

Interactive comment on “Equilibrium of sinks and sources of sulphate over Europe: comparison between a six-year simulation and EMEP observations” by M. Ménéguez et al.

Anonymous Referee #2

Received and published: 24 March 2009

General: This paper presents a six-year simulation (2000-2005) of the global sulfur cycle using a global chemistry transport model and meteorological fields obtained from ECMWF operational analyses. Results are then compared with EMEP observations. The paper is focused on the analysis of the sources and sinks of sulfate aerosols over Europe. Despite the good presentation of the results, I suggest that some minor improvements need to be done before its acceptance of publication in ACP.

Scientific comments:

1) In the present simulation organics and sea salt aerosols are missing. The authors should provide an explanation for that and also discuss the possible implications due

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to not take into accounts these two species. In general, why has the model been setup with sulfate, dust and BC? Is there a reason to take into account dust and BC and not organics and dust? The authors should clarify this non-negligible point.

2) From the introduction (paragraph 1): "The first step when studying the impact of aerosols on climate ... is to describe the distribution of natural and anthropogenic aerosol over the globe". I would like to point out that the use of a global aerosol micro-physics model (as opposed to a simpler aerosol parametrization in a climate model) could simply extend the list of uncertain parameters without actually reducing the overall uncertainty. The authors should discuss the possible impact to determine the magnitude of the direct and indirect aerosols forcing coming from a better representation of sink and sources only for the sulfate.

3) In the description of the model the authors should specify how the size bins for dust, BC and sulfate are spaced.

4) From Emissions (paragraph 2.2): "BC and dust are not involved in chemical reactions in our model and are directly emitted in the atmosphere". The authors should specify the possible implications due to that.

5) Dust emissions strongly depends upon wind speed, while no year-to-year variation in dust emissions is taken into account in the papers. The authors should discuss the possible implications resulting from that. The authors could also read the following paper: Menut, L. (2008), Sensitivity of hourly Saharan dust emissions to NCEP and ECMWF modeled wind speed, J. Geophys. Res., 113, D16201, doi:10.1029/2007JD009522.

Technical comments:

1) From Physics of aerosols in the model (paragraph 2.4) Equation 1 can be omitted in this context.

2) From Physics of aerosols in the model (paragraph 2.4) The author should change "We have to keep in mind that..." to "We have to take into account that..." or "We have

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to underline that..."

3) From Variations of the sulfate burden (paragraph 3.1): "We can see an important annual cycle". The authors should change this sentence and remove or clarify the adjective "important" using in this scientific context.

4) From Evaluation of the sulfate sinks and sources (paragraph 3.2) "There are two areas in Europe where the AEROCOM emissions of sulphur compounds are important". The authors should again clarify the adjective "important" using in this scientific context.

5) Figure 3 The authors should change the horizontal axis and put also the label "June" for each year.

6) Figure 6b-6c-6d The authors should change the color scale to make the plots easily readable.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 4381, 2009.

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