

Interactive comment on “Sensitivity of aerosol optical thickness and aerosol direct radiative effect to relative humidity” by H. Bian et al.

Anonymous Referee #2

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This paper uses the GMI 3-dimensional model to investigate the sensitivity of the computed aerosol optical thickness (AOT) and aerosol direct radiative forcing (DRF) to the relative humidity (RH) spatial and temporal resolutions. It evaluates significant differences in the global averaged AOT and the DRF due to the horizontal and temporal resolution of RH and thus points RH as a key factor controlling differences between global models participating in the AEROCOM intercomparison exercise.

This study adds to our understanding of model variability and could be of use for model discrepancies analysis. However, the paper requires significant improvements before being published in ACP both in English - to avoid errors, repetitions of text and improve the flow of the ideas - and in scientific discussion of the results. I consider that the variability of the chemical composition variability of the aerosol did not attract the attention

needed for the model results interpretation. There are also open questions with regard to the sensitivity of AOTs to the RH vertical resolution as well as to increasing both spatial and temporal resolution; are calculated differences cumulative?

Other specific comments: Briefly describe aerosol parameterization (size distributions, growth factors and dependences on RH) in section 2.1 since the results of the study strongly depend on these parameterizations.

A statistical comparison between the observations and the model results and by separating oceans from the land in Figure 2 and appropriate discussion, would be elucidating.

Figures 5 and 7 lower panel: units of y-axis should not be marked as percent since then the numbers of y-axis should read between 0 to 25 and 0-10, respectively

Figure 1: More details on the input of these calculations are needed and a reference if available.

Figure 3: Could you track the oceanic stations with color and discuss differences.

Page 13243 (section 3.4) The conclusion that the levels of the RH and its diurnal variability at the two sites have opposite effect on the AOT calculations requires justification. For instance, the chemical composition of the aerosol might be a critical factor.

Conclusion needs some restructuring to provide better logical flow: Start with the aim of the study (page 13247, lines 20-24) and then show the results. Also the last part of the conclusion (in page 13248) should be in section 3 as part of the discussion.

Page 13235: 2nd line from the bottom: 2. 2.

Page 13239: line 7: factor of 2 increase : do you mean decrease?

Define CTRH and CTRT before section 3.2

Page 13240: line4: versus

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Page 13240: Line 9: spatial resolution

Page 13241, line 13: what about the role of organics in pollution aerosol?

Page 13241, line 25 - remove in

Page 13242: line 13 - remove in

Section 3.3 last sentence move after discussion of Figure 4

Page 13245, line 10: remove again

Next line: spatial not special

Figure 4 caption: using

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