Atmos. Chem. Phys. Discuss., 11, C8828–C8830, 2011
www.atmos-chem-phys-discuss.net/11/C8828/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol optical properties determined from sky-radiometer over Loess Plateau of Northwest China" *by* Y. Liu et al.

Anonymous Referee #3

Received and published: 12 September 2011

(General comments) This paper describes aerosol radiative properties and their relation with radiation budget in an arid area, Lanzhou, China. Radiative properties of aerosol were retrieved from measurements of direct and scattered solar radiation at several wavelengths by using sky-radiometer. The original data are valuable and analyzed results in this paper are considered to be reliable. However, the contents of this paper are just the description of observation and data analysis. Comparison and discussion with similar studies are needed for a scientific paper in academic journals. The similar studies had already been carried out in the past, for example, Aeolian Dust Experiment on Climate Impact (ADEC, Mikami et al., 2006). As part of ADEC, sky-radiometer measurements were carried out in the desert area of China, and radiative properties were retrieved (Uchiyama et al., 2005). Evaluation of effects of dust aerosol on the radiation budget was also carried out by Shi et al. (2005). Simulations of the

aerosol direct effect have been carried out for the past decades (e.g., IPCC, 2007). In this paper, just two days (21 March and 8 April) are selected as dusting days, so that it is too rough to discuss and conclude the radiative effect of dust aerosols. The author should refer to the past studies related to this topic and should clearly indicate the originality and new findings of this paper.

(Specific comments) Page 23887, line 1: "the annual mean evaporation is about 1528.5mm (Huang et al., 2008b)." 1528.5mm is too large. Please check this evaporation value.

Page 23887, line 15: "Improved Langley plot method" should be described; at least some references should be shown.

Page 23887, line 28: "the Raleigh scattering" > "the Rayleigh scattering"

Page 23888, lines 25∼26: Why only two days (21 March and 8 April) are selected to be dust days? Large AOD is found on the other days, for example, 28 and 30 March, so the author should describe the reason why these two days are dusting days with weather report, Angstrom exponent or aerosol size distribution. The criterion of background aerosol should also be indicated as well as dust aerosol.

Page 23890, line 7: "SBDART model" should be described; at least some references should be shown.

Page 23890, lines 10∼12: How is the surface albedo derived from pyranometer measurement? Diffuse radiation data are used?

Page 23890, lines 18∼19: SSA value retrieved from diffuse flux is coupled with surface albedo. As mentioned above, surface albedo appears to be determined by using pyranometer measurement, and it is a constant value 0.25 independent of wavelength. How do you think about the effect of surface albedo uncertainty on the SSA retrieval?

Page 23890, line 21 and Figure 4: vertical axis of Figure 4 should be shown as difference among "Observed", "Result1", and "Result2".

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Page 23891, lines 12∼15: Since the sky-radiometer can derive aerosol size distribution, it is better to discuss SSA and ASY with aerosol size distribution.

Page 23892, ARF: How did you treat the spectral properties of aerosols and surface albedo? These properties are quite important to integrate the wavelength range of solar radiation. At least the author should mention on this matter.

Page 23893, line 18 and Figure 9: Figure 8 covers Figure 9 and the contents of Table 3 covers Figure 9, so that Figure 9 is not necessary.

Page 23894, line 20: In the acknowledgements, a name Pradeep Khatri is shown, but he is one of co-authors.

(References) Mikami, M. et al., 2006: Aeolian dust experiment on climate impact: An overview of Japan–China joint project ADEC. Global and Planetary Change, 52, 142–172.

Shi, G.-Y. et al., 2005: Sensitivity Experiments on the Effects of Optical Properties of Dust Aerosols on Their Radiative Forcing under Clear Sky Condition. J. Meteor. Soc. Japan, 83A, 333-346.

Uchiyama, A. et al., 2005: Characteristics of Aeolian Dust Observed by Sky-Radiometer in the Intensive Observation Period 1 (IOP1). J. Meteor. Soc. Japan, 83A, 291-305.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 23883, 2011.