

Interactive  
Comment

# ***Interactive comment on* “Combined retrievals of boreal forest fire aerosol properties with a polarimeter and lidar” by K. Knobelspiesse et al.**

## **Anonymous Referee #1**

Received and published: 28 April 2011

Review for Atmospheric Chemistry and Physics

Title: Combined retrievals of boreal forest fire aerosol optical properties with a polarimeter and lidar

Authors: K. Knobelspiesse, B. Cairns, M. Ottaviani, R. Ferrare, J. Hair, C. Hostetler, M. Obland, R. Rogers, J. Redemann, Y. Shinozuka, A. Clarke, S. Freitag, S. Howell, V. Kapustin, and C. McNaughton

General Comments:

This paper presents a well-written, detailed and informative investigation of aircraft

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



based remote sensing retrievals of aerosol optical properties and comparison to in-situ measurements on a single day for a large boreal fire smoke plume in western Canada. The paper provides much useful information and will make a valuable contribution to the published literature. Although the paper is quite long, I find that it is useful to provide this level of depth and analysis in order to be clear and complete. I have several comments regarding the manuscript (see specific comments below, most are minor) and I believe most of these can be addressed with a few clarifying additions/changes in phrases or sentences.

Specific Comments:

Page 7911, lines 4 & 6: Add (1974) to Hansen and Hovenier on line 5, and delete this repeated reference on line 6.

Page 7911, line 20: Are there 240 viewing angles or 240 combinations or viewing angle and spectral channels?

Page 7913, lines 13-15: The scan angle range and increment given here suggests ~140 angles, not the 240 angles mentioned on page 7911.

Page 7914, line 13: The 150 view angles given here is inconsistent with prior statements. Please be accurate and consistent throughout the paper.

Page 7919, line 5-9: Can you say how you selected the 0.5 degree heading and pitch error estimates, are they empirically determined by data variance?

Page 7919, line 27: I assume you mean lack of surface heterogeneity over ocean?

Page 7924, lines 3-5: You should elaborate that surface reflectance is nominal in the blue for soil and vegetated surfaces, but not for snow and ice surfaces (see Hsu et al. 2004).

Page 7927, lines 1-2: I suggest using BOLD in Table 1 to make it more obvious, since I cannot distinguish the italics from the standard font.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Interactive  
Comment

Page 7927, lines 7-13: I suggest that Lewis et al. (2008) would be good reference to add in this discussion of BC and OC in smoke aerosols.

Page 7929, lines 19-20: What wavelengths were used in the computation of the Angstrom Exponent, and were only 2 wavelengths used or multiple wavelengths with linear regression?

Page 7931, lines 17-19: Why do you use an exponential function, do you mean a 2nd order fit of  $\ln$  AOD versus  $\ln$  WL as shown by Eck et al. (1999) to be the best fit of AOD spectra?

Page 7933, lines 9-16: Why do you only compute the single scattering albedo at one wavelength and not interpolate to the 3 measurement wavelengths (which are relatively close for both the nephelometer and PSAP)?

Page 7935, lines 1: You say 'each plot' but there is imagery only in the top panel of Figure 3.

Page 7936, lines 1: You say the optical depths from HSRL and AATS are 'quite similar'. Please quantify the comparison here with the mean absolute difference and standard deviation of the differences.

Page 7936, lines 14-15: The comparison of the data sets in Fig. 3 is one of the most important Figures in the manuscript, however in the size presented it is relatively small and hard to read, including the y-axis font size and the color legends at the bottom. I suggest you consider a full page or even 2-page format.

Page 7937, lines 24-28: Related to Figure 4, please give the Angstrom Exponent computed from both the AATS and retrieved AOD in the  $\sim 350$  nm to 1000 nm wavelength range. It would also be useful to include the spectral variation of Angstrom or include the  $\alpha'$  parameter (Eck et al., 1999) to characterize the magnitude of the non-linearity of  $\ln$  AOD versus  $\ln$  WL.

Page 7938, lines 25-27: It would be useful to also reference Dubovik et al. (2002),

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Interactive  
Comment

boreal smoke SSA  $\sim 0.94$  and Eck et al. (2009) Alaska smoke of  $\sim 0.96$ , especially since the agreement with your data is excellent.

Page 7939, lines 9-11: Please quantify the difference in single scattering albedo here rather than just 'slightly higher'.

Page 7939, lines 13-14: Similarly, please quantify the difference in single scattering albedo here rather than 'drastically lower'.

Page 7939, lines 16-18: Also, quantify the differences in effective radii and variances in addition to using the relative phrases of 'slightly larger', 'much larger', etc.

Page 7945, lines 20-23: Define quantitatively what you consider an acceptable uncertainty range for aerosol single scattering albedo.

---

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 7909, 2011.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)