0	7	2	0	2	7	26	0	0	19	0	1	SK
TR	4	13	2	8	1	1	11	5	1	8	7	3	9	1	0	6	0	5	2	45	20	2	4	0	0	21	2	1	TR
UA	5	1	12	2	7	6	26	101	3	29	0	26	82	10	0	8	3	22	14	9	11	14	39	2	0	47	2	11	UA
ATL	1	0	25	0	4	87	2	19	26	5	0	39	402	71	3	326	16	1113	677	1	1	7	12	379	14	108	1	8	ATL
BAS	1	0	7	0	1	11	3	19	5	3	0	20	210	148	7	10	29	49	25	0	2	3	8	5	0	19	0	17	BAS
BLS	3	3	3	4	2	1	25	18	1	13	0	6	20	3	0	3	1	7	4	40	10	4	9	1	0	15	2	2	BLS
MED	51	1	28	1	22	9	40	9	21	66	14	25	88	5	1	333	1	281	17	5	127	62	37	3	0	637	1	2	MED
NOS	0	0	4	0	0	94	0	5	7	1	0	7	337	123	0	44	1	531	469	0	0	1	4	59	0	14	0	2	NOS
ASI	1	7	0	20	0	0	-1	3	0	1	1	1	3	0	0	1	0	1	1	30	0	0	0	0	0	2	5	0	ASI
NOA	4	0	3	0	1	1	1	1	2	6	0	3	11	1	0	56	0	36	3	0	7	4	4	0	0	42	0	0	NOA
SUM	237	104	435	170	167	616	356	915	423	594	28	648	4836	789	51	2766	238	6086	2408	707	513	411	521	949	23	3522	82	257	SUM
EMC	182	101	372	166	138	422	290	894	366	511	13	563	3892	464	50	2057	218	4139	1246	662	374	337	459	507	9	2747	78	245	EMC
EU	36	0	299	1	26	368	39	121	186	91	3	432	3276	346	28	1911	150	3819	1043	3	226	134	254	473	0	2250	2	147	EU
emis	264	124	449	206	189	631	431	991	428	651	46	678	4945	805	64	3261	273	6197	2470	799	601	420	550	957	25	3681	148	280	emis
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.3 Cont.: 2003 country-to-country blame matrices for **reduced nitrogen** deposition.
Units: 100 Mg of N. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	6	0	0	0	1	0	3	1	0	0	0	1	1	0	0	0	-1	0	0	1	2	0	0	140	35	AL
AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	35	1	0	0	0	0	0	32	0	2	0	0	170	2	AM
AT	1	0	0	0	0	6	0	21	1	3	1	1	15	3	0	3	0	0	0	1	1	0	1	5	0	0	614	565	AT
AZ	0	0	0	0	0	0	0	1	0	0	17	0	0	0	15	2	0	0	0	0	0	39	1	3	0	0	196	3	AZ
BA	0	0	0	1	0	1	0	7	0	6	1	0	2	2	1	3	0	0	0	0	0	0	1	4	0	0	216	89	BA
BE	5	0	0	0	0	29	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-3	0	0	1	0	0	282	283	BE
BG	0	0	5	11	0	1	0	10	0	59	13	0	1	3	12	21	0	0	0	1	0	1	2	6	0	0	396	91	BG
BY	0	8	6	1	0	6	1	107	0	27	38	5	2	6	1	84	1	-1	0	1	1	0	1	8	0	0	888	291	BY
CH	0	0	0	0	0	3	0	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	4	0	0	382	221	CH
CS	0	0	1	8	0	1	0	10	0	30	3	0	1	5	1	6	0	0	0	0	0	0	1	5	0	0	431	108	CS
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	2	1	0	0	0	11	4	CY
CZ	0	0	0	0	0	8	0	48	0	2	1	1	2	6	0	2	0	0	0	1	0	0	1	3	0	0	509	482	CZ
DE	16	0	0	0	0	211	0	51	5	2	0	5	2	1	0	3	0	-6	0	2	-10	0	2	11	0	0	3097	3010	DE
DK	0	0	0	0	0	10	1	6	0	0	0	3	0	0	0	0	0	-3	0	0	-3	0	0	2	0	0	285	286	DK
EE	0	6	0	0	0	2	1	11	0	2	6	5	0	0	0	4	0	0	0	0	1	0	0	2	0	0	108	81	EE
ES	0	0	0	0	0	2	0	5	128	2	1	0	1	1	0	2	-5	0	0	-11	1	0	17	33	-1	-2	1756	1709	ES
FI	0	5	1	0	0	6	5	46	1	7	30	25	1	3	2	12	1	1	0	1	3	0	0	14	0	0	452	350	FI
FR	7	0	0	1	0	25	0	9	32	3	1	1	4	2	1	2	-7	0	0	1	-14	0	14	37	0	-2	3703	3615	FR
GB	1	0	0	0	0	21	0	3	4	0	0	1	0	0	0	0	-5	0	0	0	-10	0	0	15	0	-3	1149	1148	GB
GE	0	0	0	0	0	0	0	1	0	1	29	0	0	0	48	3	0	0	0	0	0	16	1	4	0	0	401	4	GE
GL	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	56	21	GL
GR	0	0	2	10	0	1	0	6	0	15	6	0	1	1	17	9	0	0	0	-1	0	1	6	7	0	0	373	246	GR
HR	0	0	0	0	0	1	0	8	0	4	1	0	11	3	0	3	0	0	0	-1	0	0	1	3	0	0	265	134	HR
HU	0	0	1	1	0	2	0	18	0	24	2	0	6	27	1	8	0	0	0	0	0	0	1	3	0	0	412	305	HU
IE	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	-3	0	0	0	-2	0	0	8	0	-2	434	433	IE
IS	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	11	0	0	71	47	IS
IT	1	0	1	2	0	6	0	15	3	11	3	1	12	4	2	7	1	0	0	-12	2	0	14	21	-1	0	2032	1891	IT
KZ	0	0	1	0	0	0	0	6	0	4	114	1	0	0	26	23	0	0	0	1	0	32	2	27	1	0	330	23	KZ
LT	0	7	1	0	0	4	1	47	0	5	10	4	1	2	0	9	0	-1	0	0	1	0	0	3	0	0	285	225	LT
LU	6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	26	LU
LV	0	37	1	0	0	3	1	24	0	3	7	6	0	1	0	7	0	0	0	0	1	0	0	3	0	0	197	152	LV
MD	0	0	51	0	0	1	0	5	0	27	6	0	0	1	1	27	0	0	0	0	0	0	0	2	0	0	146	23	MD
MK	0	0	0	35	0	0	0	1	0	3	1	0	0	0	1	1	0	0	0	0	0	0	1	2	0	0	113	33	MK
MT	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	MT
NL	1	0	0	0	0	248	0	0	0	0	0	0	0	0	0	0	-1	-1	0	0	-4	0	0	0	0	0	405	410	NL
NO	1	1	0	0	0	16	74	24	1	1	3	13	0	1	0	2	2	2	0	0	5	0	0	24	0	1	428	307	NO
PL	1	3	1	1	0	25	2	1077	1	16	15	11	6	28	0	28	1	-6	0	2	0	0	1	10	0	0	1847	1698	PL
PT	0	0	0	0	0	0	0	0	233	0	0	0	0	0	0	0	-4	0	0	-1	0	0	1	6	0	-1	291	290	PT
RO	0	1	28	4	0	4	0	36	1	552	24	1	3	12	9	69	0	0	0	2	1	2	2	14	0	0	1067	238	RO
RU	1	17	20	4	0	28	8	201	2	90	2881	29	4	14	127	371	3	10	1	5	11	59	9	151	2	3	5146	847	RU
SE	1	3	0	0	0	21	20	65	1	4	10	181	1	2	1	5	2	0	0	1	3	0	0	21	0	1	700	615	SE
SI	0	0	0	0	0	1	0	3	0	1	0	0	39	1	0	1	0	0	0	0	0	0	0	1	0	0	143	118	SI
SK	0	0	0	1	0	2	0	42	0	6	2	0	2	52	1	7	0	0	0	1	0	0	0	2	0	0	252	208	SK
TR	0	0	4	2	0	1	0	12	1	18	48	1	1	2	1164	35	0	0	-1	2	0	185	28	35	-2	0	1717	98	TR
UA	1	3	56	4	0	11	1	182	1	146	129	6	5	24	20	820	1	1	-1	3	3	4	4	26	1	1	1944	525	UA
ATL	7	3	1	1	0	117	40	118	117	9	59	30	6	8	2	23	-11	12	0	7	20	1	6	1614	1	-2	5535	3674	ATL
BAS	1	10	1	1	0	27	7	145	1	8	17	81	1	4	1	12	1	-16	0	1	-3	0	1	15	0	-1	918	837	BAS
BLS	0	1	20	2	0	2	1	33	0	69	119	2	1	3	84	138	0	1	-3	1	1	11	4	14	0	0	707	131	BLS
MED	1	1	10	16	6	11	1	52	20	72	31	3	16	12	278	50	1	1	-1	-44	3	58	235	116	-1	-3	2832	1729	MED
NOS	3	1	0	0	0	172	17	31	8	1	2	13	1	2	0	4	-1	-6	0	1	-33	0	1	50	0	-4	1967	1920	NOS
ASI	0	0	1	0	0	0	0	4	0	2	67	0	0	0	77	9	0	0	0	-7	0	783	10	27	-8	-1	1045	17	ASI
NOA	0	0	1	1	0	1	0	8	4	7	3	0	1	1	8	5	0	0	0	-17	1	2	491	38	-6	-1	736	184	NOA
SUM	57	108	218	115	8	1042	181	2508	573	1247	3705	433	153	239	1947	1824	-20	-9	-5	-58	-20	1231	866	2446	-16	-15	47607	29784	SUM
EMC	45	108	189	96	3	731	121	2218	428	1102	3673	325	129	213	1582	1629	-8	1	-1	-23	-3	1161	620	663	-16	-4		21966	EMC
EU	41	61	9	18	1	635	30	1498	414	106	95	245	94	134	31	110	-20	-15	0	-15	-33	4	61	208	-3	-10		18151	EU
emis	58	125	228	132	12	1054	188	2676	767	1351	4653	458	158	249	2644	1996	0	0	0	0	0	2289	1935	0	0	0	51537	31448	emis
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.4: 2003 country-to-country blame matrices for **$AOT40_f^{3m}$**.
Units: ppb.h per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	325	1	59	2	76	4	155	7	14	328	0	45	93	3	1	96	6	141	9	4	268	56	91	2	1	442	2	2	AL
AM	0	133	2	59	1	1	3	5	1	2	1	3	10	1	1	10	2	11	4	50	3	1	3	1	0	8	4	1	AM
AT	1	0	571	0	10	10	6	11	75	15	0	137	642	5	1	100	4	368	15	1	9	37	41	8	2	471	1	4	AT
AZ	0	7	1	106	0	0	1	3	0	1	0	1	6	1	1	4	2	6	3	29	1	0	1	1	0	3	5	1	AZ
BA	16	0	147	1	417	6	28	10	18	249	0	113	206	5	1	85	5	194	12	2	38	198	217	3	2	450	2	2	BA
BE	0	0	12	0	1	-379	2	3	7	2	0	9	182	4	1	68	4	580	-117	0	2	2	3	18	2	23	0	2	BE
BG	12	1	43	1	21	4	776	20	8	148	0	41	98	7	2	45	9	67	14	4	133	17	99	3	1	93	4	7	BG
BY	0	0	6	0	1	0	2	195	2	4	0	12	71	16	3	14	9	33	13	0	1	2	8	4	1	11	3	36	BY
CH	1	0	58	0	3	9	3	3	522	4	0	17	327	0	0	186	2	935	3	1	6	7	10	7	2	451	1	1	CH
CS	38	1	91	1	110	5	145	8	13	673	0	82	152	5	1	77	6	128	12	3	88	67	193	3	1	270	2	3	CS
CY	4	5	9	4	8	2	33	8	3	15	609	9	26	3	1	28	4	30	8	11	103	6	12	2	1	58	2	2	CY
CZ	1	0	150	0	5	2	3	16	29	11	0	252	594	13	2	63	7	249	13	1	3	19	60	10	2	106	1	5	CZ
DE	0	0	37	0	2	-18	2	7	49	3	0	33	786	11	1	71	8	398	-15	1	2	3	7	13	2	75	1	3	DE
DK	0	0	3	0	0	-27	0	10	1	0	0	3	107	-29	4	19	15	59	-25	0	0	1	2	24	3	4	1	7	DK
EE	0	0	1	0	0	-2	1	18	1	1	0	4	42	24	40	8	18	24	13	0	0	1	2	6	1	2	1	17	EE
ES	0	0	7	0	3	1	3	1	5	4	0	3	18	0	0	1374	1	201	9	0	4	4	5	4	1	66	0	0	ES
FI	0	0	1	0	0	0	0	7	0	0	0	2	18	7	13	4	54	8	8	0	0	0	1	3	0	1	0	6	FI
FR	0	0	19	0	2	11	2	2	47	3	0	11	171	0	0	345	2	1520	1	0	4	6	7	10	2	130	0	1	FR
GB	0	0	4	0	0	-22	1	3	2	0	0	2	45	10	1	19	7	75	-377	0	1	1	2	38	2	8	0	2	GB
GE	0	13	3	45	1	1	6	11	1	3	2	5	15	3	1	10	4	11	7	204	3	1	5	1	0	8	3	2	GE
GL	0	0	1	0	0	0	0	1	0	0	0	1	5	2	0	1	1	5	8	0	0	0	1	3	6	1	0	1	GL
GR	53	1	35	1	28	3	359	13	9	109	0	29	71	4	1	59	6	74	11	3	870	22	52	2	1	223	3	4	GR
HR	5	0	239	1	128	6	13	14	25	93	0	152	299	6	1	77	4	205	12	2	19	458	261	5	2	527	1	3	HR
HU	2	0	213	0	30	6	19	22	21	85	0	172	297	10	1	56	6	158	15	1	10	123	641	5	2	222	2	9	HU
IE	0	0	4	0	0	-6	1	3	1	0	0	2	13	4	1	22	3	82	-66	0	0	1	2	75	2	8	1	2	IE
IS	0	0	1	0	0	-2	0	1	0	0	0	0	7	2	0	10	2	10	19	0	0	0	1	9	9	4	0	0	IS
IT	8	0	100	1	32	6	21	5	62	43	0	35	172	1	0	162	2	480	10	2	40	54	49	5	2	1357	1	2	IT
KZ	0	0	1	1	0	0	1	9	0	1	0	2	9	3	1	4	5	6	4	1	0	0	1	1	0	3	42	3	KZ
LT	0	0	4	0	1	-2	2	73	1	3	0	11	81	40	4	14	11	38	30	0	1	2	5	7	2	7	2	158	LT
LU	0	0	15	0	1	72	2	3	12	2	0	11	401	3	1	85	5	762	-53	0	2	2	4	15	2	33	0	2	LU
LV	0	0	3	0	1	-1	1	43	1	1	0	7	60	36	8	11	11	30	20	0	1	1	3	8	1	4	1	60	LV
MD	1	0	29	0	8	3	33	19	4	22	0	32	101	12	2	21	8	47	15	1	4	12	77	4	1	37	3	4	MD
MK	100	1	51	1	44	5	315	9	10	319	0	42	94	3	1	80	7	112	10	3	271	34	95	2	1	248	2	3	MK
MT	13	0	29	1	21	1	40	4	8	40	0	20	42	1	0	97	2	226	6	2	116	19	28	3	1	569	1	1	MT
NL	0	0	7	0	1	-251	1	3	4	1	0	6	43	6	1	34	4	122	-149	0	1	1	3	16	2	12	0	2	NL
NO	0	0	1	0	0	-1	0	3	1	0	0	1	36	27	2	7	4	23	22	0	0	0	1	12	1	2	0	2	NO
PL	0	0	28	0	3	-2	3	44	7	6	0	57	287	37	2	28	12	95	28	0	2	7	39	10	2	30	1	22	PL
PT	0	0	2	0	1	1	1	0	2	1	0	1	8	1	0	678	1	67	10	0	2	1	2	5	1	21	0	0	PT
RO	3	0	50	0	26	5	98	20	8	99	0	63	124	10	2	41	7	75	15	1	14	28	158	3	1	87	3	7	RO
RU	0	0	1	1	0	0	1	7	0	0	0	1	8	2	1	2	3	4	2	2	0	0	1	1	0	1	1	2	RU
SE	0	0	1	0	0	-3	0	4	1	0	0	2	41	27	4	7	11	21	13	0	0	0	1	7	1	3	0	5	SE
SI	2	0	407	0	30	9	7	13	40	26	0	112	414	5	1	87	4	253	13	1	11	216	82	7	2	700	1	5	SI
SK	2	0	103	0	14	8	11	28	15	41	0	205	269	13	2	49	8	134	23	1	6	35	295	6	2	122	2	13	SK
TR	3	5	9	5	5	2	52	14	3	16	5	14	35	5	1	24	6	27	11	21	37	4	21	2	1	32	3	4	TR
UA	1	0	22	0	5	3	19	59	5	21	0	34	105	12	2	19	9	46	14	1	3	12	78	4	1	40	3	12	UA
ATL	0	0	1	0	0	-1	0	2	1	0	0	1	17	4	1	82	5	96	-7	0	0	0	1	10	1	7	0	1	ATL
BAS	0	0	2	0	0	-3	0	12	1	0	0	4	55	28	15	8	23	24	20	0	0	0	1	9	1	2	1	16	BAS
BLS	1	2	7	4	3	1	69	25	1	13	0	15	41	9	2	11	10	18	14	24	14	3	22	3	1	15	4	8	BLS
MED	15	1	44	1	35	3	76	7	16	57	6	27	70	2	1	221	4	295	10	3	196	47	45	3	1	572	2	2	MED
NOS	0	0	2	0	0	-18	0	5	1	0	0	1	46	26	3	14	9	59	-39	0	0	0	1	29	3	4	1	3	NOS
ASI	0	2	1	13	1	0	2	2	1	1	4	1	4	0	0	7	1	7	2	5	3	1	1	0	0	5	2	0	ASI
NOA	4	0	16	0	12	2	19	1	6	19	0	10	30	0	0	128	1	166	6	1	49	10	14	2	1	257	1	0	NOA
EMC	3	0	23	1	8	-1	19	14	10	19	0	17	88	8	3	83	9	128	5	3	13	10	22	4	1	74	1	6	EMC
EU	2	0	44	0	5	-3	9	11	18	9	1	28	179	13	4	198	15	293	4	0	20	11	25	8	1	148	1	9	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.4 Cont.: 2003 country-to-country blame matrices for **AOT40$_f^{3m}$**.
Units: ppb.h per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	1	1	6	116	0	1	7	68	6	116	74	6	16	30	38	45	18	8	10	227	7	2	5	274	0	0	3313	1390	AL
AM	0	1	2	0	0	1	3	12	1	11	102	3	1	2	207	29	5	3	9	12	2	59	2	184	0	0	971	81	AM
AT	7	1	1	2	0	-6	15	102	8	19	43	10	82	20	8	30	43	10	1	49	16	1	2	262	0	0	3274	2611	AT
AZ	0	1	1	0	0	1	3	7	0	6	111	2	0	1	40	20	4	3	4	3	2	45	1	141	0	0	580	44	AZ
BA	2	1	5	13	1	-1	11	108	7	92	65	9	42	54	13	51	27	12	2	141	11	1	4	274	0	0	3369	1705	BA
BE	26	1	1	0	0	-207	20	18	8	6	17	9	1	2	3	12	107	6	1	12	-83	0	0	271	0	0	662	269	BE
BG	1	3	25	40	0	4	13	98	4	388	150	11	6	37	34	144	19	15	52	46	11	1	2	284	0	0	3066	829	BG
BY	1	11	2	0	0	0	13	119	2	11	237	16	1	7	1	62	25	28	1	3	11	0	0	139	0	0	1138	393	BY
CH	7	0	1	1	0	-11	8	20	11	10	19	5	9	6	8	15	55	2	1	68	10	1	4	267	0	0	3076	2060	CH
CS	1	1	6	48	0	2	11	124	6	191	70	8	20	64	15	52	22	12	5	97	10	1	4	275	0	0	3224	1342	CS
CY	0	1	5	6	1	1	6	29	2	40	116	5	2	7	1039	55	13	5	35	449	5	17	4	248	0	0	3095	953	CY
CZ	5	2	1	1	0	-4	24	174	6	15	49	18	19	54	4	28	55	26	1	17	22	1	1	263	0	0	2395	1801	CZ
DE	14	1	1	0	0	-58	23	65	5	6	29	17	4	4	3	15	74	17	1	17	5	0	1	264	0	0	1993	1465	DE
DK	1	4	0	0	0	-40	56	42	3	1	45	45	1	1	1	7	109	-15	0	2	-7	0	0	241	0	0	681	222	DK
EE	1	31	0	0	0	-2	20	40	1	2	94	43	0	1	0	6	32	66	0	1	14	0	0	94	0	0	667	314	EE
ES	0	0	0	1	0	0	4	5	138	6	10	2	2	2	3	8	127	1	1	112	7	0	7	306	0	0	2457	1843	ES
FI	0	6	0	0	0	1	10	18	1	1	71	23	0	1	0	3	11	27	0	1	7	0	0	42	0	0	357	176	FI
FR	9	0	0	1	0	-14	9	14	18	6	14	5	5	3	4	11	113	3	1	77	16	0	3	268	0	0	2867	2274	FR
GB	1	1	0	0	0	-32	20	14	5	2	18	11	1	1	2	8	132	10	0	3	-62	0	0	198	0	0	161	-183	GB
GE	0	1	4	1	0	1	6	24	1	25	246	6	1	4	106	64	8	6	37	13	4	25	2	163	0	0	1120	121	GE
GL	0	0	0	0	0	0	10	3	0	0	5	3	0	0	0	1	16	2	0	0	4	0	0	118	0	0	202	38	GL
GR	1	2	16	70	0	2	7	57	4	165	103	7	8	20	83	98	18	10	39	235	7	2	3	282	0	0	3287	1545	GR
HR	3	1	3	5	0	-2	12	115	7	58	66	10	124	66	11	56	30	11	2	160	13	1	3	253	0	0	3565	2140	HR
HU	3	3	3	3	0	1	20	282	6	81	89	15	60	224	7	91	33	21	2	42	19	1	1	257	0	0	3395	2417	HU
IE	1	1	0	0	0	-18	15	11	6	2	13	8	1	1	2	9	164	4	0	5	-30	0	0	204	0	0	556	157	IE
IS	0	0	0	0	0	-2	15	3	3	1	7	5	0	1	1	2	33	2	0	2	8	0	0	103	0	0	261	75	IS
IT	3	1	2	8	2	-2	7	39	10	36	40	6	33	20	13	34	35	4	3	313	9	1	6	256	0	0	3531	2533	IT
KZ	0	2	1	0	0	0	5	12	0	4	373	6	0	1	2	31	6	7	1	1	3	1	0	122	0	0	680	65	KZ
LT	1	26	1	0	0	-4	21	140	2	8	142	36	1	5	1	26	42	67	1	3	20	0	0	151	0	0	1190	619	LT
LU	-45	1	0	0	0	-80	20	20	7	6	18	10	2	3	3	12	89	5	1	17	-7	0	1	263	0	0	1727	1272	LU
LV	1	89	1	0	0	-4	25	74	2	5	126	46	1	2	1	14	44	71	1	2	14	0	0	132	0	0	959	472	LV
MD	1	2	163	1	0	4	15	184	2	363	148	18	6	41	4	267	21	23	23	8	11	0	1	199	0	0	2007	654	MD
MK	1	2	8	321	0	2	7	67	6	156	83	6	10	31	31	57	16	9	14	112	8	1	5	283	0	0	3099	1148	MK
MT	1	1	2	13	-250	0	4	28	5	34	27	4	7	10	16	20	27	4	6	465	4	1	8	203	0	0	1932	947	MT
NL	4	1	0	0	0	-879	20	18	6	3	15	9	1	2	2	9	93	9	1	5	-142	0	0	229	0	0	-722	-982	NL
NO	0	1	0	0	0	-1	88	13	1	1	20	29	0	1	1	2	47	18	0	1	22	0	0	109	0	0	498	183	NO
PL	2	6	2	0	0	1	31	461	4	11	113	34	6	38	2	49	54	65	1	8	28	0	0	225	0	0	1891	1227	PL
PT	0	0	0	0	0	1	4	2	558	3	5	2	0	1	1	3	245	1	0	33	8	0	2	307	0	0	1984	1364	PT
RO	1	3	15	5	0	5	16	173	4	682	113	13	12	67	7	139	22	18	15	26	13	1	2	233	0	0	2535	940	RO
RU	0	1	0	0	0	0	3	9	0	2	193	3	0	1	2	11	4	4	1	1	2	1	0	40	0	0	322	45	RU
SE	0	3	0	0	0	-4	31	29	1	1	30	72	0	1	1	2	32	44	0	1	13	0	0	87	0	0	492	243	SE
SI	4	1	2	2	0	-4	12	88	7	28	51	8	403	39	10	44	33	8	1	109	13	1	2	240	0	0	3549	2654	SI
SK	2	5	1	2	0	5	24	386	6	36	101	20	26	371	4	83	39	30	1	23	23	0	1	249	0	0	2845	2076	SK
TR	0	2	11	5	0	2	9	55	2	90	177	9	2	13	717	114	14	10	60	73	7	13	3	255	0	0	2010	323	TR
UA	1	4	9	1	0	4	15	225	3	91	209	17	7	57	3	284	23	22	8	10	13	0	1	182	0	0	1719	721	UA
ATL	0	1	0	0	0	-2	29	6	18	1	17	8	0	1	1	3	112	6	0	7	7	0	0	113	0	0	553	250	ATL
BAS	1	15	0	0	0	-6	29	54	1	1	70	66	0	1	0	5	40	33	0	1	15	0	0	114	0	0	667	339	BAS
BLS	0	4	23	2	0	3	14	81	1	118	411	14	1	13	78	240	16	18	150	18	10	4	1	193	0	0	1752	308	BLS
MED	1	1	6	16	2	0	6	40	11	65	64	6	17	17	142	56	32	6	22	428	7	2	7	234	0	0	2946	1593	MED
NOS	1	2	0	0	0	-25	87	22	3	1	38	39	0	1	1	5	118	10	0	2	-33	0	0	222	0	0	647	184	NOS
ASI	0	0	1	0	0	0	1	3	1	5	41	1	0	1	191	10	2	1	3	16	1	92	1	157	0	0	593	45	ASI
NOA	1	0	1	6	3	1	2	10	6	16	16	1	5	5	21	11	24	1	3	338	4	1	39	221	0	0	1492	714	NOA
EMC	1	3	2	3	0	-4	12	50	12	33	120	15	6	12	23	28	29	15	4	28	7	2	1	123	0	0	1096	579	EMC
EU	3	5	1	2	0	-11	18	75	28	11	48	28	11	17	5	17	59	26	1	49	11	0	2	182	0	0	1642	1142	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.5: 2003 country-to-country blame matrices for **AOT40$_f^{3m}$**.
Units: ppb.h per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	13	0	15	0	4	12	15	7	8	23	0	20	89	4	1	37	2	65	39	0	29	10	17	1	0	164	0	1	AL
AM	0	15	1	1	0	1	1	2	1	1	0	2	10	2	0	4	1	6	8	0	1	0	1	0	0	6	0	0	AM
AT	1	0	85	0	1	34	1	8	19	3	0	42	294	12	0	33	2	114	77	0	2	10	9	4	0	234	0	2	AT
AZ	0	0	1	2	0	1	0	2	0	0	0	1	8	1	0	2	1	4	7	0	0	0	1	0	0	3	0	0	AZ
BA	2	0	23	0	9	21	4	8	8	22	0	34	144	6	0	32	2	74	53	0	6	17	21	3	0	165	0	1	BA
BE	0	0	9	0	0	385	1	6	4	1	0	12	409	15	1	22	3	303	296	0	1	1	3	11	0	20	0	2	BE
BG	1	0	9	0	2	11	30	9	4	10	0	16	80	7	1	17	3	38	48	0	10	4	14	2	0	48	0	2	BG
BY	0	0	3	0	0	10	0	17	1	1	0	6	49	8	0	6	2	25	38	0	0	1	2	2	0	9	0	2	BY
CH	0	0	20	0	1	32	1	5	91	2	0	15	205	8	0	50	1	150	65	0	2	4	4	4	0	310	0	1	CH
CS	3	0	16	0	4	18	11	7	6	34	0	27	110	6	1	28	2	60	47	0	10	9	23	2	0	101	0	2	CS
CY	1	2	6	0	2	6	7	10	3	6	10	10	51	6	1	17	2	33	29	1	27	4	8	2	0	45	1	2	CY
CZ	0	0	39	0	1	49	1	11	14	3	0	120	344	19	1	22	3	117	120	0	1	7	12	5	0	90	0	2	CZ
DE	0	0	18	0	0	90	0	8	21	1	0	29	550	23	1	24	3	167	171	0	1	2	3	7	0	63	0	2	DE
DK	0	0	2	0	0	50	0	7	1	0	0	6	136	122	2	9	7	85	227	0	0	1	1	11	0	5	0	3	DK
EE	0	0	1	0	0	11	0	3	1	0	0	2	35	11	3	4	8	23	52	0	0	0	1	3	0	3	0	2	EE
ES	0	0	4	0	1	7	1	2	3	2	0	4	36	3	0	297	1	66	29	0	2	2	3	2	0	39	0	0	ES
FI	0	0	1	0	0	4	0	2	0	0	0	1	16	4	2	2	10	10	23	0	0	0	0	1	0	2	0	1	FI
FR	0	0	9	0	1	46	1	4	12	2	0	11	153	8	0	85	1	229	102	0	2	3	4	5	0	69	0	1	FR
GB	0	0	4	0	0	40	0	4	2	0	0	6	106	12	1	9	3	92	351	0	0	1	2	11	0	11	0	2	GB
GE	0	1	1	1	0	3	1	4	1	1	0	3	17	3	0	4	2	8	14	2	1	1	2	1	0	6	0	1	GE
GL	0	0	0	0	0	2	0	0	0	0	0	1	7	1	0	0	0	4	11	0	0	0	0	1	0	1	0	0	GL
GR	4	0	11	0	3	9	14	8	5	13	0	16	74	5	1	24	3	46	42	0	58	6	13	2	0	89	0	2	GR
HR	1	0	42	0	6	25	2	10	12	14	0	47	204	8	0	33	2	94	66	0	5	39	23	3	0	233	0	2	HR
HU	1	0	36	0	3	26	3	11	10	13	0	51	185	11	1	24	3	82	79	0	2	16	59	4	0	121	0	3	HU
IE	0	0	3	0	0	23	0	4	1	0	0	4	57	7	0	6	2	57	163	0	0	1	2	21	0	9	0	1	IE
IS	0	0	1	0	0	4	0	1	0	0	0	2	16	2	0	3	1	10	31	0	0	0	1	1	1	5	0	0	IS
IT	2	0	28	0	4	21	4	8	21	10	0	23	156	7	0	63	2	135	51	0	9	15	14	3	0	594	0	2	IT
KZ	0	0	1	0	0	2	0	4	0	0	0	1	11	3	0	2	2	5	10	0	0	0	1	1	0	2	1	1	KZ
LT	0	0	2	0	0	16	0	9	1	1	0	6	63	19	1	6	4	34	62	0	0	1	2	3	0	7	0	9	LT
LU	0	0	11	0	0	169	1	7	6	1	0	15	443	13	1	26	3	258	209	0	1	1	3	8	0	26	0	2	LU
LV	0	0	1	0	0	14	0	6	1	0	0	4	51	19	1	5	5	30	66	0	0	0	1	3	0	5	0	4	LV
MD	0	0	8	0	1	10	3	4	2	4	0	13	74	9	1	10	3	31	48	0	1	4	9	2	0	27	0	1	MD
MK	7	0	11	0	2	11	17	7	5	17	0	17	74	4	1	29	2	47	37	0	34	6	15	1	0	91	0	1	MK
MT	6	0	19	0	7	14	10	10	8	19	0	23	102	5	1	59	3	115	39	0	40	13	20	3	0	541	1	2	MT
NL	0	0	7	0	0	247	0	6	4	1	0	15	419	23	1	15	3	236	330	0	1	1	2	11	0	15	0	2	NL
NO	0	0	1	0	0	8	0	2	0	0	0	3	34	17	0	3	1	19	67	0	0	0	1	3	0	2	0	1	NO
PL	0	0	11	0	1	29	1	12	5	2	0	32	175	23	1	12	5	67	98	0	1	3	9	5	0	27	0	4	PL
PT	0	0	2	0	0	4	0	1	2	1	0	2	18	2	0	168	1	46	28	0	1	1	1	3	0	18	0	0	PT
RO	1	0	11	0	2	12	9	7	4	10	0	18	83	8	1	16	2	40	48	0	2	5	14	2	0	46	0	2	RO
RU	0	0	0	0	0	1	0	2	0	0	0	1	8	1	0	1	1	4	7	0	0	0	0	0	0	1	0	0	RU
SE	0	0	1	0	0	12	0	2	0	0	0	3	39	16	1	3	3	24	55	0	0	0	1	3	0	3	0	1	SE
SI	1	0	70	0	3	24	2	10	15	5	0	45	247	8	0	35	2	100	60	0	3	31	15	4	0	313	0	2	SI
SK	0	0	23	0	2	25	2	10	7	9	0	50	160	13	1	19	3	68	80	0	2	8	29	3	0	74	0	3	SK
TR	1	1	4	0	1	6	4	7	2	3	0	7	41	6	1	10	2	21	29	1	6	2	5	1	0	22	0	2	TR
UA	0	0	7	0	1	11	2	6	2	3	0	13	73	8	0	8	2	28	44	0	1	2	8	2	0	25	0	2	UA
ATL	0	0	1	0	0	8	0	2	1	0	0	2	26	5	0	37	1	35	53	0	0	0	1	3	0	6	0	0	ATL
BAS	0	0	1	0	0	15	0	4	1	0	0	3	55	25	3	4	11	29	75	0	0	0	1	4	0	3	0	3	BAS
BLS	0	0	3	0	1	7	4	9	1	2	0	8	48	9	1	6	3	19	41	1	3	1	6	2	0	13	0	2	BLS
MED	4	0	16	0	4	13	8	7	9	12	0	18	95	6	0	106	2	98	44	0	37	12	14	3	0	262	0	1	MED
NOS	0	0	2	0	0	30	0	4	1	0	0	5	81	37	1	6	3	67	222	0	0	0	1	10	0	5	0	2	NOS
ASI	0	0	1	0	0	1	0	1	0	0	0	1	6	1	0	3	1	4	4	0	1	0	1	0	0	5	0	0	ASI
NOA	2	0	8	0	3	8	5	3	4	7	0	11	59	3	0	43	1	54	26	0	15	5	8	2	0	114	0	1	NOA
EMC	0	0	6	0	1	13	1	4	4	2	0	8	66	7	1	22	2	39	39	0	2	2	3	2	0	37	0	1	EMC
EU	0	0	11	0	1	27	1	5	7	2	0	15	132	12	1	49	4	81	73	0	2	3	5	4	0	74	0	2	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.5 Cont.: 2003 country-to-country blame matrices for $\mathbf{AOT40_f^{3m}}$.
Units: ppb.h per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	1	2	1	7	0	12	5	33	5	23	37	4	4	9	7	9	0	0	0	2	1	0	0	191	0	0	934	569	AL
AM	0	1	0	0	0	1	2	5	1	2	18	2	0	1	10	3	0	0	0	0	0	2	0	35	0	0	148	53	AM
AT	3	2	0	0	0	33	9	43	4	5	28	10	13	7	2	6	0	0	0	1	1	0	0	189	0	0	1347	1060	AT
AZ	0	1	0	0	0	1	2	4	0	1	21	2	0	0	2	3	0	0	0	0	0	3	0	30	0	0	107	38	AZ
BA	1	1	1	1	0	21	7	49	4	15	35	6	7	10	3	8	0	0	0	1	1	0	0	185	0	0	1015	685	BA
BE	12	2	0	0	0	180	16	21	4	4	19	11	1	2	1	5	1	0	0	0	6	0	0	245	0	0	2037	1725	BE
BG	1	2	2	1	0	14	9	35	3	49	49	6	2	7	6	15	0	0	0	0	1	0	0	160	0	0	733	378	BG
BY	0	2	0	0	0	12	5	18	1	2	40	5	1	1	0	4	0	0	0	0	1	0	0	68	0	0	344	203	BY
CH	3	1	0	0	0	27	5	20	6	4	16	6	4	3	2	5	0	0	0	1	1	0	0	158	0	0	1237	938	CH
CS	1	2	1	2	0	19	7	52	4	26	32	5	4	12	3	8	0	0	0	1	1	0	0	167	0	0	877	551	CS
CY	0	2	2	1	0	6	9	29	2	20	62	5	1	5	187	18	0	0	0	3	0	2	1	250	0	0	899	307	CY
CZ	3	2	0	0	0	49	12	84	4	4	29	15	6	11	1	6	1	1	0	0	2	0	0	208	0	0	1420	1119	CZ
DE	5	2	0	0	0	94	13	37	4	3	23	16	2	2	1	5	1	1	0	0	3	0	0	221	0	0	1619	1314	DE
DK	1	3	0	0	0	56	21	26	2	1	27	34	0	1	1	3	1	2	0	0	4	0	0	187	0	0	1048	790	DK
EE	0	3	0	0	0	11	4	11	1	1	20	10	0	1	0	2	0	1	0	0	1	0	0	60	0	0	289	195	EE
ES	0	0	0	0	0	5	3	7	48	3	13	2	1	2	1	4	1	0	0	2	0	0	1	166	0	0	768	561	ES
FI	0	2	0	0	0	5	3	7	0	0	21	6	0	0	0	1	0	0	0	0	0	0	0	32	0	0	158	97	FI
FR	3	1	0	0	0	32	6	17	9	3	17	7	2	2	1	5	1	0	0	1	2	0	0	178	0	0	1038	800	FR
GB	1	2	0	0	0	50	9	16	3	1	13	9	1	1	1	4	1	0	0	0	4	0	0	121	0	0	895	732	GB
GE	0	1	0	0	0	3	4	8	1	4	34	3	0	1	7	6	0	0	0	0	0	2	0	52	0	0	205	83	GE
GL	0	0	0	0	0	2	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	-15	0	0	24	35	GL
GR	1	2	2	3	0	10	6	29	3	30	41	5	3	7	11	14	0	0	0	2	1	0	0	180	0	0	796	453	GR
HR	2	2	1	1	0	23	9	50	4	10	39	7	16	11	2	8	0	0	0	2	1	0	0	218	0	0	1281	904	HR
HU	2	3	1	0	0	27	13	87	4	12	38	10	9	23	1	9	0	0	0	1	1	0	0	203	0	0	1190	851	HU
IE	1	1	0	0	0	25	5	11	3	1	9	6	1	1	1	3	1	0	0	0	2	0	0	66	0	0	499	403	IE
IS	0	0	0	0	0	5	3	4	1	0	4	2	0	1	0	1	0	0	0	0	0	0	0	13	0	0	115	91	IS
IT	2	1	1	1	1	18	6	31	6	12	37	7	11	7	3	10	0	0	0	4	1	0	1	234	0	0	1566	1190	IT
KZ	0	1	0	0	0	2	3	5	0	1	80	3	0	0	0	5	0	0	0	0	0	0	0	36	0	0	185	54	KZ
LT	1	5	0	0	0	21	7	26	2	2	30	11	0	2	0	4	0	1	0	0	1	0	0	86	0	0	445	300	LT
LU	61	1	0	0	0	117	14	22	4	4	21	12	1	3	1	6	1	0	0	0	4	0	0	215	0	0	1692	1408	LU
LV	0	13	0	0	0	16	7	18	1	2	35	11	0	1	0	3	0	1	0	0	1	0	0	78	0	0	408	272	LV
MD	1	1	4	0	0	12	9	31	2	25	38	7	2	4	1	11	0	0	0	0	1	0	0	114	0	0	528	305	MD
MK	1	2	1	10	0	11	5	30	4	25	34	4	3	7	5	9	0	0	0	1	1	0	0	149	0	0	739	436	MK
MT	1	2	2	2	279	11	7	38	5	22	39	6	6	10	6	11	0	0	0	22	1	0	1	330	0	0	1859	1342	MT
NL	5	2	0	0	0	335	16	21	4	2	18	14	1	2	1	4	1	1	0	0	7	0	0	247	0	0	2018	1708	NL
NO	0	1	0	0	0	10	13	9	1	0	8	8	0	1	0	1	0	0	0	0	1	0	0	46	0	0	265	190	NO
PL	1	3	0	0	0	35	13	121	2	3	40	15	2	8	1	6	0	1	0	0	2	0	0	156	0	0	931	686	PL
PT	0	0	0	0	0	3	4	4	266	2	7	2	1	1	0	2	2	0	0	1	0	0	0	155	0	0	750	571	PT
RO	1	2	1	0	0	14	10	38	3	56	32	7	3	7	2	9	0	0	0	0	1	0	0	132	0	0	662	381	RO
RU	0	0	0	0	0	2	1	3	0	1	46	1	0	0	0	2	0	0	0	0	0	0	0	19	0	0	105	33	RU
SE	0	1	0	0	0	13	6	10	1	0	11	14	0	1	0	1	0	1	0	0	1	0	0	52	0	0	279	204	SE
SI	2	2	0	0	0	25	8	44	5	6	36	8	56	8	2	7	0	0	0	2	1	0	0	211	0	0	1421	1078	SI
SK	1	3	0	0	0	27	12	126	3	7	36	12	5	26	1	7	0	1	0	0	1	0	0	167	0	0	1030	757	SK
TR	0	2	1	0	0	6	7	22	2	13	45	5	1	3	73	13	0	0	0	1	0	1	0	124	0	0	504	205	TR
UA	0	2	0	0	0	13	7	35	2	8	37	7	2	4	1	12	0	0	0	0	1	0	0	95	0	0	475	296	UA
ATL	0	1	0	0	0	8	6	6	27	1	7	3	0	1	0	1	1	0	0	0	1	0	0	57	0	0	302	225	ATL
BAS	0	4	0	0	0	18	9	18	1	1	26	27	0	1	0	2	0	2	0	0	1	0	0	86	0	0	433	301	BAS
BLS	0	2	1	0	0	8	10	27	1	17	77	8	1	3	16	19	0	0	0	0	1	0	0	127	0	0	512	220	BLS
MED	1	1	1	2	1	11	6	28	8	18	41	6	6	7	25	12	0	0	0	6	1	0	1	237	0	0	1191	783	MED
NOS	1	2	0	0	0	35	29	16	2	1	20	20	0	1	0	3	1	1	0	0	4	0	0	136	0	0	750	547	NOS
ASI	0	0	0	0	0	1	1	3	0	2	12	1	0	0	17	2	0	0	0	0	0	1	0	30	0	0	105	34	ASI
NOA	1	1	1	1	0	6	3	15	4	10	19	2	3	4	5	6	0	0	0	3	0	0	1	177	0	0	644	390	NOA
EMC	1	1	0	0	0	13	4	17	5	4	33	6	1	2	3	4	0	0	0	0	1	0	0	76	0	0	433	293	EMC
EU	1	2	0	0	0	26	7	28	13	3	22	10	3	3	1	4	0	0	0	1	1	0	0	126	0	0	762	576	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.6: 2003 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	35	0	4	0	8	0	14	1	1	29	0	3	5	0	0	9	0	12	0	0	29	5	6	0	0	43	0	0	AL
AM	0	19	0	17	0	0	1	1	0	0	1	0	1	0	0	2	0	2	0	12	1	0	0	0	0	2	1	0	AM
AT	0	0	34	0	1	0	1	1	5	1	0	9	39	0	0	9	0	29	-2	0	1	3	4	1	0	32	0	0	AT
AZ	0	3	0	46	0	0	1	1	0	0	0	0	1	0	0	1	1	1	1	9	1	0	0	0	0	1	3	0	AZ
BA	2	0	11	0	38	0	3	1	1	22	0	7	11	0	0	9	0	16	-1	0	5	22	18	0	0	43	0	0	BA
BE	0	0	1	0	0	-109	0	0	0	0	0	0	-2	0	0	8	1	29	-27	0	0	0	0	2	0	1	0	0	BE
BG	1	0	3	0	2	0	76	2	1	14	0	3	6	0	0	5	1	6	0	1	13	2	8	0	0	9	1	1	BG
BY	0	0	1	0	0	0	0	31	0	1	0	1	7	2	1	2	3	4	2	0	0	0	1	1	0	2	1	6	BY
CH	0	0	2	0	0	-1	0	0	40	0	0	0	17	0	0	18	0	82	-3	0	1	1	1	1	0	22	0	0	CH
CS	4	0	7	0	11	0	13	1	1	63	0	5	9	0	0	8	0	10	0	0	8	8	18	0	0	26	0	0	CS
CY	1	1	1	1	1	0	4	1	0	2	58	1	1	0	0	4	0	3	0	1	13	1	1	0	0	7	0	0	CY
CZ	0	0	13	0	1	-1	0	2	2	1	0	19	41	1	0	6	1	21	0	0	0	2	4	1	0	10	0	0	CZ
DE	0	0	2	0	0	-5	0	1	4	0	0	1	48	0	0	7	1	32	-6	0	0	0	1	1	0	6	0	0	DE
DK	0	0	0	0	0	-3	0	1	0	0	0	0	5	-16	0	2	2	6	-5	0	0	0	0	3	1	0	0	1	DK
EE	0	0	0	0	0	-1	0	4	0	0	0	0	4	3	6	1	4	3	1	0	0	0	0	1	0	0	0	3	EE
ES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134	0	16	-1	0	0	0	0	0	0	7	0	0	ES
FI	0	0	0	0	0	0	0	2	0	0	0	0	2	1	2	1	7	1	0	0	0	0	0	1	0	0	0	1	FI
FR	0	0	0	0	0	-2	0	0	2	0	0	0	6	0	0	31	0	133	-6	0	0	0	0	2	0	4	0	0	FR
GB	0	0	0	0	0	-5	0	0	0	0	0	0	0	0	0	3	1	8	-103	0	0	0	0	5	0	1	0	0	GB
GE	0	5	0	16	0	0	1	2	0	1	0	0	1	0	0	2	1	2	0	48	1	0	1	0	0	2	1	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	5	0	3	0	3	0	35	1	1	10	0	2	3	0	0	7	0	6	0	1	93	2	4	0	0	21	0	0	GR
HR	1	0	16	0	15	0	2	2	2	10	0	8	14	0	0	8	0	17	-1	0	3	43	20	0	0	44	0	0	HR
HU	0	0	14	0	3	0	3	2	1	10	0	9	16	1	0	6	1	12	0	0	1	11	58	0	0	17	0	1	HU
IE	0	0	0	0	0	-3	0	0	0	0	0	0	-3	0	0	3	0	5	-21	0	0	0	0	0	0	1	0	0	IE
IS	0	0	0	0	0	-1	0	0	0	0	0	0	-1	0	0	1	0	1	2	0	0	0	0	2	1	0	0	0	IS
IT	1	0	6	0	3	0	2	1	4	4	0	1	6	0	0	16	0	39	-1	0	5	5	4	1	0	98	0	0	IT
KZ	0	0	0	1	0	0	0	2	0	0	0	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	11	0	KZ
LT	0	0	1	0	0	0	0	11	0	0	0	1	9	4	1	2	4	4	3	0	0	0	1	1	0	1	0	22	LT
LU	0	0	1	0	0	1	0	0	1	0	0	0	25	0	0	11	0	71	-9	0	0	0	0	2	0	3	0	0	LU
LV	0	0	0	0	0	0	0	8	0	0	0	1	6	4	2	1	4	4	2	0	0	0	0	1	0	1	0	9	LV
MD	0	0	3	0	1	0	4	5	0	3	0	3	8	1	0	3	2	5	1	0	1	1	8	0	0	5	1	1	MD
MK	10	0	4	0	4	0	31	1	1	31	0	2	5	0	0	8	0	9	0	1	24	3	7	0	0	23	0	0	MK
MT	1	0	2	0	3	0	5	0	1	4	0	1	0	0	0	12	0	22	-1	0	14	2	2	0	0	66	0	0	MT
NL	0	0	1	0	0	-31	0	1	1	0	0	0	-5	0	0	5	1	11	-29	0	0	0	0	2	0	2	0	0	NL
NO	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	1	2	0	0	0	0	0	1	0	0	0	0	NO
PL	0	0	2	0	0	-1	0	6	1	1	0	3	22	4	0	3	2	9	3	0	0	1	3	1	0	3	0	3	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	0	6	-1	0	0	0	0	1	0	2	0	0	PT
RO	1	0	4	0	3	0	13	3	1	10	0	4	7	1	0	5	1	6	0	0	3	3	14	0	0	9	1	1	RO
RU	0	0	0	1	0	0	0	3	0	0	0	0	2	0	0	1	1	1	1	1	0	0	0	0	0	1	2	1	RU
SE	0	0	0	0	0	-1	0	1	0	0	0	0	2	2	1	1	3	3	1	0	0	0	0	1	0	0	0	1	SE
SI	0	0	29	0	3	0	1	1	3	3	0	4	18	0	0	8	0	21	-1	0	1	23	6	1	0	43	0	0	SI
SK	0	0	9	0	1	0	1	3	1	4	0	15	14	1	0	5	1	11	1	0	1	3	26	1	0	9	0	1	SK
TR	0	1	1	2	0	0	5	2	0	2	1	1	2	0	0	3	1	3	0	4	5	0	1	0	0	4	1	0	TR
UA	0	0	1	0	0	0	2	8	0	1	0	2	6	1	0	2	2	4	1	0	1	1	4	0	0	3	1	2	UA
ATL	0	0	0	0	0	-1	0	0	0	0	0	0	-1	0	0	1	0	3	-1	0	0	0	0	1	1	0	0	0	ATL
BAS	0	0	0	0	0	-1	0	3	0	0	0	0	5	1	2	2	4	4	1	0	0	0	0	1	0	0	0	3	BAS
BLS	0	0	0	1	0	0	5	4	0	1	0	1	2	1	0	2	1	2	0	4	2	0	2	0	0	2	1	1	BLS
MED	1	0	2	0	2	0	7	1	1	4	2	1	1	0	0	18	0	23	-1	0	20	3	2	0	0	39	0	0	MED
NOS	0	0	0	0	0	-6	0	1	0	0	0	-1	-7	-2	0	2	1	5	-32	0	0	0	0	4	1	0	0	0	NOS
ASI	0	1	0	4	0	0	1	1	0	0	2	0	1	0	0	1	0	1	0	1	2	0	0	0	0	1	2	0	ASI
NOA	1	0	1	0	1	0	6	0	1	3	0	1	2	0	0	10	0	9	1	0	15	1	1	0	0	25	0	0	NOA
EMC	0	0	1	1	1	-1	3	2	1	2	0	1	4	0	0	9	1	10	-2	1	4	1	2	1	0	8	1	1	EMC
EU	0	0	3	0	1	-2	2	2	1	1	0	1	10	1	0	27	2	31	-8	0	4	1	3	1	0	12	0	1	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.6 Cont.: 2003 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	1	10	0	0	1	2	1	10	8	0	1	2	5	5	3	0	1	35	0	0	1	37	0	0	328	118	AL
AM	0	0	0	0	0	0	1	1	0	2	22	0	0	0	59	6	1	0	2	7	0	21	1	45	0	0	233	13	AM
AT	1	0	0	0	0	-3	2	5	1	2	4	1	6	2	1	3	5	0	0	5	0	0	0	30	0	0	234	168	AT
AZ	0	0	0	0	0	0	1	2	0	2	41	1	0	0	16	6	1	1	1	3	0	23	0	46	0	0	216	11	AZ
BA	0	0	1	1	0	-1	1	2	1	9	6	1	3	4	2	7	4	0	0	19	0	0	1	34	0	0	305	129	BA
BE	1	0	0	0	0	-43	3	1	1	1	2	1	0	0	0	1	15	1	0	2	-21	0	0	34	0	0	-94	-134	BE
BG	0	0	3	3	0	0	2	6	0	40	18	1	0	3	4	17	3	1	7	8	1	0	0	36	0	0	309	66	BG
BY	0	2	0	0	0	0	3	15	0	2	35	4	0	1	0	11	4	5	0	1	2	0	0	25	0	0	177	54	BY
CH	0	0	0	0	0	-3	1	1	1	1	2	0	0	0	1	2	7	0	0	7	-1	0	0	33	0	0	237	140	CH
CS	0	0	1	4	0	0	1	7	1	20	8	1	2	5	2	7	3	1	1	14	1	0	1	34	0	0	307	107	CS
CY	0	0	1	1	0	0	1	2	0	5	15	0	0	1	138	7	2	0	5	76	0	4	2	40	0	0	406	95	CY
CZ	0	0	0	0	0	-2	3	10	1	2	5	2	2	4	0	3	6	2	0	2	1	0	0	28	0	0	195	134	CZ
DE	1	0	0	0	0	-11	4	4	1	1	3	2	0	0	0	2	9	1	0	2	-2	0	0	31	0	0	145	87	DE
DK	0	0	0	0	0	-6	9	3	0	0	6	6	0	0	0	1	13	-9	0	0	-3	0	0	33	0	0	53	-1	DK
EE	0	5	0	0	0	-1	4	5	0	1	19	8	0	0	0	2	5	8	0	0	2	0	0	20	0	0	112	45	EE
ES	0	0	0	0	0	0	0	0	15	1	1	0	0	0	0	1	16	0	0	13	0	0	1	42	0	0	248	171	ES
FI	0	1	0	0	0	0	3	2	0	0	12	5	0	0	0	1	3	3	0	0	1	0	0	12	0	0	60	23	FI
FR	1	0	0	0	0	-4	1	0	2	1	1	1	0	0	0	1	19	0	0	10	-1	0	0	39	0	0	244	168	FR
GB	0	0	0	0	0	-7	3	1	1	0	2	1	0	0	0	1	21	1	0	1	-13	0	0	37	0	0	-38	-93	GB
GE	0	0	1	0	0	0	1	2	0	4	52	1	0	0	36	10	2	1	8	5	0	11	1	41	0	0	263	15	GE
GL	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	13	0	0	13	-2	GL
GR	0	0	2	7	0	0	1	3	1	15	12	0	1	1	13	11	3	0	5	39	0	0	1	39	0	0	352	145	GR
HR	0	0	0	1	0	-1	1	1	1	6	6	1	10	4	2	6	4	0	0	21	0	0	0	30	0	0	299	145	HR
HU	0	0	0	0	0	-1	2	16	1	11	9	1	5	17	1	11	3	2	0	5	1	0	0	28	0	0	282	175	HU
IE	0	0	0	0	0	-4	2	1	1	0	1	1	0	0	0	1	27	0	0	1	-8	0	0	41	0	0	48	-19	IE
IS	0	0	0	0	0	-1	4	0	0	0	2	1	0	0	0	0	9	0	0	0	1	0	0	28	0	0	51	5	IS
IT	0	0	0	1	0	-1	1	0	1	4	4	0	2	1	2	3	5	0	0	38	0	0	1	33	0	0	291	178	IT
KZ	0	0	0	0	0	0	1	2	0	1	45	1	0	0	2	6	1	1	0	0	0	2	0	35	0	0	120	9	KZ
LT	0	5	0	0	0	-1	5	13	0	1	21	7	0	1	0	5	6	10	0	0	3	0	0	25	0	0	169	79	LT
LU	-11	0	0	0	0	-11	2	2	1	1	2	1	0	0	0	1	11	0	0	3	-2	0	0	31	0	0	140	88	LU
LV	0	12	0	0	0	0	5	8	0	1	21	7	0	0	0	3	5	11	0	0	2	0	0	22	0	0	143	62	LV
MD	0	1	20	0	0	0	3	20	0	43	25	3	1	4	2	43	3	3	4	2	1	0	0	31	0	0	265	68	MD
MK	0	0	1	29	0	0	1	2	1	15	9	0	1	2	5	7	3	0	2	18	0	0	1	38	0	0	301	89	MK
MT	0	0	0	1	-38	-1	0	0	1	3	2	0	1	0	2	2	5	0	1	88	0	0	2	35	0	0	240	81	MT
NL	0	0	0	0	0	-121	4	2	1	0	2	1	0	0	0	1	14	1	0	1	-29	0	0	34	0	0	-129	-160	NL
NO	0	0	0	0	0	-1	10	1	0	0	3	4	0	0	0	0	7	2	0	0	2	0	0	20	0	0	60	14	NO
PL	0	1	0	0	0	-1	5	41	0	1	13	5	0	3	0	7	6	8	0	1	3	0	0	29	0	0	192	108	PL
PT	0	0	0	0	0	0	0	0	38	0	1	0	0	0	0	0	33	0	0	5	0	0	0	44	0	0	206	120	PT
RO	0	1	3	1	0	0	2	13	1	73	17	2	1	5	2	22	3	2	4	5	1	0	0	32	0	0	276	77	RO
RU	0	1	0	0	0	0	1	3	0	1	49	1	0	0	1	7	2	1	1	0	0	1	0	19	0	0	104	13	RU
SE	0	1	0	0	0	-1	8	3	0	0	6	11	0	0	0	1	6	5	0	0	1	0	0	19	0	0	75	28	SE
SI	0	0	0	0	0	-2	1	1	1	3	5	1	33	2	1	5	4	0	0	11	0	0	0	27	0	0	258	166	SI
SK	0	0	0	0	0	-1	3	24	1	4	9	2	2	33	1	10	4	2	0	3	1	0	0	28	0	0	238	157	SK
TR	0	0	1	1	0	0	1	3	0	7	26	1	0	1	113	13	2	1	8	15	0	7	1	45	0	0	285	28	TR
UA	0	1	3	0	0	0	3	16	0	10	36	3	0	3	1	48	3	3	3	1	1	0	0	30	0	0	211	53	UA
ATL	0	0	0	0	0	-1	3	0	0	0	1	1	0	0	0	0	22	0	0	0	0	0	0	28	0	0	59	3	ATL
BAS	0	2	0	0	0	-2	7	5	0	0	11	10	0	0	0	2	7	-13	0	0	2	0	0	25	0	0	83	38	BAS
BLS	0	1	4	0	0	0	2	9	0	14	66	2	0	1	8	43	3	2	38	4	1	1	0	36	0	0	268	29	BLS
MED	0	0	1	1	1	0	1	1	1	6	7	0	1	1	24	6	5	0	3	95	0	1	2	39	0	0	323	112	MED
NOS	0	0	0	0	0	-11	12	0	0	0	3	2	0	0	0	1	21	-1	0	1	-30	0	0	43	0	0	9	-42	NOS
ASI	0	0	0	0	0	0	1	1	0	1	19	0	0	0	38	4	1	0	1	9	0	26	1	37	0	0	160	12	ASI
NOA	0	0	0	1	1	0	0	1	1	4	3	0	0	0	10	3	3	0	1	51	0	0	9	59	0	0	229	69	NOA
EMC	0	0	0	0	0	-1	2	3	1	4	20	1	0	1	12	6	4	1	1	12	0	3	2	32	0	0	157	46	EMC
EU	0	1	0	0	0	-4	3	6	3	2	6	3	1	1	1	3	11	2	0	8	-1	0	0	31	0	0	170	96	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.7: 2003 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	3	0	2	0	1	2	3	2	1	5	0	3	12	1	0	5	1	10	6	0	7	2	3	0	0	25	0	0	AL
AM	0	4	0	0	0	0	0	1	0	0	0	0	3	0	0	1	0	2	2	0	0	0	0	0	0	2	0	0	AM
AT	0	0	13	0	0	4	0	1	4	1	0	6	39	2	0	4	0	17	10	0	0	2	2	0	0	35	0	0	AT
AZ	0	0	0	1	0	0	0	1	0	0	0	0	3	1	0	1	1	2	2	0	0	0	0	0	0	1	0	0	AZ
BA	0	0	4	0	2	2	1	2	1	4	0	5	19	1	0	4	1	10	7	0	2	3	5	0	0	27	0	1	BA
BE	0	0	1	0	0	57	0	1	1	0	0	1	50	2	0	4	0	46	43	0	0	0	0	2	0	5	0	0	BE
BG	0	0	2	0	0	1	6	2	1	2	0	3	11	1	0	2	1	6	6	0	4	1	3	0	0	8	0	1	BG
BY	0	0	1	0	0	1	0	5	0	0	0	1	9	1	0	1	1	4	6	0	0	0	1	0	0	2	0	1	BY
CH	0	0	4	0	0	4	0	1	14	0	0	2	30	1	0	6	0	23	9	0	0	1	1	0	0	47	0	0	CH
CS	1	0	3	0	1	2	2	2	1	9	0	4	16	1	0	4	1	9	6	0	3	2	6	0	0	18	0	1	CS
CY	0	0	1	0	0	1	1	2	1	1	2	1	8	1	0	2	0	6	5	0	4	1	1	0	0	8	0	0	CY
CZ	0	0	5	0	0	5	0	2	2	0	0	16	44	2	0	3	0	15	13	0	0	1	2	1	0	11	0	0	CZ
DE	0	0	3	0	0	10	0	1	3	0	0	4	67	3	0	3	1	21	21	0	0	0	1	1	0	9	0	0	DE
DK	0	0	1	0	0	6	0	2	0	0	0	1	23	16	0	1	1	10	26	0	0	0	0	1	0	2	0	1	DK
EE	0	0	0	0	0	2	0	2	0	0	0	1	7	2	1	1	3	3	8	0	0	0	0	0	0	1	0	1	EE
ES	0	0	1	0	0	1	0	0	1	0	0	1	6	0	0	46	0	11	4	0	0	0	1	0	0	7	0	0	ES
FI	0	0	0	0	0	1	0	1	0	0	0	0	4	1	0	0	2	2	5	0	0	0	0	0	0	1	0	0	FI
FR	0	0	2	0	0	6	0	1	2	0	0	2	21	1	0	11	0	39	15	0	0	1	1	1	0	16	0	0	FR
GB	0	0	1	0	0	6	0	1	1	0	0	1	18	2	0	2	0	16	55	0	0	0	0	2	0	2	0	0	GB
GE	0	1	0	0	0	1	0	1	0	0	0	1	4	1	0	1	0	2	3	2	0	0	0	0	0	2	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	GL
GR	1	0	2	0	1	1	3	2	1	3	0	2	11	1	0	4	1	7	6	0	16	1	2	0	0	14	0	1	GR
HR	0	0	6	0	1	3	1	2	2	3	0	6	27	1	0	4	1	13	8	0	1	7	6	0	0	39	0	1	HR
HU	0	0	5	0	1	3	1	2	1	3	0	7	25	2	0	3	1	10	9	0	0	3	12	0	0	18	0	1	HU
IE	0	0	1	0	0	4	0	1	0	0	0	1	12	1	0	2	0	13	28	0	0	0	0	4	0	2	0	0	IE
IS	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	1	0	3	5	0	0	0	0	0	0	1	0	0	IS
IT	0	0	5	0	1	3	1	2	3	2	0	3	22	1	0	8	1	19	7	0	2	3	3	0	0	91	0	0	IT
KZ	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	0	1	0	0	KZ
LT	0	0	0	0	0	2	0	3	0	0	0	1	11	3	0	1	1	4	8	0	0	0	1	0	0	1	0	2	LT
LU	0	0	2	0	0	18	0	1	1	0	0	2	52	2	0	4	0	36	24	0	0	0	0	1	0	5	0	0	LU
LV	0	0	0	0	0	2	0	2	0	0	0	1	9	3	0	1	1	4	8	0	0	0	0	0	0	1	0	1	LV
MD	0	0	1	0	0	1	1	2	0	1	0	2	11	2	0	2	1	5	6	0	0	1	1	0	0	5	0	0	MD
MK	2	0	2	0	1	1	4	2	1	5	0	2	10	1	0	4	1	7	5	0	9	1	3	0	0	15	0	1	MK
MT	1	0	3	0	1	2	2	2	1	4	0	3	16	1	0	9	1	17	7	0	6	2	3	0	0	74	0	1	MT
NL	0	0	1	0	0	26	0	1	1	0	0	2	53	3	0	3	0	31	46	0	0	0	0	2	0	4	0	0	NL
NO	0	0	0	0	0	1	0	0	0	0	0	0	6	2	0	1	0	3	9	0	0	0	0	0	0	1	0	0	NO
PL	0	0	2	0	0	3	0	3	1	1	0	4	23	3	0	1	1	8	11	0	0	1	2	1	0	4	0	1	PL
PT	0	0	1	0	0	1	0	0	0	0	0	0	4	0	0	26	0	8	4	0	0	0	0	0	0	3	0	0	PT
RO	0	0	2	0	0	2	2	2	1	2	0	3	13	1	0	2	1	6	6	0	1	1	3	0	0	9	0	1	RO
RU	0	0	0	0	0	0	0	1	0	0	0	0	3	1	0	0	1	1	2	0	0	0	0	0	0	1	0	0	RU
SE	0	0	0	0	0	2	0	1	0	0	0	1	8	3	0	1	1	4	9	0	0	0	0	0	0	1	0	0	SE
SI	0	0	11	0	1	3	0	2	3	1	0	6	34	1	0	4	0	15	8	0	1	5	3	0	0	55	0	1	SI
SK	0	0	5	0	0	3	0	2	2	2	0	8	27	2	0	3	1	10	9	0	0	2	7	0	0	14	0	1	SK
TR	0	0	1	0	0	1	1	2	0	1	0	1	6	1	0	2	0	4	4	0	2	0	1	0	0	4	0	0	TR
UA	0	0	1	0	0	1	0	2	0	1	0	2	9	1	0	1	1	4	6	0	0	0	1	0	0	3	0	1	UA
ATL	0	0	0	0	0	1	0	0	0	0	0	0	4	1	0	2	0	4	5	0	0	0	0	0	0	1	0	0	ATL
BAS	0	0	0	0	0	3	0	2	0	0	0	1	14	7	1	1	3	6	14	0	0	0	0	1	0	1	0	1	BAS
BLS	0	0	1	0	0	1	1	3	0	1	0	2	10	2	0	1	1	4	7	0	1	0	1	0	0	3	0	1	BLS
MED	1	0	3	0	1	2	2	2	1	2	0	3	15	1	0	14	1	16	7	0	10	2	3	0	0	39	0	1	MED
NOS	0	0	1	0	0	7	0	1	1	0	0	1	22	5	0	2	1	16	42	0	0	0	0	2	0	3	0	0	NOS
ASI	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	0	2	2	0	1	0	0	0	0	2	0	0	ASI
NOA	0	0	1	0	0	1	1	1	1	2	0	1	8	0	0	6	0	8	4	0	4	1	1	0	0	17	0	0	NOA
EMC	0	0	1	0	0	2	0	1	1	1	0	1	9	1	0	4	0	6	6	0	1	0	1	0	0	7	0	0	EMC
EU	0	0	2	0	0	4	0	1	1	1	0	2	21	2	0	10	1	15	14	0	1	1	1	1	0	14	0	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.7 Cont.: 2003 country-to-country blame matrices for **SOMO35**.
Units: ppb.d per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	1	0	1	1	6	1	5	7	1	1	1	2	2	0	0	0	0	0	0	0	30	0	0	154	88	AL
AM	0	0	0	0	0	0	1	1	0	1	6	1	0	0	6	1	0	0	0	0	0	1	0	6	0	0	43	15	AM
AT	0	0	0	0	0	4	1	7	1	1	4	2	2	1	0	1	0	0	0	0	0	0	0	25	0	0	191	150	AT
AZ	0	0	0	0	0	0	1	2	0	1	11	1	0	0	2	1	0	0	0	0	0	2	0	12	0	0	51	16	AZ
BA	0	1	0	0	0	2	1	9	1	4	7	2	1	2	1	2	0	0	0	0	0	0	0	28	0	0	165	106	BA
BE	1	0	0	0	0	24	2	3	1	1	3	2	0	0	0	1	0	0	0	0	1	0	0	34	0	0	288	244	BE
BG	0	1	1	0	0	2	1	6	0	10	10	1	0	1	3	4	0	0	0	0	0	0	0	25	0	0	128	60	BG
BY	0	1	0	0	0	2	1	5	0	1	13	2	0	0	0	2	0	0	0	0	0	0	0	13	0	0	76	40	BY
CH	0	0	0	0	0	4	1	3	1	1	3	1	1	1	0	1	0	0	0	0	0	0	0	22	0	0	185	140	CH
CS	0	1	0	0	0	2	1	9	1	6	7	1	1	2	1	3	0	0	0	0	0	0	0	27	0	0	153	89	CS
CY	0	0	0	0	0	1	1	4	0	3	11	1	0	1	36	3	0	0	0	0	0	1	0	38	0	0	150	49	CY
CZ	0	0	0	0	0	5	2	11	1	1	4	2	1	1	0	1	0	0	0	0	0	0	0	25	0	0	179	141	CZ
DE	1	0	0	0	0	11	2	6	1	1	3	2	0	0	0	1	0	0	0	0	0	0	0	27	0	0	205	165	DE
DK	0	1	0	0	0	8	3	6	0	0	4	5	0	0	0	1	0	0	0	0	1	0	0	24	0	0	146	109	DK
EE	0	1	0	0	0	2	1	3	0	0	8	4	0	0	0	1	0	0	0	0	0	0	0	11	0	0	63	40	EE
ES	0	0	0	0	0	1	1	2	8	1	2	1	0	0	0	1	0	0	0	0	0	0	0	26	0	0	123	91	ES
FI	0	1	0	0	0	1	1	2	0	0	5	2	0	0	0	1	0	0	0	0	0	0	0	6	0	0	37	23	FI
FR	0	0	0	0	0	4	1	4	2	1	3	1	1	1	0	1	0	0	0	0	0	0	0	26	0	0	167	129	FR
GB	0	0	0	0	0	7	2	2	1	0	2	1	0	0	0	1	0	0	0	0	1	0	0	19	0	0	144	118	GB
GE	0	0	0	0	0	1	1	2	0	1	11	1	0	0	5	2	0	0	0	0	0	1	0	11	0	0	58	20	GE
GL	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	4	5	GL
GR	0	1	0	1	0	1	1	6	1	6	9	1	0	1	5	3	0	0	0	0	0	0	0	30	0	0	145	79	GR
HR	0	1	0	0	0	3	1	11	1	4	7	2	3	2	1	2	0	0	0	0	0	0	0	32	0	0	202	138	HR
HU	0	1	0	0	0	3	2	13	1	4	6	2	1	4	0	3	0	0	0	0	0	0	0	26	0	0	173	120	HU
IE	0	0	0	0	0	4	1	2	1	0	2	1	0	0	0	1	0	0	0	0	0	0	0	12	0	0	95	77	IE
IS	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	22	18	IS
IT	0	0	0	0	0	2	1	6	1	3	6	1	2	1	1	2	0	0	0	1	0	0	0	36	0	0	240	179	IT
KZ	0	0	0	0	0	0	1	1	0	0	13	1	0	0	0	1	0	0	0	0	0	0	0	7	0	0	35	11	KZ
LT	0	1	0	0	0	3	1	5	0	1	8	2	0	0	0	1	0	0	0	0	0	0	0	13	0	0	79	49	LT
LU	8	0	0	0	0	11	2	3	1	1	3	2	0	0	0	1	0	0	0	0	0	0	0	27	0	0	207	171	LU
LV	0	3	0	0	0	2	1	4	0	1	9	3	0	0	0	1	0	0	0	0	0	0	0	12	0	0	71	44	LV
MD	0	1	1	0	0	2	2	6	0	6	11	2	0	1	1	4	0	0	0	0	0	0	0	19	0	0	99	50	MD
MK	0	1	0	2	0	1	1	6	1	6	7	1	0	1	2	3	0	0	0	0	0	0	0	24	0	0	132	72	MK
MT	0	1	0	0	28	2	1	6	1	5	6	1	1	2	2	3	0	0	0	3	0	0	0	51	0	0	268	182	MT
NL	1	0	0	0	0	38	2	3	1	0	3	2	0	0	0	1	0	0	0	0	1	0	0	33	0	0	259	217	NL
NO	0	0	0	0	0	1	2	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0	38	28	NO
PL	0	1	0	0	0	4	2	19	0	1	6	2	0	1	0	2	0	0	0	0	0	0	0	20	0	0	130	93	PL
PT	0	0	0	0	0	1	0	1	42	0	1	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	121	93	PT
RO	0	1	0	0	0	2	1	7	0	13	8	1	1	1	1	3	0	0	0	0	0	0	0	23	0	0	124	65	RO
RU	0	0	0	0	0	1	1	1	0	0	23	1	0	0	0	1	0	0	0	0	0	0	0	8	0	0	48	14	RU
SE	0	0	0	0	0	2	1	3	0	0	3	3	0	0	0	1	0	0	0	0	0	0	0	9	0	0	55	40	SE
SI	0	0	0	0	0	3	1	9	1	2	6	2	9	2	0	2	0	0	0	0	0	0	0	30	0	0	225	169	SI
SK	0	1	0	0	0	3	2	17	1	2	5	2	1	5	0	3	0	0	0	0	0	0	0	23	0	0	163	119	SK
TR	0	0	0	0	0	1	1	3	0	3	10	1	0	0	24	3	0	0	0	0	0	1	0	20	0	0	100	33	TR
UA	0	1	0	0	0	1	1	5	0	2	16	2	0	1	0	6	0	0	0	0	0	0	0	17	0	0	89	42	UA
ATL	0	0	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	26	22	ATL
BAS	0	1	0	0	0	4	2	6	0	1	6	8	0	0	0	1	0	1	0	0	0	0	0	18	0	0	105	73	BAS
BLS	0	1	0	0	0	1	2	6	0	4	22	2	0	1	7	6	0	0	0	0	0	0	0	26	0	0	122	47	BLS
MED	0	1	0	0	0	2	1	6	2	4	8	1	1	1	9	3	0	0	0	2	0	0	0	48	0	0	215	127	MED
NOS	0	0	0	0	0	9	5	4	0	0	3	3	0	0	0	1	0	0	0	0	1	0	0	25	0	0	156	119	NOS
ASI	0	0	0	0	0	0	1	1	0	1	6	1	0	0	6	1	0	0	0	0	0	1	0	10	0	0	41	14	ASI
NOA	0	0	0	0	0	1	1	3	1	3	5	1	0	1	4	2	0	0	0	0	0	0	0	33	0	0	113	59	NOA
EMC	0	0	0	0	0	2	1	3	1	1	9	1	0	0	3	1	0	0	0	0	0	0	0	16	0	0	82	47	EMC
EU	0	0	0	0	0	4	1	5	3	1	4	2	1	1	0	1	0	0	0	0	0	0	0	22	0	0	138	104	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.8: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	40	0	1	0	4	0	7	0	0	22	0	1	2	0	0	1	0	2	0	0	22	1	2	0	0	14	0	0	AL
AM	0	26	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	AM
AT	0	0	88	0	1	1	0	1	4	2	0	13	28	1	0	1	0	10	1	0	0	1	5	0	0	26	0	0	AT
AZ	0	4	0	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	1	0	AZ
BA	1	0	4	0	45	0	3	0	0	25	0	4	6	0	0	1	0	3	0	0	2	6	10	0	0	18	0	0	BA
BE	0	0	2	0	0	227	0	0	2	0	0	4	68	1	0	2	0	142	14	0	0	0	0	1	0	5	0	0	BE
BG	1	0	1	0	2	0	97	1	0	13	0	2	3	0	0	0	0	1	0	0	10	0	3	0	0	3	0	0	BG
BY	0	0	1	0	1	1	2	62	0	2	0	2	5	1	2	0	2	3	1	0	0	0	2	0	0	2	0	11	BY
CH	0	0	4	0	0	2	0	0	54	0	0	1	17	0	0	1	0	33	1	0	0	0	0	0	0	47	0	0	CH
CS	3	0	3	0	9	0	10	1	0	99	0	3	4	0	0	0	0	2	0	0	4	2	12	0	0	10	0	0	CS
CY	0	0	0	0	0	0	2	0	0	1	26	0	1	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	CY
CZ	0	0	21	0	1	2	1	1	2	3	0	94	49	1	0	1	1	13	2	0	0	1	7	0	0	9	0	1	CZ
DE	0	0	8	0	0	9	0	1	6	1	0	13	180	4	0	1	1	38	6	0	0	0	1	0	0	8	0	0	DE
DK	0	0	1	0	0	4	0	1	0	0	0	4	32	77	0	1	1	10	10	0	0	0	1	1	0	1	0	1	DK
EE	0	0	0	0	0	1	1	5	0	0	0	1	5	2	50	0	16	2	2	0	0	0	1	0	0	1	0	6	EE
ES	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	89	0	11	0	0	0	0	0	0	0	4	0	0	ES
FI	0	0	0	0	0	0	0	1	0	0	0	1	2	1	4	0	47	1	1	0	0	0	0	0	0	0	0	1	FI
FR	0	0	2	0	0	7	0	0	3	0	0	2	16	0	0	8	0	196	5	0	0	0	0	0	0	14	0	0	FR
GB	0	0	1	0	0	6	0	0	0	0	0	1	12	1	0	1	0	25	88	0	0	0	0	3	0	2	0	0	GB
GE	0	5	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	2	0	1	0	1	0	20	0	0	6	0	1	2	0	0	1	0	1	0	0	70	0	1	0	0	6	0	0	GR
HR	1	0	10	0	13	1	2	1	1	18	0	7	9	0	0	1	0	5	1	0	1	23	19	0	0	36	0	0	HR
HU	0	0	14	0	3	1	4	1	1	18	0	11	12	1	0	0	0	5	1	0	1	5	104	0	0	15	0	1	HU
IE	0	0	0	0	0	3	0	0	0	0	0	1	6	1	0	1	0	16	17	0	0	0	0	29	0	1	0	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	5	0	0	0	IS
IT	0	0	4	0	3	0	1	0	2	4	0	2	5	0	0	2	0	11	0	0	1	1	2	0	0	204	0	0	IT
KZ	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	KZ
LT	0	0	1	0	0	1	1	13	0	1	0	2	8	3	3	0	4	5	2	0	0	0	1	0	0	2	0	78	LT
LU	0	0	3	0	0	34	0	0	2	0	0	5	90	1	0	2	0	151	7	0	0	0	0	0	0	6	0	0	LU
LV	0	0	1	0	0	1	1	9	0	1	0	2	6	3	8	0	6	3	2	0	0	0	1	0	0	1	0	20	LV
MD	0	0	1	0	1	0	7	3	0	3	0	2	4	0	1	0	1	2	1	0	1	0	3	0	0	2	0	1	MD
MK	7	0	1	0	3	0	20	0	0	23	0	1	2	0	0	0	0	1	0	0	36	0	2	0	0	7	0	0	MK
MT	1	0	1	0	2	0	2	0	0	4	0	1	2	0	0	3	0	6	0	0	3	0	1	0	0	46	0	0	MT
NL	0	0	2	0	0	56	0	0	1	0	0	5	98	3	0	1	0	54	17	0	0	0	0	1	0	4	0	0	NL
NO	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	1	2	2	0	0	0	0	0	0	0	0	0	NO
PL	0	0	3	0	1	2	2	6	1	3	0	13	24	3	1	0	1	8	2	0	0	0	5	0	0	4	0	4	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	35	0	5	1	0	0	0	0	0	0	1	0	0	PT
RO	0	0	2	0	2	0	16	1	0	11	0	2	4	0	0	0	0	2	1	0	2	1	7	0	0	4	0	1	RO
RU	0	0	0	1	0	0	0	2	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	1	1	RU
SE	0	0	0	0	0	1	0	1	0	0	0	1	5	4	1	0	3	2	3	0	0	0	0	0	0	1	0	1	SE
SI	0	0	31	0	2	1	1	1	1	6	0	7	13	0	0	1	0	7	1	0	1	9	8	0	0	75	0	0	SI
SK	0	0	11	0	2	1	3	2	1	7	0	20	14	1	0	0	0	6	1	0	1	1	34	0	0	10	0	1	SK
TR	0	0	0	1	0	0	3	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	TR
UA	0	0	1	1	1	0	3	6	0	2	0	2	4	1	1	0	1	1	1	0	1	0	2	0	0	1	1	1	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	4	2	0	0	0	0	0	0	0	0	0	ATL
BAS	0	0	1	0	0	2	1	2	0	1	0	2	14	12	6	0	14	5	4	0	0	0	1	0	0	1	0	4	BAS
BLS	0	0	0	2	0	0	6	1	0	1	0	1	1	0	0	0	0	1	0	3	1	0	1	0	0	1	0	0	BLS
MED	1	0	1	0	2	0	4	0	0	3	0	1	2	0	0	8	0	10	0	0	8	1	1	0	0	30	0	0	MED
NOS	0	0	1	0	0	7	0	0	0	0	0	2	19	5	0	1	0	26	25	0	0	0	0	1	0	2	0	0	NOS
ASI	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	ASI
NOA	0	0	0	0	1	0	2	0	0	1	0	0	1	0	0	2	0	2	0	0	3	0	0	0	0	7	0	0	NOA
EMC	0	0	1	2	1	1	2	2	0	2	0	2	7	1	1	4	2	10	2	0	1	0	2	0	0	7	1	1	EMC
EU	0	0	5	0	1	5	1	1	1	1	0	6	27	2	1	14	5	39	8	0	2	0	4	1	0	21	0	2	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.8 Cont.: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	10	0	0	0	3	0	7	3	0	0	1	3	5	0	0	0	8	0	0	0	0	0	0	161	52	AL
AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	17	2	0	0	0	0	0	6	0	0	0	0	81	1	AM
AT	0	0	0	0	0	1	0	14	0	2	3	1	5	5	0	4	0	0	0	1	1	0	0	0	0	0	219	200	AT
AZ	0	0	0	0	0	0	0	0	0	0	15	0	0	0	6	3	0	0	0	0	0	12	0	0	0	0	167	1	AZ
BA	0	0	0	1	0	0	0	11	0	8	3	1	1	4	1	6	0	0	0	4	0	0	0	0	0	0	169	66	BA
BE	7	0	0	0	0	40	1	6	0	0	1	1	0	1	0	1	1	1	0	0	19	0	0	0	0	0	547	521	BE
BG	0	0	1	2	0	0	0	4	0	41	10	0	0	2	13	23	0	0	2	2	0	0	0	0	0	0	240	32	BG
BY	0	1	0	0	0	1	1	26	0	7	37	2	0	2	1	41	0	1	0	0	1	0	0	0	0	0	221	65	BY
CH	0	0	0	0	0	1	0	2	0	0	1	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	172	113	CH
CS	0	0	0	3	0	0	0	10	0	21	4	0	1	5	2	10	0	0	0	2	0	0	0	0	0	0	226	58	CS
CY	0	0	0	0	0	0	0	1	0	2	6	0	0	0	60	7	0	0	1	15	0	2	1	0	0	0	132	35	CY
CZ	0	0	0	0	0	2	1	54	0	2	4	2	2	12	1	6	0	1	0	0	2	0	0	0	0	0	299	273	CZ
DE	1	0	0	0	0	9	2	19	0	1	2	3	0	1	0	2	0	3	0	0	6	0	0	0	0	0	327	303	DE
DK	0	0	0	0	0	5	11	22	0	1	3	14	0	1	0	2	0	17	0	0	14	0	0	0	0	0	236	186	DK
EE	0	3	0	0	0	1	4	11	0	2	28	12	0	1	1	8	0	11	0	0	1	0	0	0	0	0	178	116	EE
ES	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	1	0	0	6	0	0	0	0	0	0	126	117	ES
FI	0	0	0	0	0	0	5	5	0	1	20	10	0	0	0	3	0	4	0	0	1	0	0	0	0	0	110	74	FI
FR	1	0	0	0	0	3	0	3	1	0	1	0	0	1	0	1	1	0	0	3	5	0	0	0	0	0	276	260	FR
GB	0	0	0	0	0	5	1	2	0	0	1	1	0	0	0	0	2	0	0	0	15	0	0	0	0	0	172	151	GB
GE	0	0	0	0	0	0	0	0	0	1	20	0	0	0	16	6	0	0	1	0	0	3	0	0	0	0	115	1	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	0	0	0	4	0	0	0	3	0	10	5	0	0	1	15	12	0	0	1	12	0	0	0	0	0	0	179	88	GR
HR	0	0	0	1	0	0	0	16	0	7	3	1	8	7	1	7	0	0	0	7	0	0	0	0	0	0	206	121	HR
HU	0	0	0	0	0	1	1	32	0	21	5	1	3	36	2	20	0	1	0	2	1	0	0	0	0	0	326	240	HU
IE	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	2	0	0	0	5	0	0	0	0	0	90	80	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	6	IS
IT	0	0	0	0	0	0	0	4	0	3	2	0	2	2	1	3	0	0	0	14	0	0	0	0	0	0	276	242	IT
KZ	0	0	0	0	0	0	0	1	0	0	48	0	0	0	1	8	0	0	0	0	0	1	0	0	0	0	73	3	KZ
LT	0	3	0	0	0	1	2	38	0	5	24	6	0	2	1	15	0	4	0	0	1	0	0	0	0	0	229	160	LT
LU	100	0	0	0	0	10	1	7	0	0	1	1	0	1	0	1	0	0	0	0	6	0	0	0	0	0	434	420	LU
LV	0	14	0	0	0	1	2	21	0	3	26	8	0	1	1	12	0	6	0	0	1	0	0	0	0	0	163	99	LV
MD	0	0	18	0	0	0	0	11	0	55	20	1	0	2	5	87	0	1	1	0	0	0	0	0	0	0	238	33	MD
MK	0	0	0	31	0	0	0	4	0	11	3	0	0	2	4	7	0	0	0	3	0	0	0	0	0	0	173	59	MK
MT	0	0	0	0	40	0	0	2	0	2	1	0	0	1	1	2	0	0	0	54	0	0	1	0	0	0	180	108	MT
NL	2	0	0	0	0	139	2	7	0	0	1	2	0	0	0	1	1	1	0	0	28	0	0	0	0	0	428	392	NL
NO	0	0	0	0	0	0	37	2	0	0	2	3	0	0	0	0	0	1	0	0	2	0	0	0	0	0	60	17	NO
PL	0	0	0	0	0	2	2	192	0	5	11	4	1	8	1	16	0	4	0	0	2	0	0	0	0	0	331	278	PL
PT	0	0	0	0	0	0	0	0	114	0	0	0	0	0	0	0	4	0	0	2	0	0	0	0	0	0	165	158	PT
RO	0	0	1	1	0	0	0	9	0	153	10	0	0	4	6	31	0	0	1	1	0	0	0	0	0	0	279	42	RO
RU	0	0	0	0	0	0	1	2	0	1	173	1	0	0	1	18	0	0	0	0	0	0	0	0	0	0	211	10	RU
SE	0	0	0	0	0	1	15	7	0	0	4	37	0	0	0	1	0	5	0	0	2	0	0	0	0	0	98	69	SE
SI	0	0	0	0	0	1	0	14	0	4	3	1	57	5	1	5	0	0	0	5	1	0	0	0	0	0	261	222	SI
SK	0	0	0	0	0	1	1	65	0	11	6	1	2	89	2	19	0	1	0	1	1	0	0	0	0	0	315	258	SK
TR	0	0	0	0	0	0	0	1	0	3	9	0	0	0	103	9	0	0	1	2	0	2	0	0	0	0	141	6	TR
UA	0	0	1	0	0	0	1	15	0	13	45	1	0	3	3	243	0	1	1	0	0	0	0	0	0	0	357	36	UA
ATL	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	18	12	ATL
BAS	0	1	0	0	0	2	7	27	0	2	13	30	0	1	1	5	0	27	0	0	3	0	0	0	0	0	191	128	BAS
BLS	0	0	0	0	0	0	0	3	0	10	51	0	0	1	37	60	0	0	11	1	0	1	0	0	0	0	197	11	BLS
MED	0	0	0	1	0	0	0	2	0	4	3	0	0	1	17	6	0	0	1	45	0	1	1	0	0	0	157	67	MED
NOS	0	0	0	0	0	8	13	7	0	0	1	3	0	0	0	1	1	2	0	0	31	0	0	0	0	0	159	109	NOS
ASI	0	0	0	0	0	0	0	0	0	0	9	0	0	0	10	3	0	0	0	1	0	18	0	0	0	0	52	2	ASI
NOA	0	0	0	0	0	0	0	1	0	1	1	0	0	0	4	2	0	0	0	9	0	0	5	0	0	0	44	17	NOA
EMC	0	0	0	0	0	1	2	8	1	4	45	2	0	1	7	16	0	1	0	2	1	2	1	0	0	0	147	55	EMC
EU	0	0	0	0	0	4	3	24	4	2	5	6	1	4	1	4	1	2	0	3	3	0	0	0	0	0	217	186	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.9: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of SO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	40	0	1	0	44	1	75	1	0	70	0	8	7	0	0	8	0	4	4	0	51	4	20	0	0	35	1	0	AL
AM	0	12	0	4	0	0	2	1	0	1	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	4	0	AM
AT	0	0	13	0	9	4	4	2	2	7	0	25	53	1	0	8	0	11	11	0	2	4	15	0	0	28	1	1	AT
AZ	0	1	0	8	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	9	0	AZ
BA	4	0	2	0	137	2	20	1	0	83	0	14	15	0	0	7	1	5	5	0	9	12	44	0	0	31	1	1	BA
BE	0	0	1	0	2	87	1	1	1	1	0	8	66	1	0	16	1	57	67	0	0	1	3	3	0	5	0	0	BE
BG	3	0	1	0	16	1	203	3	0	34	0	6	7	0	1	4	1	2	5	0	18	2	19	0	0	7	2	1	BG
BY	0	0	0	0	4	1	12	37	0	5	0	4	7	1	10	3	4	2	10	0	1	1	6	0	0	1	4	9	BY
CH	0	0	2	0	2	5	2	0	16	2	0	7	37	0	0	19	0	27	12	0	1	1	6	1	0	37	0	0	CH
CS	7	0	2	0	50	1	54	1	0	132	0	11	12	0	1	6	1	3	6	0	15	6	47	0	0	19	1	1	CS
CY	1	0	0	0	5	0	33	1	0	7	21	2	3	0	0	2	0	1	3	0	27	1	4	0	0	9	1	0	CY
CZ	0	0	5	0	7	6	4	3	1	9	0	68	62	1	1	7	1	11	20	0	1	3	22	1	0	11	1	1	CZ
DE	0	0	2	0	3	13	1	2	3	2	0	20	115	2	1	12	1	23	36	0	0	1	6	2	0	10	0	1	DE
DK	0	0	0	0	1	4	1	2	0	2	0	5	23	9	2	5	3	6	54	0	0	0	5	3	0	1	0	1	DK
EE	0	0	0	0	2	1	6	10	0	2	0	2	4	1	25	2	14	2	14	0	1	0	3	1	0	1	1	4	EE
ES	0	0	0	0	4	1	1	0	0	2	0	1	3	0	0	189	0	10	4	0	1	1	3	1	0	10	0	0	ES
FI	0	0	0	0	1	0	3	4	0	1	0	1	3	0	8	2	19	1	7	0	0	0	2	0	0	0	0	1	FI
FR	0	0	1	0	4	9	1	0	2	2	0	5	23	0	0	54	0	57	24	0	1	1	5	2	0	15	0	0	FR
GB	0	0	0	0	1	5	0	0	0	1	0	2	13	1	0	12	1	12	107	0	0	0	1	8	0	1	0	0	GB
GE	0	2	0	4	1	0	5	1	0	1	1	0	1	0	0	0	0	0	1	3	1	0	1	0	0	1	4	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	8	0	1	0	19	1	161	2	0	29	0	5	6	0	1	6	0	2	4	0	82	2	13	0	0	18	1	1	GR
HR	2	0	4	0	68	2	15	2	0	52	0	20	24	0	0	8	1	7	7	0	6	30	53	0	0	45	1	1	HR
HU	2	0	4	0	22	3	25	3	0	43	0	21	23	1	1	5	1	6	10	0	5	9	99	0	0	20	1	1	HU
IE	0	0	0	0	1	3	0	0	0	0	0	1	5	0	0	7	0	8	34	0	0	0	1	23	0	1	0	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	5	0	0	0	0	1	6	0	0	0	IS
IT	2	0	3	0	33	2	15	1	2	21	0	9	17	0	0	21	0	16	6	0	10	7	19	0	0	123	0	0	IT
KZ	0	0	0	0	0	0	2	2	0	0	0	1	1	0	1	0	1	0	1	0	0	0	1	0	0	0	32	0	KZ
LT	0	0	0	0	3	1	10	16	0	4	0	3	8	2	11	3	7	2	14	0	1	0	6	1	0	1	2	21	LT
LU	0	0	1	0	2	34	1	1	1	1	0	10	87	1	0	17	1	56	39	0	0	1	4	2	0	7	0	0	LU
LV	0	0	0	0	2	1	7	15	0	3	0	3	6	2	15	2	8	2	12	0	1	0	4	0	0	1	2	11	LV
MD	1	0	1	0	10	1	40	9	0	13	0	5	10	0	3	3	2	2	7	0	3	1	18	0	0	4	5	2	MD
MK	14	0	1	0	25	1	114	1	0	63	0	7	7	0	1	6	0	3	4	0	49	2	21	0	0	17	1	1	MK
MT	4	0	1	0	41	1	33	1	0	30	0	6	7	0	1	26	0	12	4	0	37	4	18	0	0	144	0	0	MT
NL	0	0	1	0	2	37	1	1	1	1	0	9	75	2	1	13	1	32	77	0	0	1	2	3	0	4	0	1	NL
NO	0	0	0	0	0	0	0	1	0	0	0	1	2	1	1	1	2	1	10	0	0	0	1	1	0	0	0	0	NO
PL	0	0	1	0	6	3	11	9	0	9	0	14	26	2	3	4	3	4	20	0	2	1	18	1	0	4	1	4	PL
PT	0	0	0	0	2	1	0	0	0	1	0	1	2	0	0	185	0	6	5	0	0	0	1	1	0	3	0	0	PT
RO	2	0	1	0	19	1	74	4	0	30	0	7	9	0	1	4	1	2	6	0	7	2	28	0	0	8	2	1	RO
RU	0	0	0	0	1	0	4	6	0	1	0	1	2	0	5	1	3	1	3	0	0	0	2	0	0	0	8	1	RU
SE	0	0	0	0	1	1	1	2	0	1	0	1	4	1	2	2	4	1	14	0	0	0	2	1	0	1	0	1	SE
SI	1	0	8	0	23	3	8	2	1	19	0	21	36	0	0	7	1	9	9	0	4	18	28	0	0	62	1	1	SI
SK	1	0	3	0	13	3	17	4	0	23	0	24	24	1	1	4	1	5	12	0	4	4	59	1	0	10	1	2	SK
TR	1	0	0	0	3	0	24	1	0	4	2	1	2	0	0	1	0	1	2	0	8	0	3	0	0	3	2	0	TR
UA	0	0	0	0	5	1	20	13	0	7	0	4	7	1	4	2	2	1	6	0	2	1	10	0	0	2	6	2	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	7	0	2	6	0	0	0	0	1	0	0	0	0	ATL
BAS	0	0	0	0	2	2	4	6	0	3	0	3	10	3	7	3	9	3	23	0	1	0	4	1	0	1	1	3	BAS
BLS	0	0	0	1	3	1	28	5	0	5	0	2	4	0	2	1	1	1	5	1	4	0	6	0	0	2	5	1	BLS
MED	4	0	1	0	26	1	49	1	0	21	2	5	7	0	0	29	0	11	5	0	37	4	13	0	0	61	1	0	MED
NOS	0	0	0	0	1	4	0	1	0	1	0	2	12	1	1	7	1	9	55	0	0	0	2	4	0	1	0	0	NOS
ASI	0	0	0	1	1	0	5	1	0	1	3	0	1	0	0	0	0	0	1	0	3	0	1	0	0	1	6	0	ASI
NOA	2	0	0	0	12	0	32	0	0	11	1	2	3	0	0	14	0	4	2	0	28	1	5	0	0	35	0	0	NOA
EMC	1	0	0	0	6	1	14	3	0	6	1	3	8	0	2	13	2	5	7	0	7	1	5	1	0	10	4	1	EMC
EU	1	0	1	0	7	5	9	3	1	6	0	8	24	1	2	41	3	16	22	0	4	2	10	2	0	17	0	1	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.9 Cont.: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of SO_x. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	1	38	1	0	0	42	1	45	6	0	2	5	12	18	1	1	1	42	1	1	2	12	10	3	620	190	AL
AM	0	0	0	0	0	0	0	4	0	3	10	0	0	0	95	13	0	0	1	2	0	36	1	14	11	0	222	9	AM
AT	0	0	0	1	0	2	0	81	0	9	6	0	10	6	2	11	1	3	0	6	6	0	1	13	4	2	366	272	AT
AZ	0	0	0	0	0	0	0	4	0	3	25	0	0	0	42	18	0	0	0	1	0	36	1	18	5	0	179	8	AZ
BA	0	0	0	6	0	1	0	76	1	36	6	0	5	9	7	19	1	2	0	23	3	0	2	11	7	2	611	229	BA
BE	1	0	0	0	0	22	0	32	1	2	4	1	1	1	0	5	11	4	0	3	61	0	0	19	1	10	500	374	BE
BG	0	0	3	9	0	0	0	44	0	121	18	0	1	5	20	63	0	2	5	8	2	1	1	14	3	2	661	124	BG
BY	0	1	1	1	0	1	0	76	0	17	71	1	1	2	4	61	1	9	0	1	4	1	0	14	1	2	390	142	BY
CH	0	0	0	1	0	2	0	20	1	6	2	0	4	2	1	4	3	1	0	8	7	0	1	15	4	2	260	181	CH
CS	0	0	1	11	0	1	0	79	1	70	8	0	3	11	9	30	1	2	1	15	3	1	1	12	6	2	639	217	CS
CY	0	0	1	4	1	0	0	17	0	23	14	0	0	1	354	32	0	1	5	62	1	19	5	15	10	11	700	93	CY
CZ	0	0	0	1	0	3	0	163	0	8	11	1	5	9	2	17	2	7	0	3	11	0	0	14	2	3	508	399	CZ
DE	0	0	0	0	0	7	0	69	1	3	8	2	2	2	1	8	4	11	0	3	24	0	0	15	2	6	428	329	DE
DK	0	0	0	0	0	3	2	49	0	2	9	4	0	1	1	4	6	32	0	0	37	0	0	15	0	14	308	179	DK
EE	0	1	0	0	0	0	1	27	0	9	77	3	0	1	3	23	1	24	0	0	5	1	0	11	1	4	291	109	EE
ES	0	0	0	0	0	0	0	7	23	2	1	0	1	1	0	2	17	0	0	33	3	0	4	22	4	7	358	254	ES
FI	0	0	0	0	0	0	1	21	0	4	73	4	0	1	2	9	1	11	0	0	3	0	0	9	0	3	200	73	FI
FR	0	0	0	0	0	3	0	20	2	3	2	0	2	2	0	4	15	1	0	15	21	0	2	18	2	9	330	226	FR
GB	0	0	0	0	0	3	0	10	1	1	3	1	0	0	0	2	19	3	0	1	33	0	0	20	0	17	281	179	GB
GE	0	0	0	0	0	0	0	7	0	7	28	0	0	0	77	30	0	0	3	2	0	21	1	15	8	1	233	15	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	18	1	GL
GR	0	0	1	19	1	0	0	32	1	59	12	0	1	3	28	41	0	1	4	47	2	1	2	14	7	4	642	179	GR
HR	0	0	0	4	0	1	0	97	1	29	7	0	11	11	5	22	1	3	0	31	4	0	2	12	7	2	600	300	HR
HU	0	0	0	3	0	1	0	159	0	41	12	1	6	24	6	46	1	4	0	9	5	0	1	13	4	2	646	391	HU
IE	0	0	0	0	0	1	0	5	1	1	2	0	0	0	0	1	20	1	0	1	13	0	0	25	0	20	178	92	IE
IS	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	2	0	0	0	1	0	0	11	0	10	47	14	IS
IT	0	0	0	4	2	1	0	43	1	18	4	0	9	5	3	11	2	1	0	67	3	0	4	13	14	5	519	287	IT
KZ	0	0	0	0	0	0	0	6	0	3	67	0	0	0	5	26	0	1	0	0	0	5	0	36	1	0	197	15	KZ
LT	0	2	1	1	0	1	0	90	0	14	59	3	0	2	4	40	1	17	0	1	6	1	0	12	1	4	375	178	LT
LU	7	0	0	0	0	10	0	39	1	2	4	1	1	2	0	5	7	3	0	3	29	0	1	16	1	6	405	319	LU
LV	0	3	1	1	0	1	1	46	0	11	68	3	0	1	4	36	1	18	0	0	5	1	0	12	1	4	315	123	LV
MD	0	0	10	2	0	1	0	77	0	82	38	1	1	5	9	130	1	4	3	3	3	2	0	16	2	2	533	147	MD
MK	0	0	1	46	0	0	0	42	0	61	8	0	2	5	12	25	0	1	1	17	2	1	2	13	6	2	583	167	MK
MT	0	0	0	8	67	0	0	35	1	22	4	0	3	4	4	10	2	1	0	251	1	0	10	14	38	22	870	369	MT
NL	0	0	0	0	0	40	1	33	2	2	6	1	1	1	0	5	11	8	0	2	68	0	0	18	1	12	476	336	NL
NO	0	0	0	0	0	0	3	8	0	0	9	1	0	0	0	1	2	3	0	0	5	0	0	11	0	6	72	31	NO
PL	0	0	0	1	0	2	0	262	0	13	28	2	2	7	4	33	2	15	0	2	10	0	0	13	1	4	550	385	PL
PT	0	0	0	0	0	0	0	4	76	0	1	0	0	0	0	1	44	0	0	12	4	0	2	25	2	12	392	285	PT
RO	0	0	2	4	0	1	0	75	0	167	19	0	2	8	13	70	1	3	3	5	3	1	1	15	3	2	608	164	RO
RU	0	0	0	0	0	0	0	17	0	6	126	1	0	1	5	37	0	3	0	0	1	2	0	21	1	1	263	39	RU
SE	0	0	0	0	0	0	2	21	0	2	18	6	0	1	1	4	2	12	0	0	7	0	0	9	0	5	133	65	SE
SI	0	0	0	3	0	1	0	90	1	17	7	0	41	8	3	17	1	3	0	21	4	0	1	13	6	2	499	331	SI
SK	0	0	0	2	0	1	0	228	0	22	13	1	4	31	5	39	1	5	0	4	7	0	0	13	3	2	600	419	SK
TR	0	0	1	2	0	0	0	16	0	21	17	0	0	1	214	38	0	1	5	10	1	14	2	13	11	2	430	42	TR
UA	0	0	2	1	0	0	0	70	0	30	58	1	1	3	7	151	1	4	2	2	3	2	0	16	1	2	456	122	UA
ATL	0	0	0	0	0	0	0	3	1	0	4	0	0	0	0	1	10	1	0	0	3	0	0	24	0	14	83	24	ATL
BAS	0	1	0	0	0	1	1	48	0	7	36	6	0	1	2	14	3	44	0	0	11	0	0	11	0	8	285	130	BAS
BLS	0	0	2	1	0	0	0	38	0	34	57	0	0	2	46	124	0	2	23	4	2	6	1	16	3	7	448	72	BLS
MED	0	0	1	7	3	0	0	30	2	28	8	0	3	3	57	23	3	1	2	170	2	3	8	15	17	16	681	215	MED
NOS	0	0	0	0	0	3	1	15	1	1	4	1	0	0	0	2	11	5	0	1	49	0	0	15	0	20	232	119	NOS
ASI	0	0	0	0	0	0	0	4	0	4	16	0	0	0	89	13	0	0	1	7	0	47	1	21	9	1	242	16	ASI
NOA	0	0	0	5	2	0	0	13	1	15	3	0	1	1	21	9	1	0	1	56	1	1	17	17	25	6	354	115	NOA
EMC	0	0	0	2	0	1	0	27	1	12	42	1	1	2	25	25	2	3	1	14	4	7	3	18	6	3	302	100	EMC
EU	0	0	0	1	0	2	0	56	5	8	16	2	2	3	3	12	8	7	0	15	12	0	1	15	3	7	367	229	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.10: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	35	0	5	0	7	1	14	1	1	32	0	5	9	1	0	2	0	5	2	0	34	4	7	0	0	32	0	0	AL
AM	0	10	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	AM
AT	0	0	84	0	2	4	1	1	18	3	0	34	119	2	0	3	1	31	8	0	1	6	14	0	0	110	0	0	AT
AZ	0	3	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	1	0	AZ
BA	1	0	15	0	29	1	4	1	2	27	0	11	25	1	0	2	1	7	3	0	4	19	23	0	0	47	0	0	BA
BE	0	0	10	0	0	75	0	1	9	0	0	14	206	7	0	12	1	177	92	0	0	1	1	4	0	31	0	0	BE
BG	1	0	4	0	3	1	59	2	1	17	0	5	9	1	0	1	1	3	2	0	14	2	7	0	0	7	0	1	BG
BY	0	0	3	0	1	2	2	47	1	2	0	6	18	4	2	1	6	5	5	0	1	1	5	0	0	5	0	12	BY
CH	0	0	21	0	0	7	0	0	92	1	0	7	85	2	0	8	0	81	15	0	0	2	2	0	0	203	0	0	CH
CS	5	0	13	0	13	1	17	2	2	82	0	12	23	1	0	2	1	7	3	0	10	11	38	0	0	25	0	1	CS
CY	0	0	0	0	0	0	3	0	0	1	9	0	1	0	0	1	0	1	1	0	7	0	1	0	0	4	0	0	CY
CZ	0	0	56	0	2	7	1	3	11	5	0	96	169	5	0	3	1	36	13	0	0	5	21	1	0	33	0	1	CZ
DE	0	0	27	0	0	21	0	2	20	1	0	35	314	15	0	6	1	74	41	0	0	1	4	2	0	36	0	1	DE
DK	0	0	5	0	0	13	0	3	2	0	0	14	118	82	0	2	4	24	73	0	0	0	2	3	0	5	0	2	DK
EE	0	0	1	0	0	1	0	8	0	0	0	3	12	4	8	1	12	3	7	0	0	0	1	0	0	1	0	6	EE
ES	0	0	2	0	0	2	0	0	1	0	0	1	8	0	0	156	0	25	4	0	0	0	0	0	0	10	0	0	ES
FI	0	0	0	0	0	0	0	1	0	0	0	1	4	2	1	0	13	1	3	0	0	0	0	0	0	0	0	0	FI
FR	0	0	11	0	0	20	0	0	15	0	0	7	70	2	0	32	0	200	39	0	0	1	1	2	0	52	0	0	FR
GB	0	0	2	0	0	13	0	0	2	0	0	4	51	6	0	9	1	56	135	0	0	0	0	12	0	9	0	0	GB
GE	0	6	0	10	0	0	1	0	0	0	0	0	1	0	0	0	0	1	1	30	0	0	0	0	0	1	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	4	0	2	0	2	0	32	1	0	9	0	3	6	0	0	2	0	3	1	0	63	1	4	0	0	13	0	0	GR
HR	1	0	34	0	16	3	4	1	4	29	0	23	47	2	0	2	1	14	4	0	3	48	47	0	0	111	0	1	HR
HU	1	0	38	0	7	3	8	4	4	38	0	37	59	2	0	2	1	15	5	0	2	24	117	0	0	57	0	1	HU
IE	0	0	1	0	0	12	0	0	1	0	0	4	32	3	0	6	0	46	132	0	0	0	0	36	0	3	0	0	IE
IS	0	0	0	0	0	1	0	0	0	0	0	1	5	0	0	1	0	3	8	0	0	0	0	1	2	1	0	0	IS
IT	1	0	20	0	4	2	2	1	8	5	0	8	31	1	0	7	0	27	4	0	3	9	8	0	0	295	0	0	IT
KZ	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	5	0	KZ
LT	0	0	3	0	0	3	1	24	1	1	0	6	29	8	2	1	8	8	10	0	0	1	4	0	0	4	0	34	LT
LU	0	0	17	0	0	76	0	1	12	0	0	20	256	6	0	10	1	184	59	0	0	1	1	2	0	35	0	0	LU
LV	0	0	2	0	0	2	0	15	1	1	0	4	19	5	3	1	8	5	9	0	0	0	2	0	0	2	0	20	LV
MD	0	0	4	0	1	1	10	8	1	5	0	6	17	2	1	1	2	5	4	1	2	1	9	0	0	5	0	2	MD
MK	11	0	5	0	5	1	28	1	1	35	0	5	9	0	0	2	1	3	2	0	44	3	8	0	0	16	0	0	MK
MT	1	0	2	0	3	1	4	0	1	5	0	2	6	0	0	8	0	11	2	0	10	2	3	0	0	72	0	0	MT
NL	0	0	7	0	0	45	0	1	6	0	0	17	245	18	0	8	1	108	102	0	0	1	1	4	0	19	0	1	NL
NO	0	0	1	0	0	2	0	0	0	0	0	1	11	4	0	1	1	4	12	0	0	0	0	1	0	1	0	0	NO
PL	0	0	13	0	1	5	1	14	3	4	0	34	86	11	1	2	4	17	12	0	0	3	16	1	0	12	0	6	PL
PT	0	0	1	0	0	1	0	0	1	0	0	1	4	0	0	102	0	10	3	0	0	0	0	0	0	3	0	0	PT
RO	1	0	8	0	4	1	21	4	1	20	0	10	20	1	0	1	1	6	3	0	4	4	23	0	0	12	0	1	RO
RU	0	0	0	0	0	0	0	3	0	0	0	1	2	0	0	0	2	1	1	1	0	0	0	0	0	0	1	1	RU
SE	0	0	1	0	0	1	0	1	0	0	0	3	16	8	0	1	3	4	9	0	0	0	1	1	0	1	0	1	SE
SI	0	0	70	0	5	3	2	1	9	12	0	24	65	1	0	3	1	22	5	0	2	36	25	0	0	234	0	0	SI
SK	0	0	22	0	3	3	3	4	4	13	0	40	56	2	0	1	1	14	5	0	1	9	58	0	0	31	0	1	SK
TR	0	1	0	1	0	0	3	0	0	1	1	1	2	0	0	1	0	1	1	1	3	0	1	0	0	2	0	0	TR
UA	0	0	3	0	1	1	4	12	0	3	0	5	13	2	1	1	3	4	3	1	1	1	7	0	0	4	1	3	UA
ATL	0	0	0	0	0	2	0	0	0	0	0	1	5	1	0	3	0	8	10	0	0	0	0	1	0	1	0	0	ATL
BAS	0	0	3	0	0	4	0	5	1	0	0	7	42	17	2	1	8	9	20	0	0	0	3	1	0	3	0	4	BAS
BLS	0	1	1	1	0	0	4	2	0	1	0	2	5	1	0	0	1	1	2	3	1	0	1	0	0	1	0	1	BLS
MED	1	0	3	0	2	1	7	0	1	4	1	2	7	0	0	15	0	13	2	0	14	3	3	0	0	49	0	0	MED
NOS	0	0	3	0	0	12	0	1	2	0	0	8	74	18	0	5	1	47	74	0	0	0	1	5	0	8	0	0	NOS
ASI	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	ASI
NOA	1	0	1	0	1	0	4	0	0	2	0	1	2	0	0	6	0	4	1	0	8	1	1	0	0	16	0	0	NOA
EMC	0	0	4	0	1	2	2	3	2	2	0	4	19	2	0	8	1	14	7	1	2	1	3	1	0	15	1	1	EMC
EU	0	0	12	0	1	8	2	3	6	2	0	13	69	6	0	29	3	51	26	0	2	2	7	2	0	43	0	2	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.10 Cont.: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NO_x. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	15	0	1	0	9	0	13	3	0	1	3	3	4	1	1	1	28	1	0	0	9	0	0	290	117	AL
AM	0	0	0	0	0	0	0	1	0	1	6	0	0	0	34	2	0	0	1	1	0	8	0	7	0	0	87	4	AM
AT	1	0	0	0	0	5	1	21	0	3	3	2	12	7	0	4	2	3	0	6	5	0	0	10	0	0	530	460	AT
AZ	0	0	0	0	0	0	0	0	0	0	14	0	0	0	12	2	0	0	0	1	0	9	0	7	0	0	78	3	AZ
BA	0	0	0	2	0	2	1	14	0	11	3	1	4	6	1	4	1	2	0	14	2	0	0	8	0	0	301	168	BA
BE	6	0	0	0	0	100	5	11	1	1	2	3	1	2	0	2	19	6	0	4	79	0	0	32	0	0	920	757	BE
BG	0	0	3	4	0	1	1	10	0	52	11	1	1	3	5	16	1	1	4	5	1	0	0	9	0	0	270	71	BG
BY	0	6	2	0	0	3	2	48	0	11	49	4	1	3	1	30	1	10	0	1	3	0	0	7	0	0	310	138	BY
CH	1	0	0	0	0	8	1	7	0	1	1	1	5	1	0	1	3	2	0	9	8	0	0	11	0	0	587	455	CH
CS	0	0	1	7	0	2	1	23	0	38	5	1	3	10	2	10	1	2	1	9	2	0	0	10	0	0	393	176	CS
CY	0	0	0	0	0	0	0	1	0	3	5	0	0	0	88	3	0	0	2	37	0	3	1	10	0	0	190	29	CY
CZ	1	0	0	0	0	10	2	70	0	4	6	4	6	14	0	7	3	8	0	3	9	0	0	15	0	0	633	547	CZ
DE	2	0	0	0	0	41	4	39	1	1	4	6	2	3	0	3	7	17	0	4	32	0	0	20	0	0	787	670	DE
DK	1	1	0	0	0	31	16	50	0	0	6	21	0	2	0	2	8	57	0	1	70	0	0	17	0	0	637	453	DK
EE	0	7	0	0	0	3	3	15	0	2	20	8	0	1	0	4	1	20	0	0	4	0	0	5	0	0	163	95	EE
ES	0	0	0	0	0	2	0	2	16	0	0	0	0	0	0	0	11	0	0	17	2	0	0	10	0	0	274	230	ES
FI	0	0	0	0	0	1	4	3	0	0	7	6	0	0	0	1	1	5	0	0	2	0	0	3	0	0	62	38	FI
FR	2	0	0	0	0	16	2	7	2	1	1	1	2	1	0	1	14	2	0	10	29	0	0	14	0	0	558	467	FR
GB	1	0	0	0	0	26	3	5	1	0	1	2	0	0	0	1	20	4	0	2	51	0	0	18	0	0	440	334	GB
GE	0	0	0	0	0	0	0	1	0	2	23	0	0	0	35	5	0	0	3	1	0	5	0	7	0	0	137	7	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	GL
GR	0	0	1	8	0	1	0	7	0	17	6	0	1	2	10	8	1	1	3	27	1	0	0	9	0	0	250	109	GR
HR	0	0	0	1	0	3	1	23	0	14	4	1	15	11	1	7	1	3	0	26	3	0	0	10	0	0	522	346	HR
HU	0	1	1	1	0	4	1	54	0	36	9	2	11	34	1	21	2	4	0	9	4	0	0	13	0	0	632	445	HU
IE	1	0	0	0	0	16	2	3	1	0	1	1	0	0	0	1	27	2	0	1	38	0	0	12	0	0	384	297	IE
IS	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	3	0	0	35	24	IS
IT	0	0	0	1	0	2	1	9	0	4	2	1	10	3	1	2	2	1	0	45	2	0	0	12	0	0	537	433	IT
KZ	0	0	0	0	0	0	0	1	0	1	44	0	0	0	1	4	0	1	0	0	0	1	0	5	0	0	71	6	KZ
LT	0	8	1	0	0	6	3	67	0	5	27	8	1	3	1	11	2	22	0	1	7	0	0	8	0	0	329	214	LT
LU	13	0	0	0	0	57	3	14	1	1	2	3	2	2	0	2	10	5	0	4	36	0	0	20	0	0	856	759	LU
LV	0	14	0	0	0	4	2	32	0	3	24	7	0	2	0	7	1	18	0	0	5	0	0	6	0	0	228	142	LV
MD	0	1	22	1	0	2	1	30	0	75	34	2	1	5	3	67	1	4	5	1	2	0	0	10	0	0	355	100	MD
MK	0	0	1	28	0	1	0	9	0	21	4	0	1	3	3	6	1	1	1	12	1	0	0	9	0	0	282	110	MK
MT	0	0	0	1	7	1	0	3	0	4	1	0	1	1	1	1	1	0	0	67	1	0	1	10	0	0	238	133	MT
NL	3	0	0	0	0	95	6	17	1	1	3	6	1	1	1	2	19	14	0	4	93	0	0	34	0	0	883	699	NL
NO	0	0	0	0	0	3	11	4	0	0	1	4	0	0	0	0	2	3	0	0	6	0	0	3	0	0	78	49	NO
PL	0	2	0	0	0	9	3	174	0	6	16	7	3	12	0	14	3	21	0	2	10	0	0	13	0	0	540	426	PL
PT	0	0	0	0	0	1	0	1	70	0	0	0	0	0	0	0	26	0	0	7	1	0	0	11	0	0	242	195	PT
RO	0	1	4	2	0	2	1	26	0	112	14	1	2	8	3	27	1	3	3	3	2	0	0	10	0	0	373	132	RO
RU	0	1	0	0	0	0	1	3	0	1	86	1	0	0	1	10	0	1	0	0	1	0	0	6	0	0	130	14	RU
SE	0	0	0	0	0	3	8	9	0	0	3	13	0	1	0	1	2	11	0	0	7	0	0	4	0	0	112	76	SE
SI	0	0	0	1	0	3	1	19	0	8	4	1	54	8	0	5	2	3	0	26	3	0	0	12	0	0	674	542	SI
SK	0	1	0	0	0	3	2	66	0	14	9	2	5	32	0	17	2	4	0	4	4	0	0	11	0	0	451	347	SK
TR	0	0	0	0	0	0	0	2	0	4	9	0	0	0	80	6	0	0	3	7	0	3	0	8	0	0	143	15	TR
UA	0	1	4	0	0	2	1	28	0	19	61	2	1	4	2	79	1	5	3	1	2	0	0	9	0	0	298	87	UA
ATL	0	0	0	0	0	2	1	1	1	0	1	0	0	0	0	0	10	1	0	0	4	0	0	5	0	0	60	37	ATL
BAS	0	2	0	0	0	10	6	38	0	1	10	16	0	2	0	3	3	28	0	1	16	0	0	8	0	0	275	191	BAS
BLS	0	0	2	0	0	1	1	8	0	11	42	1	0	1	14	30	1	2	16	2	1	1	0	8	0	0	172	28	BLS
MED	0	0	0	1	1	1	0	4	1	5	3	0	1	1	19	4	2	1	2	67	1	1	1	10	0	0	256	121	MED
NOS	1	0	0	0	0	21	9	15	1	0	2	5	0	1	0	1	13	12	0	2	43	0	0	14	0	0	402	301	NOS
ASI	0	0	0	0	0	0	0	0	0	1	9	0	0	0	22	2	0	0	0	4	0	12	0	6	0	0	64	5	ASI
NOA	0	0	0	1	0	0	0	1	0	2	1	0	0	0	6	1	1	0	1	26	0	0	2	9	0	0	102	44	NOA
EMC	0	1	0	0	0	3	1	10	1	5	25	2	1	1	8	8	2	3	1	7	4	2	0	7	0	0	191	103	EMC
EU	1	1	0	0	0	12	3	28	4	3	5	4	3	4	1	4	8	8	0	10	16	0	0	12	0	0	415	331	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.11: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NH_3. **Emitters →, Receptors ↓**.

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	76	0	2	0	2	0	3	1	0	18	0	1	3	0	0	0	0	1	0	0	16	2	2	0	0	9	0	0	AL
AM	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	AM
AT	0	0	76	0	1	2	0	2	8	3	0	29	82	2	0	1	0	17	4	0	0	5	9	0	0	59	0	0	AT
AZ	0	1	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	AZ
BA	2	0	10	0	78	0	2	1	1	30	0	9	16	1	0	0	0	3	1	0	2	36	25	0	0	30	0	1	BA
BE	0	0	4	0	0	224	0	1	3	0	0	8	120	5	0	4	0	132	53	0	0	1	1	3	0	12	0	0	BE
BG	2	0	2	0	2	0	98	2	1	21	0	3	6	0	0	0	0	1	0	0	12	3	6	0	0	5	0	1	BG
BY	0	0	2	0	1	1	1	79	1	2	0	6	20	2	1	0	1	7	3	1	0	2	6	0	0	7	0	10	BY
CH	0	0	5	0	0	3	0	0	58	0	0	3	39	1	0	1	0	36	4	0	0	2	1	0	0	94	0	0	CH
CS	6	0	6	0	11	0	9	2	1	110	0	7	12	1	0	0	0	3	1	0	4	12	28	0	0	14	0	1	CS
CY	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	CY
CZ	0	0	25	0	1	6	1	4	4	5	0	150	121	4	0	1	0	28	7	0	0	7	17	1	0	22	0	1	CZ
DE	0	0	8	0	0	19	0	3	8	1	0	21	286	10	0	2	0	55	21	0	0	1	3	2	0	20	0	1	DE
DK	0	0	4	0	0	11	0	7	2	1	0	9	126	137	0	1	1	28	38	0	0	1	2	4	0	5	0	4	DK
EE	0	0	2	0	0	2	0	11	1	1	0	5	27	10	37	1	8	5	8	0	0	0	2	1	0	2	0	8	EE
ES	0	0	1	0	0	1	0	0	1	0	0	1	7	0	0	111	0	21	1	0	0	0	0	0	0	6	0	0	ES
FI	0	0	0	0	0	1	0	3	0	0	0	1	9	4	2	0	31	2	4	0	0	0	1	0	0	1	0	1	FI
FR	0	0	4	0	0	15	0	0	6	0	0	4	43	2	0	9	0	187	16	0	0	2	1	1	0	34	0	0	FR
GB	0	0	2	0	0	22	0	1	2	0	0	4	60	6	0	4	0	69	243	0	0	1	0	8	0	10	0	0	GB
GE	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	5	0	1	0	1	0	13	1	0	6	0	1	3	0	0	0	0	1	0	0	70	1	2	0	0	5	0	0	GR
HR	1	0	17	0	17	1	2	2	2	21	0	15	26	2	0	0	0	6	1	0	1	102	39	0	0	72	0	1	HR
HU	1	0	21	0	3	1	4	4	2	21	0	27	41	2	0	0	0	10	2	0	1	20	137	0	0	29	0	1	HU
IE	0	0	1	0	0	14	0	1	1	0	0	3	37	4	0	3	0	53	107	0	0	0	0	86	0	3	0	0	IE
IS	0	0	0	0	0	1	0	0	0	0	0	0	5	0	0	0	0	3	5	0	0	0	0	2	3	1	0	0	IS
IT	1	0	7	0	2	1	0	1	3	3	0	4	14	1	0	1	0	8	1	0	1	9	4	0	0	189	0	0	IT
KZ	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	13	0	KZ
LT	0	0	2	0	0	2	1	24	1	1	0	8	37	8	1	1	1	11	7	0	0	1	4	1	0	6	0	60	LT
LU	0	0	6	0	0	81	0	1	4	0	0	11	159	4	0	3	0	124	31	0	0	1	1	2	0	11	0	0	LU
LV	0	0	2	0	0	2	1	20	1	1	0	6	33	9	4	1	3	8	8	0	0	1	3	1	0	4	0	27	LV
MD	1	0	1	0	1	0	6	7	0	3	0	3	10	1	0	0	0	2	1	1	1	1	5	0	0	3	0	1	MD
MK	14	0	2	0	2	0	13	1	0	30	0	2	4	0	0	0	0	1	0	0	31	3	4	0	0	6	0	0	MK
MT	1	0	1	0	1	0	1	0	0	1	0	0	2	0	0	2	0	3	0	0	3	2	1	0	0	30	0	0	MT
NL	0	0	4	0	0	64	0	1	4	0	0	9	137	9	0	3	0	83	64	0	0	1	1	3	0	12	0	0	NL
NO	0	0	1	0	0	2	0	1	1	0	0	1	18	9	0	1	0	7	11	0	0	0	0	2	0	1	0	0	NO
PL	0	0	6	0	1	4	1	11	2	4	0	28	72	7	0	1	1	16	7	0	0	5	13	1	0	13	0	4	PL
PT	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	45	0	10	0	0	0	0	0	0	0	1	0	0	PT
RO	1	0	4	0	2	0	14	3	1	14	0	6	13	1	0	0	0	3	1	0	2	4	18	0	0	8	0	1	RO
RU	0	0	0	0	0	0	0	5	0	0	0	0	2	0	0	0	1	1	0	1	0	0	0	0	0	1	1	1	RU
SE	0	0	2	0	0	2	0	3	1	0	0	4	32	18	0	1	2	7	10	0	0	0	1	1	0	3	0	2	SE
SI	1	0	42	0	2	1	1	2	4	8	0	19	38	2	0	0	0	11	2	0	0	43	17	0	0	125	0	1	SI
SK	0	0	16	0	2	2	3	5	3	11	0	49	52	2	0	0	0	13	3	0	0	11	57	0	0	29	0	1	SK
TR	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	TR
UA	0	0	1	0	0	1	2	12	0	2	0	4	10	1	0	0	1	3	1	1	0	1	7	0	0	4	0	2	UA
ATL	0	0	0	0	0	2	0	0	0	0	0	0	5	1	0	2	0	10	9	0	0	0	0	2	0	1	0	0	ATL
BAS	0	0	3	0	0	5	0	8	1	1	0	8	74	35	4	1	8	13	14	0	0	1	3	1	0	4	0	7	BAS
BLS	0	0	0	0	0	0	4	2	0	1	0	1	2	0	0	0	0	0	0	3	1	0	1	0	0	0	0	0	BLS
MED	2	0	2	0	1	0	2	0	1	2	1	1	4	0	0	7	0	7	0	0	6	3	1	0	0	32	0	0	MED
NOS	0	0	3	0	0	25	0	2	2	0	0	7	105	30	0	3	0	71	100	0	0	1	1	6	0	8	0	1	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	ASI
NOA	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	2	0	1	0	0	2	0	0	0	0	4	0	0	NOA
EMC	0	0	2	0	1	2	1	4	1	2	0	3	17	2	0	4	1	12	7	0	1	1	3	1	0	8	1	1	EMC
EU	0	0	6	0	0	9	1	3	3	2	0	12	59	7	1	17	3	46	25	0	2	3	7	3	0	28	0	2	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.11 Cont.: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of NH_3. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	9	0	0	0	3	0	6	1	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	162	40	AL
AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	3	0	0	0	0	16	-1	AM
AT	0	0	0	0	0	4	0	25	0	2	1	1	9	4	0	3	0	0	0	0	0	0	0	1	0	0	354	327	AT
AZ	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	17	0	AZ
BA	0	0	1	1	0	1	0	20	0	12	1	1	3	7	0	4	0	0	0	0	0	0	0	1	0	0	299	129	BA
BE	7	0	0	0	0	78	0	12	1	0	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	676	666	BE
BG	0	0	4	4	0	0	0	7	0	52	4	0	1	2	2	13	0	0	0	0	0	0	0	1	0	0	260	49	BG
BY	0	3	2	0	0	3	0	55	0	10	26	2	1	3	0	34	0	0	0	0	0	0	0	1	0	0	295	133	BY
CH	0	0	0	0	0	5	0	4	0	1	0	0	2	1	0	1	0	0	0	0	0	0	0	1	0	0	263	200	CH
CS	0	0	1	4	0	0	0	17	0	27	2	1	2	7	0	6	0	0	0	0	0	0	0	1	0	0	297	104	CS
CY	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	31	0	0	0	0	0	0	1	1	0	0	0	62	26	CY
CZ	1	0	0	0	0	7	0	75	0	4	2	2	4	11	0	6	0	0	0	0	0	0	0	1	0	0	520	483	CZ
DE	2	0	0	0	0	36	1	40	0	1	1	3	1	2	0	2	0	0	0	0	0	0	0	1	0	0	551	531	DE
DK	1	1	0	0	0	30	4	65	0	1	3	16	0	2	0	3	0	0	0	0	0	0	0	1	0	0	506	484	DK
EE	0	13	0	0	0	5	2	33	0	3	22	17	0	2	0	6	0	0	0	0	0	0	0	1	0	0	236	187	EE
ES	0	0	0	0	0	1	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	158	156	ES
FI	0	1	0	0	0	2	2	9	0	1	6	8	0	0	0	2	0	0	0	0	0	0	0	1	0	0	96	80	FI
FR	2	0	0	0	0	10	0	7	1	1	0	0	2	1	0	1	0	0	0	0	0	0	0	1	0	0	349	338	FR
GB	1	0	0	0	0	33	1	7	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	479	472	GB
GE	0	0	0	0	0	0	0	0	0	0	2	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	24	-1	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	GL
GR	0	0	1	5	0	0	0	4	0	11	1	0	0	1	5	5	0	0	0	0	0	0	0	1	0	0	145	89	GR
HR	0	0	1	1	0	1	0	28	0	11	2	1	13	10	0	5	0	0	0	0	0	0	0	1	0	0	403	236	HR
HU	0	0	1	1	0	2	0	52	0	27	3	1	5	35	0	13	0	0	0	0	0	0	0	1	0	0	469	369	HU
IE	1	0	0	0	0	17	0	4	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	340	335	IE
IS	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	26	22	IS
IT	0	0	0	0	0	1	0	7	0	2	0	0	6	2	0	1	0	0	0	0	0	0	0	1	0	0	271	246	IT
KZ	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	3	0	0	0	0	0	1	0	4	0	0	62	2	KZ
LT	0	7	1	0	0	6	1	87	0	6	17	6	1	3	0	11	0	0	0	0	0	0	0	1	0	0	324	257	LT
LU	50	0	0	0	0	37	0	14	1	0	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	548	537	LU
LV	0	41	1	0	0	5	1	56	0	4	20	10	0	2	0	9	0	0	0	0	0	0	0	1	0	0	285	224	LV
MD	0	1	54	0	0	1	0	18	0	54	12	1	0	2	1	53	0	0	0	0	0	0	0	1	0	0	249	53	MD
MK	0	0	1	61	0	0	0	5	0	13	1	0	0	2	1	4	0	0	0	0	0	0	0	1	0	0	205	60	MK
MT	0	0	0	0	80	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	133	124	MT
NL	2	0	0	0	0	213	1	15	0	0	1	2	1	1	0	1	0	0	0	0	0	0	0	1	0	0	636	625	NL
NO	0	0	0	0	0	4	14	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	86	68	NO
PL	0	1	0	0	0	8	1	217	0	7	6	4	2	10	0	10	0	0	0	0	0	0	0	1	0	0	466	415	PL
PT	0	0	0	0	0	0	0	1	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	151	150	PT
RO	0	0	5	1	0	1	0	14	0	146	4	0	1	5	1	16	0	0	0	0	0	0	0	1	0	0	295	79	RO
RU	0	0	0	0	0	0	0	4	0	1	107	1	0	0	0	11	0	0	0	0	0	0	0	2	0	0	142	12	RU
SE	0	1	0	0	0	5	7	19	0	1	1	38	0	1	0	1	0	0	0	0	0	0	0	1	0	0	165	149	SE
SI	0	0	0	0	0	2	0	27	0	6	2	1	91	6	0	4	0	0	0	0	0	0	0	1	0	0	460	386	SI
SK	0	0	0	1	0	3	0	94	0	18	3	1	4	92	0	13	0	0	0	0	0	0	0	1	0	0	493	421	SK
TR	0	0	0	0	0	0	0	1	0	2	1	0	0	0	66	2	0	0	0	0	0	2	0	0	0	0	83	4	TR
UA	0	1	6	0	0	1	0	26	0	16	34	1	0	4	1	124	0	0	0	0	0	0	0	1	0	0	273	69	UA
ATL	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	41	37	ATL
BAS	0	4	0	0	0	12	3	70	0	2	8	37	0	2	0	5	0	0	0	0	0	0	0	1	0	0	340	308	BAS
BLS	0	0	2	0	0	0	0	3	0	10	19	0	0	0	6	23	0	0	0	0	0	0	0	1	0	0	81	9	BLS
MED	0	0	0	1	1	0	0	2	0	3	1	0	1	0	9	2	0	0	0	0	0	1	3	1	0	0	97	67	MED
NOS	1	0	0	0	0	43	4	22	0	0	1	5	1	1	0	1	0	0	0	0	0	0	0	2	0	0	447	433	NOS
ASI	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	11	0	1	0	0	20	0	ASI
NOA	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0	14	1	0	0	33	11	NOA
EMC	0	1	1	0	0	3	1	12	1	5	26	2	1	1	4	9	0	0	0	0	0	1	2	1	0	0	147	85	EMC
EU	1	1	0	0	0	12	1	34	3	3	3	7	2	4	0	3	0	0	0	0	0	0	0	1	0	0	314	291	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.12: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	-1	0	0	0	-1	0	-1	0	0	-2	0	0	0	0	0	0	0	0	0	0	-2	-1	-1	0	0	-3	0	0	AL
AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AM
AT	0	0	3	0	0	0	0	1	0	0	0	1	3	0	0	0	0	1	1	0	0	0	0	0	0	-3	0	0	AT
AZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AZ
BA	0	0	0	0	-1	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-3	0	0	BA
BE	0	0	2	0	0	22	0	1	1	0	0	3	32	2	0	2	0	23	29	0	0	0	0	1	0	5	0	0	BE
BG	0	0	0	0	0	0	-2	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	BG
BY	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	BY
CH	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	CH
CS	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	CS
CY	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	CY
CZ	0	0	3	0	0	1	0	1	2	0	0	5	13	1	0	1	0	5	3	0	0	1	2	0	0	7	0	0	CZ
DE	0	0	3	0	0	3	0	1	2	0	0	3	22	1	0	1	0	11	5	0	0	1	1	0	0	11	0	0	DE
DK	0	0	2	0	0	1	0	1	1	0	0	2	12	4	0	1	0	4	3	0	0	0	1	0	0	5	0	0	DK
EE	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	EE
ES	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	-3	0	-1	0	0	0	0	0	0	0	-1	0	0	ES
FI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	FI
FR	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	-1	0	4	4	0	0	0	0	0	0	2	0	0	FR
GB	0	0	1	0	0	3	0	0	1	0	0	1	12	1	0	1	0	8	18	0	0	0	0	0	0	4	0	0	GB
GE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	0	0	0	0	0	0	-2	0	0	-1	0	0	0	0	0	0	0	0	0	0	-3	0	0	0	0	-1	0	0	GR
HR	0	0	1	0	-1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	-4	0	0	HR
HU	0	0	2	0	0	0	0	1	0	0	0	1	4	0	0	0	0	3	1	0	1	1	8	0	0	0	0	0	HU
IE	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	IS
IT	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	1	0	0	0	0	0	0	18	0	0	IT
KZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	KZ
LT	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	LT
LU	0	0	3	0	0	4	0	1	1	0	0	2	18	1	0	1	0	12	8	0	0	0	0	0	0	6	0	0	LU
LV	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	LV
MD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MD
MK	0	0	0	0	0	0	-1	0	0	-1	0	0	0	0	0	0	0	0	0	0	-1	0	-1	0	0	-1	0	0	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	-5	0	0	MT
NL	0	0	4	0	0	15	0	1	2	1	0	4	41	2	0	3	1	24	19	0	0	1	1	1	0	14	0	0	NL
NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NO
PL	0	0	1	0	0	1	0	1	0	0	0	2	6	1	0	0	0	3	1	0	0	0	1	0	0	3	0	0	PL
PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	0	-1	0	0	0	0	0	0	0	0	0	0	PT
RO	0	0	0	0	0	0	-1	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	RO
RU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	RU
SE	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SE
SI	0	0	2	0	0	0	0	0	0	0	0	1	2	0	0	1	0	2	1	0	0	0	0	0	0	5	0	0	SI
SK	0	0	2	0	0	1	0	1	1	0	0	2	6	0	0	0	0	3	1	0	1	0	2	0	0	3	0	0	SK
TR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TR
UA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ATL
BAS	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	2	1	0	0	0	0	0	0	2	0	0	BAS
BLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	BLS
MED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	-3	0	0	MED
NOS	0	0	1	0	0	2	0	0	1	0	0	1	9	1	0	0	0	5	6	0	0	0	0	0	0	4	0	0	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ASI
NOA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	-1	0	0	NOA
EMC	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	EMC
EU	0	0	1	0	0	1	0	0	0	0	0	1	5	0	0	0	0	3	3	0	0	0	1	0	0	4	0	0	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.12 Cont.: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of VOC. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-11	0	0	-22	-6	AL
AM	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-1	0	0	0	0	0	0	0	0	-11	0	0	-15	-1	AM
AT	0	0	0	0	0	0	0	3	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	-6	0	0	11	13	AT
AZ	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-1	0	0	0	0	0	0	-1	0	-10	0	0	-12	0	AZ
BA	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-9	0	0	-11	-2	BA
BE	1	0	0	0	0	13	2	4	0	1	3	2	0	0	0	1	0	0	0	0	0	0	0	12	0	0	168	144	BE
BG	0	0	0	0	0	0	0	0	0	-2	1	0	0	0	1	0	0	0	0	0	0	0	0	-12	0	0	-16	0	BG
BY	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	-9	0	0	-8	2	BY
CH	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-8	0	0	1	7	CH
CS	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	-12	0	0	-11	1	CS
CY	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	-8	0	0	0	0	0	0	0	0	-14	0	0	-27	-2	CY
CZ	0	0	0	0	0	1	0	7	0	1	3	1	1	1	1	2	0	0	0	0	0	0	0	-1	0	0	63	52	CZ
DE	0	0	0	0	0	3	1	5	0	1	3	2	1	1	0	1	0	0	0	0	0	0	0	3	0	0	88	75	DE
DK	0	0	0	0	0	2	1	5	0	0	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	52	46	DK
EE	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	0	0	3	6	EE
ES	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12	0	0	-18	-6	ES
FI	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	3	3	FI
FR	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-8	0	0	12	18	FR
GB	0	0	0	0	0	3	1	2	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	3	0	0	67	58	GB
GE	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	-1	0	0	0	0	0	0	0	0	-14	0	0	-20	-1	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-12	0	0	-21	-4	GR
HR	0	0	0	0	0	0	0	3	0	1	2	1	0	0	0	1	0	0	0	0	0	0	0	-9	0	0	1	6	HR
HU	0	0	0	0	0	0	0	5	0	2	3	1	0	2	1	2	0	0	0	0	0	0	0	-7	0	0	36	32	HU
IE	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0	1	5	IE
IS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	1	IS
IT	0	0	0	0	0	0	0	2	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	-5	0	0	29	31	IT
KZ	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-3	0	0	-1	1	KZ
LT	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-8	0	0	5	11	LT
LU	2	0	0	0	0	3	1	4	0	0	3	2	0	0	0	1	0	0	0	0	0	0	0	2	0	0	80	69	LU
LV	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0	3	7	LV
MD	0	0	0	0	0	0	0	-1	0	-2	-1	0	0	0	0	0	0	0	0	0	0	0	0	-14	0	0	-21	-2	MD
MK	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-12	0	0	-17	-2	MK
MT	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-10	0	0	-18	-8	MT
NL	1	0	0	0	0	17	1	6	1	1	4	3	1	1	0	1	0	0	0	0	0	0	0	14	0	0	185	157	NL
NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	1	NO
PL	0	0	0	0	0	0	0	10	0	1	2	1	0	1	1	2	0	0	0	0	0	0	0	-5	0	0	35	32	PL
PT	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12	0	0	-19	-6	PT
RO	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	1	0	0	0	0	0	0	0	0	-14	0	0	-19	-2	RO
RU	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0	-1	2	RU
SE	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	5	5	SE
SI	0	0	0	0	0	0	0	3	0	1	2	1	2	0	0	1	0	0	0	0	0	0	0	-6	0	0	21	22	SI
SK	0	0	0	0	0	0	0	5	0	1	2	1	0	1	1	1	0	0	0	0	0	0	0	-5	0	0	32	29	SK
TR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	-11	0	0	-14	0	TR
UA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-11	0	0	-10	1	UA
ATL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	-1	0	ATL
BAS	0	0	0	0	0	1	0	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	19	17	BAS
BLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	0	-8	0	0	-7	2	BLS
MED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	-10	0	0	-17	-4	MED
NOS	0	0	0	0	0	2	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	39	35	NOS
ASI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	-1	0	-7	0	0	-11	0	ASI
NOA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0	-8	-2	NOA
EMC	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0	1	6	EMC
EU	0	0	0	0	0	1	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	-4	0	0	23	24	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	

Table C.13: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM, SO_x, NO_x, NH_3 and VOC. **Emitters →, Receptors ↓.**

	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	
AL	185	0	7	0	55	1	96	3	1	135	0	13	18	1	1	9	1	8	5	0	114	9	29	0	0	71	1	1	AL
AM	0	50	0	32	0	0	2	1	0	1	1	0	1	0	0	0	0	0	1	10	1	0	1	0	0	1	4	0	AM
AT	1	0	259	0	12	11	5	5	31	14	0	98	273	5	1	11	2	67	22	0	3	16	42	1	0	214	1	2	AT
AZ	0	8	0	145	0	0	2	1	0	0	0	0	1	0	0	0	0	0	1	15	1	0	0	0	0	0	10	0	AZ
BA	7	0	28	0	284	3	28	4	4	158	0	34	54	3	1	9	2	16	8	0	15	70	95	0	0	107	1	2	BA
BE	0	0	18	0	3	626	1	3	16	3	0	35	478	16	1	33	2	516	232	0	1	3	5	10	0	56	0	2	BE
BG	7	0	7	0	22	2	445	7	1	81	0	13	22	1	1	4	2	7	7	1	49	7	32	0	0	20	3	2	BG
BY	1	0	5	1	5	4	16	221	2	11	0	16	46	7	14	4	12	16	16	1	2	3	17	1	0	14	4	40	BY
CH	0	0	31	0	3	15	2	1	217	3	0	17	168	3	0	27	0	165	28	0	2	4	9	1	0	371	0	0	CH
CS	20	0	21	0	82	2	87	5	3	414	0	29	45	2	1	7	2	13	8	0	30	29	119	0	0	59	1	2	CS
CY	1	1	0	1	6	0	37	1	0	9	79	2	4	0	0	3	0	2	3	1	33	1	5	0	0	13	1	0	CY
CZ	1	0	108	0	10	20	7	12	19	22	0	405	394	11	2	12	3	88	39	0	2	16	66	2	0	78	1	4	CZ
DE	0	0	48	0	4	61	2	7	38	5	0	88	895	30	2	21	4	192	96	0	1	4	15	5	0	82	1	3	DE
DK	0	0	11	0	1	31	1	13	5	3	0	31	297	302	2	9	8	67	146	0	0	1	11	9	0	16	1	8	DK
EE	0	0	3	0	2	4	7	31	1	3	0	10	45	16	117	3	46	12	28	1	1	1	7	2	0	5	1	23	EE
ES	0	0	3	0	4	3	1	0	2	2	0	3	17	1	0	509	0	60	8	0	1	1	3	1	0	25	0	0	ES
FI	0	0	1	0	1	2	3	9	0	2	0	4	16	7	14	2	107	5	14	0	0	0	3	1	0	2	0	4	FI
FR	0	0	17	0	5	50	1	1	25	3	0	17	148	5	0	93	1	624	78	0	1	4	7	5	0	110	0	1	FR
GB	0	0	6	0	1	47	0	2	6	1	0	11	142	14	1	24	1	164	567	0	0	2	2	30	0	26	0	1	GB
GE	0	13	0	36	1	0	5	2	0	1	1	1	1	0	0	1	0	0	1	86	1	0	1	0	0	1	5	0	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	GL
GR	18	0	3	0	23	1	215	3	1	47	0	8	14	1	1	7	1	5	5	0	265	4	18	0	0	35	1	1	GR
HR	5	0	61	0	112	6	23	5	7	115	0	59	96	4	1	10	2	29	12	0	11	199	151	1	0	236	1	2	HR
HU	3	0	76	0	36	7	40	12	7	117	0	90	128	5	1	7	3	36	17	0	10	57	455	1	0	114	2	4	HU
IE	0	0	3	0	1	30	0	1	3	1	0	8	80	7	0	15	1	116	273	0	0	1	1	171	1	8	0	0	IE
IS	0	0	1	0	0	2	0	0	0	0	0	1	10	1	0	2	0	6	14	0	0	0	0	3	14	2	0	0	IS
IT	5	0	32	0	40	5	17	2	15	31	0	20	62	2	1	27	1	56	10	0	14	25	32	1	0	791	0	1	IT
KZ	0	0	0	2	0	0	2	4	0	1	0	1	2	0	1	0	2	1	1	1	0	0	1	0	0	1	57	1	KZ
LT	0	0	5	1	3	7	12	75	3	6	0	18	76	17	17	5	17	25	28	1	2	3	14	1	0	12	2	192	LT
LU	0	0	29	0	3	222	1	4	21	3	0	46	591	12	1	30	2	512	131	0	1	3	6	6	0	64	0	2	LU
LV	0	0	4	1	3	5	9	56	2	5	0	14	60	15	29	4	22	18	27	1	2	2	9	1	0	8	2	76	LV
MD	2	0	6	1	13	3	60	24	1	23	0	14	36	3	4	4	4	9	11	2	6	4	32	1	0	13	6	5	MD
MK	44	0	7	0	33	1	169	3	1	146	0	13	19	1	1	7	1	7	5	0	150	7	33	0	0	39	1	1	MK
MT	6	0	3	0	46	1	37	1	1	36	0	8	12	0	1	33	1	25	4	0	47	7	22	0	0	237	0	1	MT
NL	0	0	16	0	3	212	1	4	13	3	0	41	580	32	1	26	3	291	243	0	1	4	5	10	0	52	0	2	NL
NO	0	0	1	0	0	4	0	2	1	0	0	3	31	13	1	3	3	12	28	0	0	0	1	3	0	3	0	1	NO
PL	1	0	24	0	8	12	14	40	6	19	0	87	201	21	5	7	8	45	37	0	3	9	52	2	0	34	2	17	PL
PT	0	0	1	0	2	2	0	0	1	1	0	2	9	0	0	339	0	27	7	0	0	0	1	2	0	7	0	0	PT
RO	4	0	13	0	26	3	121	12	2	72	0	22	41	2	2	5	3	12	9	1	14	10	71	1	0	28	3	4	RO
RU	0	0	0	2	1	1	4	15	0	2	0	2	6	1	6	1	6	2	4	2	1	0	3	0	0	2	11	3	RU
SE	0	0	3	0	1	5	2	6	1	2	0	9	54	31	3	4	10	14	32	0	0	1	4	3	0	5	0	4	SE
SI	2	0	149	0	31	7	11	6	15	43	0	68	145	4	1	11	2	47	16	0	6	103	75	1	0	481	1	2	SI
SK	2	0	50	0	19	9	27	14	7	52	0	127	141	6	2	6	3	38	20	0	6	25	204	1	0	77	2	5	SK
TR	1	1	1	2	3	0	30	2	0	6	2	2	4	0	1	2	0	1	3	2	11	1	4	0	0	5	2	0	TR
UA	1	0	4	1	7	2	27	40	1	14	0	13	29	3	6	2	5	8	10	2	3	3	25	1	0	10	8	8	UA
ATL	0	0	1	0	0	3	0	0	1	0	0	1	12	1	0	11	1	21	22	0	0	0	0	4	1	2	0	0	ATL
BAS	0	0	6	0	2	11	5	20	3	4	0	19	133	62	17	5	34	29	51	0	1	2	11	3	0	10	1	17	BAS
BLS	1	1	1	3	3	1	38	9	0	7	0	4	9	1	2	1	2	2	6	8	6	1	8	0	0	3	6	2	BLS
MED	7	0	5	0	30	2	58	2	2	28	3	7	15	1	1	48	1	33	6	0	55	8	16	0	0	140	1	1	MED
NOS	0	0	8	0	1	48	1	4	5	2	0	18	206	51	1	15	2	150	216	0	0	1	4	14	0	21	0	2	NOS
ASI	0	1	0	8	1	0	6	1	0	1	4	0	1	0	0	1	0	0	1	1	4	0	1	0	0	1	8	0	ASI
NOA	3	0	1	0	13	1	37	1	0	13	1	3	5	0	0	19	0	8	2	0	36	2	6	0	0	49	0	0	NOA
EMC	2	0	7	2	7	7	18	11	3	12	1	12	49	5	4	26	6	39	22	1	10	3	12	2	0	37	6	4	EMC
EU	1	0	24	0	8	27	12	9	11	12	0	38	177	15	5	95	13	148	78	0	11	7	27	7	0	107	1	8	EU
	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CS	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KZ	LT	

Table C.13 Cont.: 2003 country-to-country blame matrices for **PM2.5**.
Units: ng/m^3 per 15% emis. red. of PPM, SO_x, NO_x, NH_3 and VOC. **Emitters →, Receptors ↓.**

	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	
AL	0	0	1	70	1	1	0	54	1	67	12	1	4	9	17	28	1	2	2	65	2	1	3	7	10	3	1127	350	AL
AM	0	0	0	0	0	0	0	4	0	4	16	0	0	0	146	15	0	0	1	3	0	51	1	8	11	0	370	11	AM
AT	1	1	0	1	0	11	2	139	1	16	14	4	35	21	2	22	3	6	0	12	10	0	1	17	4	2	1419	1222	AT
AZ	0	0	0	0	0	0	0	4	0	3	48	0	0	0	57	22	0	0	1	2	0	55	1	13	5	0	398	10	AZ
BA	0	1	2	9	0	3	1	114	1	63	13	2	13	24	9	32	1	3	0	35	4	1	2	9	7	2	1283	535	BA
BE	21	1	0	0	0	246	8	63	3	4	11	8	3	4	1	9	28	10	0	6	147	0	1	61	1	10	2707	2381	BE
BG	0	1	10	19	0	1	1	62	0	252	39	1	3	10	38	109	1	3	10	12	3	1	1	10	3	2	1335	247	BG
BY	0	11	5	1	0	6	3	195	0	42	168	9	2	10	5	159	2	17	1	1	6	1	0	11	1	2	1137	445	BY
CH	1	0	0	1	0	14	1	31	1	8	4	2	11	4	2	7	5	2	0	16	13	0	1	17	4	2	1218	903	CH
CS	0	1	3	24	0	2	1	120	1	149	18	2	8	30	13	53	1	3	1	22	4	1	1	9	6	2	1459	507	CS
CY	0	0	1	4	1	0	0	18	0	27	22	0	1	1	477	40	1	1	7	93	1	25	7	8	10	11	959	166	CY
CZ	2	1	0	1	0	19	4	355	1	18	25	10	16	45	3	36	5	14	0	6	19	0	1	26	2	3	1935	1682	CZ
DE	6	1	0	0	0	91	6	164	2	6	18	15	6	9	1	16	11	29	0	6	56	0	1	37	2	6	2094	1837	DE
DK	1	1	0	0	0	66	30	177	1	4	20	53	1	6	1	12	11	99	0	1	108	0	0	30	0	14	1615	1257	DK
EE	0	23	1	1	0	8	8	82	0	16	140	36	1	5	5	40	2	45	0	1	8	1	0	12	1	4	810	478	EE
ES	0	0	0	0	0	2	0	9	48	2	2	0	1	1	0	3	24	0	0	48	5	0	5	18	4	7	828	698	ES
FI	0	2	0	0	0	3	11	36	0	6	104	26	0	2	2	14	2	17	0	0	4	0	0	10	0	3	445	253	FI
FR	5	0	0	0	0	30	2	36	5	5	5	3	6	4	1	7	26	3	0	24	50	0	2	22	2	9	1445	1247	FR
GB	2	0	0	0	0	67	5	26	3	2	6	5	2	1	1	4	34	6	0	3	90	0	0	39	0	17	1364	1142	GB
GE	0	0	0	0	0	0	0	8	0	9	63	0	0	0	126	38	0	1	5	3	1	27	1	6	8	1	457	19	GE
GL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	20	1	GL
GR	0	0	4	34	1	1	0	42	1	89	22	1	2	6	52	61	1	2	6	69	2	1	3	9	7	4	1098	420	GR
HR	1	1	1	6	0	4	2	157	1	60	16	4	46	36	6	40	2	5	0	53	6	0	2	12	7	2	1620	932	HR
HU	1	1	1	5	0	6	2	287	1	123	30	5	25	126	9	98	3	7	1	18	8	0	1	18	4	2	2011	1406	HU
IE	1	0	0	0	0	35	2	14	3	1	4	3	0	1	0	3	41	3	0	2	50	0	0	29	0	20	938	773	IE
IS	0	0	0	0	0	2	1	4	0	0	2	0	0	0	0	1	2	0	0	0	2	0	0	12	0	10	97	51	IS
IT	0	0	0	5	2	4	1	61	2	26	9	2	26	10	4	17	3	2	0	108	5	0	5	18	14	5	1520	1161	IT
KZ	0	0	0	0	0	0	0	7	0	3	165	1	0	0	6	37	0	1	0	0	0	7	0	40	1	0	350	20	KZ
LT	0	19	2	1	0	12	5	276	0	28	120	19	2	9	6	74	3	36	1	1	11	1	0	12	1	4	1187	774	LT
LU	172	1	0	0	0	111	5	74	2	4	10	7	5	6	1	10	16	8	0	7	64	0	1	37	1	6	2237	2032	LU
LV	0	70	2	1	0	10	5	151	0	21	128	25	1	6	5	63	2	35	1	1	10	1	0	12	1	4	927	557	LV
MD	0	1	102	3	0	3	1	126	0	257	90	3	3	12	16	321	2	7	9	4	5	2	0	10	2	2	1269	300	MD
MK	0	0	3	164	0	1	0	57	1	100	15	1	3	10	19	40	1	2	2	28	2	1	2	9	6	2	1161	361	MK
MT	0	0	1	9	187	1	0	38	2	27	6	1	4	6	5	13	2	1	1	302	2	0	13	10	38	22	1220	633	MT
NL	7	1	0	0	0	498	9	75	4	4	15	14	4	3	1	10	27	21	0	5	174	0	0	64	1	12	2495	2123	NL
NO	0	0	0	0	0	6	61	17	0	1	12	12	0	1	0	2	3	5	0	0	9	0	0	13	0	6	259	144	NO
PL	1	3	1	1	0	18	5	837	1	31	59	17	7	36	6	72	4	35	1	4	18	1	0	20	1	4	1840	1477	PL
PT	0	0	0	0	0	1	0	5	332	0	1	0	0	0	0	1	62	0	0	18	5	0	3	21	2	12	867	737	PT
RO	0	1	12	7	0	2	1	117	0	563	42	2	5	23	21	138	1	5	6	8	4	1	1	10	3	2	1458	381	RO
RU	0	1	1	0	0	1	1	24	0	9	461	3	0	1	7	72	1	3	1	0	1	3	0	22	1	1	691	68	RU
SE	0	2	0	0	0	9	30	53	0	3	26	93	1	2	1	7	3	25	0	1	13	0	0	11	0	5	480	342	SE
SI	1	1	1	4	0	6	2	148	1	34	16	4	242	25	4	31	3	5	0	47	7	0	1	17	6	2	1836	1443	SI
SK	1	1	1	3	0	8	2	441	1	63	31	5	14	241	8	86	3	9	1	8	10	0	0	19	3	2	1806	1409	SK
TR	0	0	1	2	0	0	0	18	0	28	30	0	0	1	434	51	0	1	8	16	1	20	2	9	11	2	724	58	TR
UA	0	2	12	2	0	3	1	128	0	73	175	4	2	13	11	576	1	8	5	2	4	2	0	13	1	2	1276	283	UA
ATL	0	0	0	0	0	4	2	5	3	0	6	1	0	0	0	1	14	1	0	1	6	0	0	27	0	14	167	93	ATL
BAS	1	7	1	0	0	23	16	172	1	12	64	82	1	6	3	25	5	82	0	1	24	0	0	16	0	8	997	703	BAS
BLS	0	0	5	1	0	1	1	45	0	58	138	1	1	3	93	215	1	3	41	5	2	7	1	13	3	7	771	100	BLS
MED	0	0	1	9	4	1	0	35	3	36	13	1	5	5	89	32	3	1	4	223	2	5	13	11	17	16	1000	388	MED
NOS	2	1	0	0	0	72	21	56	1	2	8	14	2	3	1	5	19	16	0	2	101	0	0	27	0	20	1142	905	NOS
ASI	0	0	0	1	0	0	0	4	0	5	30	0	0	0	115	16	0	0	1	10	0	84	2	18	9	1	340	19	ASI
NOA	0	0	0	6	3	0	0	14	1	18	5	0	1	2	29	13	1	1	1	72	1	2	36	17	25	6	455	154	NOA
EMC	1	1	1	2	1	8	4	54	4	25	128	6	3	5	41	54	4	5	1	19	8	11	6	19	6	3	731	325	EMC
EU	2	3	0	2	0	29	7	139	15	15	29	19	8	14	5	22	14	14	0	23	28	0	2	21	3	7	1263	1008	EU
	LU	LV	MD	MK	MT	NL	NO	PL	PT	RO	RU	SE	SI	SK	TR	UA	ATL	BAS	BLS	MED	NOS	ASI	NOA	BIC	VOL	NAT	SUM	EU	