

## ***Interactive comment on “Offsetting effects of aerosols on Arctic and global climate in the late 20th century” by Q. Yang et al.***

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Received and published: 6 March 2014

Dear Reviewer,

Thanks so much for your time. Your comments and suggestions are very helpful to improve the presentation of the paper. We have followed the comments and suggestions in the revision (attached). Please see the following point-to-point responses :

(1) It is a great advantage that this study includes several ensemble-runs of each aerosol. Would it be an idea to make a table with the different runs?

We have followed the suggestion and made Table 1 (page 19) that lists name of experiments, number of ensemble members, whether the run was obtained from CMIP5 or

C12723

it is a new run conducted in this study, run period, trend analysis period and aerosols that vary in the run.

(2) It is a bit confusing to me what the ‘all-aerosol-forcing’ includes; is that OC in addition to BC and sulfate? Could this be specified? Then the sentence in line 129-131 would make more sense (.. ‘but this is almost completely offset by the cooling influence from organic carbon, which is co-emitted with BC’).

The definition of all aerosol forcing run is now more clearly illustrated in Table 1. The all aerosol forcing includes forcing from sulfate, black carbon and organic carbon aerosols.

(3) The model set-up section is a bit short. How are aerosols treated in the model?

We have followed the suggestion and added more details about aerosol emission sources and aerosol physics in the model and experiments section on page 5 from line 79 to 88.

(4) It is a reference to Shindell et al. 2013 for comparison with observed AOD trends 1980-2000. What about other comparisons with observations? Climate models (and I think CAM4 is no exception) tend to underestimate surface concentrations of BC, especially in the Arctic. I would like to see a discussion about how good the model captures aerosol concentrations and how CAM4 is in comparison with other climate models

We have followed the suggestion and included studies from Lamaque et al. [2010] and Koch et al. [1999] on comparisons of the simulated aerosol optical depths with observations in the model and experiments section on page 5-6 from line 88 to 95.

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/13/C12723/2014/acpd-13-C12723-2014-supplement.pdf>