Atmospheric Chemistry and Physics Discussions

Interactive
Comment

Interactive comment on "Comparison of UV-RSS spectral measurements and TUV model runs for clear skies for the May 2003 ARM aerosol intensive observation period" *by* J. J. Michalsky and P. W. Kiedron

Anonymous Referee #1

General comments:

The authors show that the ultraviolet (UV) optical properties of atmospheric aerosol can be retrieved from radiometric measurements, forward radiative transfer modeling, and physical insight. Two significant advances, relative to previous work, are the use of transmittances (rather than absolute irradiances), and the successful application to relatively small aerosol optical depths. The paper is suitable for publication in ACP, with consideration of minor comments listed below.

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Specific comments:

In the abstract, it may be useful to state how transmittances were obtained.

Section 3 (model description): Some additional detail should be provided: What were the altitude distributions of ozone and aerosols (extinction, single scattering albedo, and asymmetry factor)? What radiative solver was used (discrete ordinates? how many streams? pseudo-spherical correction?)

17407/21-27: Some more description of the determination of the TOA irradiance would be useful, since this is the basis for using transmittances in the remainder of the paper. Indeed, lines 21-27 suggest, but don't actually say, that the Langley method was used here. Also, the article by Keidron et al. (2006) is not in the open literature (SPIE conference proceedings), so some more description here seems warranted.

17408/3,5: was the cosine of the solar zenith angle (sza) used also for low sun (e.g. on 28 May, sza=72.1 deg.)? Or was an airmass factor calculated to account for atmospheric curvature?

Section 5: The assumption of wavelength-independent single scattering albedo (ssa) and asymmetry factor (g) is itself not consistent with Mie theory. Perhaps more fundamental is how the real and imaginary refraction indices vary with wavelength, and whether any excess UV absorption might be expected from various substances (e.g. organics) in the particles. In going from visible to UV wavelengths, are the required changes in ssa and g in excess of those predicted by Mie theory assuming constant index of refraction?

17408/19-23: Surface reflectance may be significant even for such low values, due to the high UV Rayleigh optical depths. It would be good to see a sensitivity study, e.g. between 1% and 5%, and consequences on retrieved aerosol properties.

17409/3-4: A short explanation would be helpful. A higher g means that when a scattering event occurs, it is more in the forward direction. Why would this increase the

diffuse field? Is delta-scaling used in the model?

17411/19: Would tropospheric O3 also lead to some of this discrepancy in diffuse radiation?

Figure 2 is useful to show the wavelength-dependent transmittance. However, for latter figures, it may be better to show % fractional deviation (as suggested by Referee #2).

Technical comments: Style: when citing other work, it's generally nicer to say e.g. "reported by ..." rather than "reported in ... ." 17405/8: Madronich (2003) citation is given as 1993 in references at end. 17409/10: here mean ssa, not g. 17411/8: unclear reference to Oklahoma springtime 17410/21: should this be RSS rather than MFRSR (twice)?

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17401, 2007.

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