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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling the direct effect of aerosols in the solar near-infrared on a planetary scale" *by* N. Hatzianastassiou et al.

Anonymous Referee #1

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In this manuscript, the authors compute the direct radiative effect of aerosols in the near-infrared wavelength (0.85 to 10 micron) on a global scale using a detailed spectral database, the Global Aerosol Data Set (GADS), and evaluate it at the top of the atmosphere, in the atmosphere, and at the surface. The novelty of this study is that the aerosol direct effect is calculated at fine wavelength intervals, though plenty of past studies addressed estimation of it as mentioned in introduction. However, the authors don't examine a difference between calculations at fine wavelength intervals in this study and at coarse wavelength intervals as in the standard global and regional models. This is a crucial defect. This study also quantitatively estimates the radiative forcing of aerosol in the near-infrared region. However, the authors completely rely on the global distributions of aerosol optical properties (optical thickness, single scattering

albedo, and asymmetry parameter) of GADS, and don't validate them with observations (e.g., AERONET). Moreover, the presentation quality is poor because Figures 1 to 8 present with the same format of a global map. The authors must use various figure formats to present the merits of this study well. Therefore the authors must rewrite the manuscript more than the major revision, so that it is not suitable to be published by Atmospheric Chemistry and Physics. The other individual comments are mentioned below.

page 9152, line 19 (abstract): "their magnitude is similar to that of climate forcing associated with increasing concentrations of greenhouse gases" is an exaggerated expression. You compare the effect of greenhouse gases only from anthropogenic sources with the effect of aerosols both from natural and anthropogenic sources. This is invalid.

page 9152, line 21 (abstract): Rewrite from "affects" to "may affect". The feedback mechanisms of cloud and precipitation are not calculated in this study, so that this sentence is just supposition.

page 9153, line 5 (section 1): Add "in total" after "an opposite way". There are aerosols absorbing radiation.

page 9154, line 9 (section 1): Rewrite from "An important improvement" to "One of important improvements".

page 9155, line 11-23 (section 1): This paragraph should move to section 2 because this is a part of explanation on methodologies in this study.

page 9157, line 8 (section 2): "which can introduce errors in the case of absorbing aerosols above clouds". A word "errors" is inappropriate because studies on absorbing aerosols above clouds is important and cannot be ignored (e.g., Haywood and Ramaswamy, JGR, 1998). Also, explain what occurs if absorbing aerosols are above clouds.

ACPD
6, S3997–S3999, 2006

EGU

page 9160, line 14 (section 3.1): Why is no data in the high latitudes of the winter hemisphere from Figures 1 to 8?

page 9160, line 14 (section 3.1): There are little differences in global distributions among three wavelengths from Figure 1 to 3, so that they are ineffective figures. I recommend that the aerosol optical thickness, single scattering albedo, and asymmetry parameter are present with figures of global maps only at 0.9μm and their global averages at three wavelengths are described with a table.

page 9160, line 27 (section 3.1): Explain what are specific components of water soluble and water insoluble particles.

page 9162, line 5 (section 3.2): Explain which cloud parameters of NASA-Langley database do you use actually in this study?

page 9163, line 11 (section 4.1): Discuss the radiative forcing of dust aerosols depending on the imaginary part of the refractive index that is largely different due to elements of dust aerosols (e.g., Sokilik and Toon, JGR, 1999; Kaufman et al., GRL, 2001).

page 9163, line 15 (section 4.1): It is not clear why the sign of radiative forcing is 'patched' in Sahara. Explain clearly and in detail.

page 9166, line 18 (section 4.4): As mentioned above, you have to compare the radiative forcing of greenhouse gases both from natural and anthropogenic sources because the estimations of aerosol radiative forcing in this study is both from natural and anthroopgenic sources.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 9151, 2006.

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6, S3997–S3999, 2006