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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol optical depth over the Arctic: a comparison of ECHAM-HAM and TM5 with ground-based, satellite and reanalysis data" *by* J. von Hardenberg et al.

Anonymous Referee #1

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The manuscript presented by von Hardenberg et al. compares the results from 3 global models simulating aerosols to ground-based and space measurements of aerosols properties: optical depth and Angstrom exponents. The manuscript concentrates on a comparison over 6 Arctic stations for a period of six years between 2001 and 2006.

This manuscript is crucially lacking a much more thorough section on interpretation and discussion of results. First I missed a description of how Bourgeois and Bey (2011) modified the aerosol deposition in the ECHAM5-HAM model. The reader should not have to go to another publication to be told what physical considerations were taken

into account that were not there before. Did these modifications change the aerosol simulations only over high latitudes or globally?

When comparing aerosol optical depth at stations the models are unable to capture the optical depth and its seasonality at 3 stations: Alert, Barrow and Summit. The reasons why the models are so far off from the measurements is poorly discussed. It is suggested that both the deposition and the elevation of these stations play a role but how so and what tests were done to come to pinpoint this lack of agreement to these 2 reasons?

Finally the information carried in Figures 4, 5 and 6 is not sufficiently discussed and might be worth looking into more thoroughly to understand why models do a poor job at reproducing the aerosol properties over high latitude regions.

I will look a much more incisive discussion in this manuscript in the next round of reviewing. At his point this work cannot be published as such in ACP.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 8319, 2012.