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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Regional and monthly and clear-sky aerosol direct radiative effect (and forcing) derived from the GlobAEROSOL-AATSR satellite aerosol product" *by* G. E. Thomas et al.

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General Comments:

The paper "Regional and monthly and clear-sky aerosol direct radiative effect (and forcing) derived from the GlobAEROSOL-AATSR satellite aerosol product" submitted to the Atmos. Chem. Phys. (ACP) by Thomas et al calculated the direct aerosol radiative effect (ARE) and forcing (ARF) at TOA and surface with the Met Office unified model radiation scheme constrained by aerosol properties derived from satellite, AERONET, and in-situ observations. The paper performed a systematic analysis on the uncertainties involved in the AER calculation before performing ARF calculation,

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which is the uniqueness of the paper comparing to previous AER (ARF) calculations in the literature. There are evident differences in the AER derived from satellite observations using empirical approach (without using radiation transfer scheme) and calculated from radiation transfer schemes (constrained by observed aerosol properties), it is necessary to performed systematic analysis on the error sources in both types of AER calculations in order to narrow the differences. This paper is a very good study along this line from the aspect of radiation transfer model calculation. Another good practice of this paper that I liked is it performed the calculation of ARE first so that the resulted ARE can be compared with that from empirical observational approach, which is not only a good examination of the model assumptions used in the calculation but also increases the confidence of the subsequent ARF calculation since the uncertainty in current aerosol optical properties has been well evaluated (even though the uncertainty in pre-industrial aerosol optical properties are still unknown). The paper has been in very good shape and I have only a few minor itemized comments listed below for authors to consider. I strongly recommend ACP to publish the paper after the minor revisions has been made.

Itemized Comments: 1)Page 3, 1st Paragraph: Aside from the three factors limiting the accuracy of satellite aerosol measurements listed here, instrument uncertainty, such as calibration error, is another important factor that should be included.

2)Table 1: Why the match-up points of 550nm AOD and 870nm AOD are different for AL01, AL02, and AL11?

3)Page 11, Section 6.2, 1st Paragraph: Work of Zhao et al. (2008) for global ocean had been extended to include global land in Zhao et al (2011; Zhao, T. X.-P., N. G. Loeb, I. Laszlo, and M. Zhou, Global Component Aerosol Direct Radiative Effect at the Top of Atmosphere, Int. J. Rem. Sens., 32:3, 633-655). The revised annual global mean ARE value (ocean+land) is 6.8±1.7Wm-2, which is much closer to the value (6.7±3.9Wm-2) obtained in this paper.

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