**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 #1

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Aerosol optical properties have been retrieved using direct and sky radiance measurements at a site located in Loess Plateau of Northwest China. The aerosol optical data have been used together broadband solar radiation to study aerosol direct radiative forcing and atmospheric heating. It was shown that aerosol absorption has been underestimated by sky-radiometer. The adjusted single scattering albedo of dust aerosols was about 0.89, which leads to large atmospheric heating as combined with large dust optical depth. The topic is interesting and the analysis is fair, but a few important issues should been addressed before it is accepted for publication.

Major concerns: 1. Aerosol optical properties such as aerosol optical depth (AOD, single scattering albedo (SSA) are retrieved using POM-01 measurements, which are also derived from CIMEL measurements, so the authors should compare two prod-

ucts, including not only AOD but also SSA. Pure dust single scattering albedo was retrieved to be 0.98($\pm$0.01) using CIMEL measurements at Dunhuang during spring of 2001. Aerosol SSA at Beijing during dust period was estimated to increase from about 0.91 at 440 nm to about 0.96 at 870 nm (Xia et al., Tellus, 2005, 57B, 28-39). This indicates that mixing of dust and anthropogenic aerosols leads to higher SSA, although particle size increases as dust activities impact Beijing. 2. CM21 measurements of diffuse solar radiation are used to adjust aerosol SSA. It should be noted that field measurement uncertainties were estimated to be 3%, 6%, and 6% for direct, diffuse and global measurements using NIP and B&W radiometers (Stoffel, 2005, ARM-TR-035, http://www.arm.gov). This means we should take CM21 measurement uncertainties (zero offset, cosine response, et al.) into consideration and CM21 measurement is not a standard. In addition, aerosol asymmetry factor can also contribute to difference between CM21 measurements and SBDART simulations. 3. Meteorological report was used to select dust cases, which is objective in nature, suggest to use aerosol Angstrom wavelength exponent, at least, Angstrom wavelength exponent should be provided in the text. 4. A few words should be added to describe SBDART model simulation, including how to set spectral variation of aerosol optical properties, atmospheric profile, et al. Model uncertainty should also be noted. 5. Direct + diffuse are suggested to represent global radiation in the analysis of aerosol direct radiative effect. 6. Suggest to compare results of aerosol direct radiative forcing and atmospheric heating here to results derived in North China. The aerosol radiative forcing efficiency is often used in comparison.

Minor comments: 1. Suggest to add aerosol radiative effects in the title 2. Abstract, p1, retrieved change to "derived" because forcing can not be retrieved. 3. The elevation of station is 1965.8, so the atmospheric pressure should not be set 1 atm. 4. p7, l3-4, my understanding is that sunphotometer can work under cloudy and heavy dust storm if it is not rain determined by the humidity sensor, generally, we can not get aerosol retrieval because measurements under these situations are often cloud-screened out. 5. Background aerosol is used to compare dust aerosol, however, background is gen-

erally used to describe the condition with very low aerosol loading. 6. wm-2 change to W m-2