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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Emissions of primary aerosol and precursor gases in the years 2000 and 1750, prescribed data-sets for AeroCom" *by* F. Dentener et al.

F. Dentener et al.

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Responses to reviewer 1:

item: Give proper credit and indicate own contributions

The abstract was changed - also now indicating that the emission data-sets are an interpretation of (most recent) published emission inventories and published simulations.

In the introduction this sentence was added: "For both Experiments 'B' and Pre' global data sets for aerosol emissions needed to be defined. For year 2000 emissions (Experiment 'B'), recently published emission inventories (e.g. Bond et al., 2004; van der Werf et al., 2003) and recently published model simulations (e.g. Gong et al., 2003; Ginoux

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et al., 2003; Boucher et al, 2003) were interpreted and combined to a comprehensive data-set addressing all major aerosol emission sources."

item: Move up the definition for the characteristic size

In chapter 3 it now reads: "The (radiatively) characteristic size of any size-distribution is commonly represented by the effective radius (reff), defined as the ratio between the sums of third and the second moments of ('equivalent') radii of all individual particles (sum (r**3)/ sum(r**2)). The characteristic maximum dimension for DU is about 4 micro-m, largely determined by contribution of coarse mode particles (e.g. a coarse mode radius of 0.65 micro-m combined with a standard deviation of 2.0 translates into 2.1 m for reff)."

"The (radiatively) characteristic size of any size-distribution is commonly represented by the effective radius (reff), defined as the ratio between the sums of third and the second moments of ('equivalent') radii of all individual particles (sum (r**3)/ sum(r**2)). The characteristic SS diameter is about 5 mirco-m, largely determined by coarse mode particle contributions (e.g. a coarse mode radius of 0.74 micro-m in conjunction with a standard deviation of 2 translates into 2.5 miro-m for reff)."

item: Consequences on using diff. near-surface wind data when simulating dust and seasalt.

A new section has been added in the conclusions: "Inadequate temporal resolution is another source for uncertainties. In particular the lack of an annual cycle for most anthropogenically modified emissions is a large simplification (De Meijr et al., 2006). Similarly, the daily resolution for dust and sea-salt seem inadequate, since their simulated emissions are tied to the strength of near-surface winds and their variability. In that context, potential uncertainties introduced by the inconsistency with respect to the applied year 2000 wind fields for dust and sea-salt appear minor. In fact, a study comparing dust mobilization due to the use of different (NCEP, NASA GEOS-DAS) surface winds for the same year leads to fairly consistent fields - except for some differences

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over East Asia and Australia (Luo et al., 2003). Also note that dust applies wind data only over land, whereas sea-salt applies wind data only over oceans. “

Ěmore specifics: The paper by Luo, Mahowald and John del Corral, Sensitivity study of meteorological paprameters on mineral aerosol mobilization, transport, and distribution (JGR, 108, 4447, doi:10.1029/2003JD003483, 2003), studied the influence of surface winds between NCEP and NASA GEOS-DAS. They found that the model results are fairly consistent between the two with some differences in East Asia and Australia. Some papers (e.g. Grousset, F. E., P. Ginoux, A. Bory, and P. E. Biscaye, 2003: Case study of a Chinese dust plume reaching the French Alps. Geophysical Research Letters, 30(6), 1277, doi:10.1029/2002GL016833) showed that NASA GEOS-DAS allows to simulate inter-continental transport (from China to the frenc Alps) of dust very accurately. The Ginoux et al. (2003) showed that GEOS-DAS allows to simulate very complex dust patterns as confirm using TOMS aerosol index in the near UV. The papers by Cakmur, R. V. , R. L. Miller, J. Perlwitz, I. V. Geogdzhayev , P. Ginoux, D. Koch, K. E. Kohfeld, I. Tegen, and C. S. Zender, 2006: Constraining the magnitude of the global dust cycle by minimizing the difference between a model and observations. Journal of Geophysical Research, 111, D06207, doi:10.1029/2005JD005791, and by Miller, R. L., R. V. Cakmur, J. Perlwitz, I. V. Geogdzhayev, P. Ginoux, D. Koch, K. E. Kohfeld, C. Prigent, R. Ruedy, G. A. Schmidt, and I. Tegen, 2006: Mineral dust aerosols in the NASA Goddard Institute for Space Sciences ModelE atmospheric general circulation model. Journal of Geophysical Research, 111, D06208, 10.1029/2005JD005796, have compared the sources of Ginoux et al. (2001), Tegen et al. (2002), Zender (2003) and Grini (2005) with the same surface winds from the NASA GISS model-E GCM. They found that Ginoux (2001) gives the lowest deviations (error) between model results and different measurement datasets.

item: Why are larger sea-salt particles ignored?

Sea-salt with sizes at of larger than cloud-particles ($>$ 10micro-m radius) are not considered because of their very short lifetime. An explanation in brackets was

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added to the thxt to read: “Contributions of SS emissions associated with radii larger 10m were ignored (as they are quickly removed) and SS contributions over sea-ice were removed according to monthly ECMWF sea-ice-free-fractions for the year 2000.”

Item: How can 1996 biofuel emissions apply to 2000?

SPEW is the best most consistent attempt for biofuel emissions. Nonetheless, uncertainties are much larger than (uncertain) differences between 1996 and 2000. The text now reads: “Yearly average data (no annual cycle) for biofuel organic emissions are based on the Speciated Particulate Emissions Wizard (SPEW) inventory for 1996 (Bond et al., 2004). When choices for the AeroCom datasets were made, SPEW was (and in 2006 still is) the most detailed attempt to evaluate an emission factor dataset and couple it to energy statistics for 1996. It was assumed that this inventory applies without changes to the year 2000, because it is expected that year 2000 biofuel emissions are well within the uncertainty range of SPEW 1996. Here the uncertain overall impact from changes in energy consumption and in concurrent technology on biofuel emissions between 1996 and 2000 is a contributing factor.”

The reviewer’s careful and detailed reading is appreciated. All inconsistencies found (e.g. Tables) and wording issues (e.g. Grammar) have been addressed. The figures are currently being worked on also to include suggestions for improvement by the reviewer.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 2703, 2006.