Atmos. Chem. Phys. Discuss., 9, S132–S133, 2009
www.atmos-chem-phys-discuss.net/9/S132/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variable CCN formation potential of regional sulfur emissions" *by* P. T. Manktelow et al.

Anonymous Referee #2

Received and published: 4 February 2009

General:

By relying on global chemical transport model simulations, this manuscript investigates how the global CCN production is tied with sulfur emissions from different regions (continents). The main point made by the paper is that CCN concentrations and sulfate mass concentrations respond in a very different way to regional sulfur emissions, highlighting the important role of aerosol microphysics in simulating the indirect climatic effects by anthropogenic aerosols. The paper is a valuable contribution to the scientific community. I have a few comments that the authors should address when revising their paper.

Major comment:

The performed sensitivity analysis considers only changes due to variations in the nucleation rate. I would like to see this part of the paper somewhat expanded, as far as it is possible within the computational limitations. Especially, how sensitive the results are to the assumed CCN size of 50 nm. The effective activation diameter of real atmospheric clouds in usually closer to 100 nm than 50 nm, so the authors might consider calculating CCN concentrations based on some other diameters (e.g. 80 and 100 nm) as well. The authors mention additional CCN formation due to boundary layer nucleation. Could this be tested here or is it too much tied with SOA formation not included in simulations? How about sub-grid-scale CN formation from sulfur emissions as assumed in many earlier simulations of global sulfur cycle?

Minor/technical comments:

I cannot follow the argument that the differences in the magnitude of SO2 emissions would influence significantly influence the behavior of sulfur emitted from each region (pages 3101-3102). Why would the magnitude of SO2 emissions affect its fate? Would the reason be oxidant limitation or something else?

There seems to be a typo in per cent values in line 17 on page 3101.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 3095, 2009.

ACPD

9, S132–S133, 2009

Interactive Comment