

Interactive
Comment

Interactive comment on “The sensitivity of aerosol in Europe to two different emission inventories and temporal distribution of emissions” by A. de Meij et al.

Anonymous Referee #2

Received and published: 31 May 2006

Review of paper:

The sensitivity of aerosol in Europe to two different emission inventories and temporal distribution of emissions by A.deMeij et al

Positives - hot subject of general interest to the global modeling community - useful sensitivity tests regarding emission data needs for temporal resolution - useful supplement with a lot of extra information

Concerns - EMEP emission and EMEP station data seem linked (not independent → thus validation?) - comparisons of simulated aots to ‘data’ raise questions: - MODIS

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aot and Angstrom over land are biased high (e.g. see Remer et al. 2005) - simulated aots on June 11 of 1.4 or 1.6 over Europe seem awfully high (AERONET help?) - AERONET monthly comparisons are apparently good only, because times of usually lower values in modeling are compensated by a few high humidity/high aot events - why are simulated (background) aots so low if emissions are relatively high (model bias?)

General comments

The paper is an interesting study - in two parts: The first part of the contribution investigates the impact of different aerosol emission data-sets on simulated surface concentration and associated aerosol optical depths (AOD) over Europe. Significant aerosol module simulation differences are found by switching between AeroCom and EMEP emission data as model input. With focus on a summer month (June 2000) and a winter month (December 2000) neither simulation seems to do too well in comparisons to 'data'. This is not completely surprising, since 'data' have uncertainties of their own. In particular MODIS AOD is biased high over Europe and so is its Angstrom parameter (as the land-retrieval emphasizes on small aerosol sizes). AERONET has problems with regional representation and EMEP station data seem not unrelated to the EMEP emission inventory, which appears to limit the 'evaluation' aspect. Also the apparently good comparison between AERONET monthly statistics seems to be helped by the few high humidity / high aot events. Otherwise the simulated AOD would be low. Maybe for such a comparison it would be more honest to do a comparison by rel.hum ranges given the sensitivity of the model to ambient relative humidity (- at least pick a lower threshold than 90%). Some sentences regarding potential biases of the TM5 simulated aots might be useful, based on comparisons to simulations of other models with the same AeroCom emissions. The second part of the contribution conducts sensitivity studies. The one test suggests that the treatment of anthropogenic emissions over Europe should at least include a seasonal cycle, which is currently not considered in the AeroCom emission data-set. However, it remains unclear, if internal mixing, which is not considered by the model, would necessitate an even higher temporal resolution.

The other test concludes that choices for the emission injection altitude (as expected) impacts surface concentrations but has only a minor impact on (column burden and) AOD. This possibly suggests that overall processing of emissions in models are more important than emission themselves indicating that each model has a mind of its own largely independent of emission input (a result which was also observed when harmonizing aerosol emissions in AeroCom Exp. B (see Textor et al. 2005). This is an overall nice contribution and appropriate for ACP.

Minor comments

P3272 BC mass fraction seems high at 25% P3277 MODIS data have a positive bias over land (see Remer et al, 2005) P3278 EMEP emission data validating with EMEP station data ? (are they not dependent?) P3279 Any recommendation (for the AeroCom next generation data-set) for SO₂ emission heights? P3283 Is the difference in POM between EMEP and AEROCOM related to SOA (if so - say so) P3284 MODIS Angstrom parameter are biased high over land (qualitative use recommended) P3285 I have a hard time accepting these large (simulated) aots -also given the MODIS biases I prefer a discussion on patterns rather the numbers (where there any AERONET data to substantiate large aots?) P3288 monthly average comparison seems often fortunate (generally low simulations seem balanced by high rel.hum. / aot event). What if we only compare aot at rel.hum <70%? P3293 N?? -species are NOT part of the AeroCom but of the (your) 'extended AeroCom' dataset (say so)

some apparent typos 3276/22 calculate 3276/25 are 3288/12 presence of inorganic

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 3265, 2006.

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