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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A refinement of the emission data for Kola Peninsula based on inverse dispersion modelling" *by* M. Prank et al.

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A response to the Anonymous referee #1, step 2.

Below is the second-step response to the criticism of the reviewer, which builds on the initial response, extends the answers given there, and reflects the specific changes being made in the revised paper. The comments themselves are bracketed by » « marks.

»>The general outcome of the exercise is rather moderate. Modelled SO2 levels still underestimate observations by a factor of 2 to 3. This is a major problem in the presented analysis of the signal from the sources on the Kola Peninsula. The paper does not present an analysis of the agreement between boundary SOx levels observed and

modelled, and therefore it is not clear whether such discrepancies are due to the uncertainties in inventories for the Kola Peninsula. ««

The references to extensive evaluation of the model in Central Europe have been added. We have also re-checked the DMS-vs-boundaries issue. Since the EMEP database contains some estimate of DMS emission (sector S11, source NAT), so it is not the matter of missing it entirely. Rather, even the European domain of SILAM does not extend far enough to the Arctic, so that the DMS emission of that area are missing in the regional run and the nesting into the European one does not help. The clarification has been added to the paper.

The model-measurement comparison has been repeated for peaks only, i.e. cutting out the concentrations below 1 ug SO2 m-3 in both observations and modelled fields. This has not changed the statistical scores by more than 10%. Therefore, the input of the missing part of the background to the model-measurement comparison seems to be negligible.

»»The applied SO2 to SO42- conversion rate of 4 to 5% sounds very high. Usually values in the order of 2 to 3% are reported, and this is taking place far to the north where one would imagine even lower conversion rates. Such a high conversion rate therefore demands more argumentation. ««

We re-checked the actual conversion rates taking into account the actual temperatures of the region. Since the temperature variability is wide, the conversion rates also vary widely. For the comparatively low temperatures of the region they indeed rarely exceed 3.5%. For temperatures below zero this ratio is less than 0.5% per hour. The sentence is corrected.

»»The applied 20% fraction of SOx emitted as SO42- is very high and the analysis points at even 30 to 70% direct emitted sulphate. This analysis may, however, be questioned as this may be due to problems with the initial concentrations on the boarder of the model domain. The paper does not present any data on how well the initial SOx

value fits with observations.««

Thank you, this part is under revision. The re-analysed data of Karasjok with segregated SO2 concentrations indeed showed substantially higher fraction of SO2 for the high-concentration episodes.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 15963, 2010.