Atmos. Chem. Phys. Discuss., 9, C307–C309, 2009
www.atmos-chem-phys-discuss.net/9/C307/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Closure on the single scattering albedo in the WRF-Chem framework using data from the MILAGRO campaign" *by* J. C. Barnard et al.

Anonymous Referee #2

Received and published: 21 April 2009

General Comments

This reviewer is not an expert in all aspects of atmospheric aerosols, and my experience is in the area of absorption and scattering of radiation. My comments come from this perspective.

A positive aspect of this paper is that it identifies the large array of variables that influence the optical properties of aerosols at a particular location. Given the complexity of the subject, it is a bit surprising that the "chemical to optical properties modules" (CTOM) perform as well as they do.

The negative side effect of the complexity is that one can not have confidence that the

source of the discrepancy between observations and measurements has been identified, although the possibility of contamination by coarse particles appears reasonable.

Specific Comments

I recognize that the CTOM has been described elsewhere, but its calculations are central to the work. From the information given in the paper, it is not possible to trace exactly how one goes from data sets on particle composition to computed optical properties. The reader gets lost in all of the details. Variables that specify the abundance of inorganic ionic species, black carbon and organic matter must be combined with modeled size distributions. Then one has the problem of how that absorbing material is distributed throughout the volume of a single particle. From all of these inputs and assumptions, the module computes B(abs) and B(scat). It is not clear how all of the information is combined to produce the optical properties. A flowchart that displays the various steps would be useful. This would essentially be a more detailed version of Figure 1.

Several assumptions influence the accuracy of the results, but I can not assess the magnitude of their effects. For example, if one looks at the wavelength-dependent calculations of the CTOM, from 300 to 1000 nm, is it valid to do a linear interpolation to obtain results at 870 nm? When the particles are dry, is it valid to assume a spherical geometry? The parameters used to fit the analytic size distribution are based on optical column measurements with a sun photometer. Is it valid to apply parameters derived from column data to the local particle distribution at the ground? These questions illustrate the fact that the authors are addressing a very difficult problem, and some significant assumptions are necessary. This makes one question whether the paper is overly ambitious.

I would modify the paper to address the following questions clearly: (1) Exactly what information on chemical composition and size does one need to specify the optical properties of the particles? This would include a detailed flowchart of the operation of

the CTOM. (2) What portion of the information in item (1) is available and where do assumptions need to be made? (3) Where do significant uncertainties neter the work? This information is likely in the current paper, but I found it awkward to follow.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5009, 2009.