Atmos. Chem. Phys. Discuss., 4, S3223–S3226, 2004
www.atmos-chem-phys.org/acpd/4/S3223/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol optical depth measurements by airborne sun photometer in SOLVE II: Comparisons to SAGE III, POAM III and airborne spectrometer measurements" *by* P. Russell et al.

Anonymous Referee #2

Received and published: 5 January 2005

GENERAL COMMENTS

This is an excessively long and detailed intercomparison of AOD measurements made during SOLVE 2. Four different instruments are involved: AATS and DIAS on board the DC-8 aircraft, and SAGE3 and POAM3 satellite instruments.

The challenge is that the instruments on board the DC-8 typically measure only half the full limb path that the SAGE3 and POAM3 instruments see though. This leaves a

high potential for systematic biases between the air- and space-borne sensors, since the conversion of the partial-limb-path AODs to full limb path AODs is critically dependent on the assumed solar zenith angle, refraction, aircraft altitude, and the aerosol extinction profile.

A major problem is that the paper unearths significant biases between the DC-8 and the satellite instruments, but never satisfactorily explains/resolves any of them. The authors try several different ways of comparing the data (transmission, vertical OD, slant OD, etc) but they all exhibit the same behavior. To add to the sense of confusion and futility, the authors tell us that SAGE3 and POAM3 disagree with each other during the period of the DC-8 measurements, but are in agreement before and after.

The authors go to great lengths to prove that there was no ice on the window of the AATS instrument, adding an appendix, but they don't say anything about non-ice crud on their optics. The SAGE3 and POAM3 instruments can take a solar spectrum high above the atmosphere to establish a "baseline" exo-atmospheric spectrum. But for the DC-8 instruments this is much more difficult. How does AATS distinguish crud on its optics from atmospheric aerosol?

The paper has a lot of duplication. For example, lines 4-10 of the abstract are virtually identical to lines 14-21 of the introduction. I strongly recommend that the authors try to shorten the text and try to reduce the number of figures. Although there are "only" 24 figures, most of these are multi-panel. I counted a total of 111 figure-panels! The problem with this excessive detail is that readers "burn out" half-way through the paper, before reaching the important stuff. So I recommend that the number of figure-panels be reduced by at least a factor 2. This will allow more space for the remaining figures (improving their legibility) and will allow the text to be trimmed since the deleted figures don't have to be discussed. A few suggestions: figures 6-9 are very similar. Is it really necessary to show this same information for all 4 DC-8 flights? Why not simply choose one typical flight? And figures 14 and 15 are really very similar – there is no need for both.

ACPD

4, S3223–S3226, 2004

SPECIFIC COMMENTS

The authors say nothing about the spectral resolution of the AATS-14 instrument. Their equations implicitly assume that its spectral resolution is much higher than any structure in the incident solar spectrum. They should comment on the validity of this assumption.

P. 7292, line 2: Why is "Second" capitalized? Is this the "S" in SOLVE?

P. 7292, line 4-5: I prefer "multi-wavelength" to "mul-tiwavelength".

P. 7292, line 27: It seems redundant to use the word "percentage" when it says "%" after each value.

P. 7292, line 28: Is the 1020nm channel mentioned here the same as the 1019nm channel cited in Table 2, or are they different?

P. 7294, line 6: The authors state that "airmass is defined as the LOS optical thickness (OT) to the vertical OT". Is this the vertical OT above the observer or above the lowest point along the LOS?

P. 7324: Table 2: I don't understand how the rms values are calculated for this table. Take the right-most column (1545nm) in Table 2(a). The values are 10.1, 15.3, 16.8, and 19.4. By my calculation, the mean value is 15.4 and the rms is 3.4. So where does the tabulated rms value of 15.8 come from? Ditto for all the other rms values in Table 2 and for Table 4. Obviously, I'm completely missing the point here.

P. 7324: Table 2: Why do the wavelengths in Table 2a have 5 significant figures, but only 4 in Table 2b? Ditto for 2c & 2d.

P. 7335: What is the significance of the left-pointing arrows in figures 6, 7, 8, and 18?

P. 7339: Change "Aaerosol" to "Aerosol" (y-axis annotation). Ditto for figure 19.

P. 7341: Panels are not labelled (a), (b), (c).

ACPD

4, S3223–S3226, 2004

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7291, 2004.

ACPD

4, S3223–S3226, 2004

Interactive Comment