



Interactive comment on “Comparison of modelled and monitored deposition fluxes of sulphur and nitrogen to ICP-forest sites in Europe” by O. Westling et al.

O. Westling et al.

Received and published: 30 November 2005

1. General comments: This paper presents a useful and sound comparison of modelled and measured total and wet depositions, concentrations and amounts of precipitation.
2. Abstract: The abstract is now formulated in such a way that it is not always clear whether deposition is wet deposition, dry deposition or total deposition. The abstract should to start with mention what is compared (precipitation amount, total deposition of SO₄²⁻ to coniferous and deciduous forests, wet deposition of SO₄²⁻, NO₃⁻ and NH₄⁺ in the open field, concentrations of SO₄²⁻, NO₃⁻ and NH₄⁺ in precipitation. Information on the results for total deposition of SO₄²⁻ to coniferous and deciduous forests should be included in the abstract. The use of the word EMEP in the abstract (and in the rest of the paper) can be confusing as it can

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refer to either the EMEP model or the EMEP monitoring network. For that reason either “model” or “monitoring network” should be added to “EMEP”.

Reply:

We have changed the abstract accordingly, and also reviewed the rest of the text in order to improve clarity on this point. We have also been more explicit with the term EMEP model throughout the paper.

3. Introduction. Here we compare the results of the EMEP model with a completely independent dataset..... This is mentioned in contrast to a comparison between the results of the EMEP model and monitoring data at EMEP sites mentioned in the previous line. This could suggest that the EMEP monitoring data are not independent of the EMEP model results. This is, however, not true. The results of both the model and measurements are done by the same organisation, but are in fact completely independent. So better leave the expression “completely independent” out. The end of the introduction is a bit abrupt. I would prefer that at the end of the introduction is referred to what is presented in the next sections.

Reply:

Although the EMEP measurement results are completely independent of the EMEP model, it can be argued that the reverse is not true. Over the years the measurements have been used to evaluate the EMEP model. Although we try to avoid ‘tuning’ the EMEP model towards the EMEP measurements, differences between the two do provide a driving force for changes to the model. For this reason we prefer to keep the term ‘independent’ as one reason to make use of the ICP data.

4. p. 938. “Only measured bulk deposition of N in open field is compared with model calculated wet deposition by EMEP.” Bulk precipitation consists of wet deposition and some dry deposition to the open funnel. For that reason it would be useful

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that to refer here to a publication that discusses this difference (which usually is not too large).

Reply:

We have added extra text and references on this subject, referring to the papers of Draaijers et al. (1996) and a relevant Swedish work (Uggla, 2003, unfortunately in Swedish only, but with data which is very helpful for this analysis). We have also added Fig. 2, comparing total deposition and the open-field wet-deposition, along with some discussion, since this figure helps to highlight some of the differences and uncertainties of these two types of measurements.

5. p. 939. “Smith and Fowler (2001) suggested that rainfall amounts for 5x5 km² in the UK could be uncertain by between 30-50%.” Mention here also the length of the period as the uncertainty decreases with the length of the period.

Reply:

The length of the rainfall period (annual) has now been added to the document when referring to the UK uncertainty for rainfall amounts.

6. p. 941. Mention also why the years 1997 and 2000 chosen.

Reply:

Year 1997 and 2000 were chosen because they represent two years with different precipitation patterns (data were available from 1996 – 2000). We have added this to section 1.

7. I am not sure that tables 2-6 are needed. They give an impression of how the frequency distribution of the amount of precipitation and deposition for the EMEP model results for the grid elements that contain ICP stations and the same distribution for the data measured at the ICP stations. The tables do not give information on whether the geographical distribution is the same. I would suggest to drop

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these tables as the figures already contain much of this information. If necessary some lines could be added to the text on mean/median values.

Reply:

We agree with this. Most tables originated from the very first manuscript, before the technical review in which we were asked to add a table with correlation coefficients and other statistics, and to add regression lines to the figures. We have condensed the main points of these tables into the new Tables 1 and 2.

8. p.945. "..., but the modelled data should be 5 to 15% lower due to dry deposition in observed data in open field with bulk samplers." Make this sentence more clear and add a reference.

Reply:

We have added references to appropriate data from Draaijers et al (1996) and Ugglå (2003). As noted above we have also added Fig. 2 and some appropriate discussion.

9. In general: It would be useful if information were given on the possible horizontal gradients within an EMEP grid element of 50x50 km² and if this information were used in the interpretation, but this is maybe difficult to achieve.

Reply:

This would be a long and difficult discussion. The horizontal gradients depend strongly on the vicinity of emission sources, and of course this varies from grid to grid. We have preferred not to take up this discussion in the paper, except that we mention in section 4 and the conclusions that we are comparing a 50×km² model calculation with data from an area of ca. 30×30m².

10. p. 948. Is there any explanation for the difference between the comparison of with the ICP stations and the comparison with the EMEP stations. If not, this should also be mentioned.

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Reply:

In order to make this discussion easier, we have move text concerning the EMEP measurements to the new section 2.1, and made the comparisons more explicit by adding a few lines on this point at the end of each comparison with ICP data. Reasons for any differences are discussed there.

11. p. 941. Use a full name for the institute MET.NO

Reply:

Done

12. p. 948. line 15. “ a comparison of the EMEP chemical transport model” should be “a comparison of the results of the EMEP chemical transport model” Several places in the article: “EMEP grids” should be “EMEP grid elements”.

Reply:

Done

13. p. 948. line 15. “ a comparison of the EMEP chemical transport model” should be “a comparison of the results of the EMEP chemical transport model” Several places in the article: “EMEP grids” should be “EMEP grid elements”.

Reply:

Done

14. p. 947. (CCC: 2004) should be (CCC, 2004)

Reply:

This reference has actually been replaced with Hjellbrekke (2004).

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