

## ***Interactive comment on “NASA LaRC airborne high spectral resolution lidar aerosol measurements during MILAGRO: observations and validation” by R. R. Rogers et al.***

### **Anonymous Referee #2**

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### GENERAL COMMENTS

This manuscript describes the validation of the NASA Langley Airborne High Spectral Resolution Lidar (HSRL) extinction profile and aerosol optical depth products through comparisons with independent, ground-based or airborne measurements performed during the MILAGRO campaign. In contrast to traditional lidars, which usually need to assume a relationship (commonly called the lidar ratio) between the aerosol volume backscatter and extinction coefficients in order to retrieve profiles of either, HSRLs make use of a second receiver channel to enable the determination of the reduction with range in the “clear-air” signal. The two-way transmittance with range can be de-

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duced by comparing this signal with one modeled using an atmospheric density profile. Thus HSRLs can determine aerosol extinction and backscatter directly without the need to assume a lidar ratio.

This work makes an original contribution to science by its reporting on the first substantial efforts at validating the airborne HSRL measurements and by the results it presents on the fine-resolution vertical and horizontal variations in aerosol properties over the MILAGRO study area. It is well written and structured and explains the methods and results clearly. After the authors attend to some minor points, I would recommend that this work be accepted for publication.

### SPECIFIC COMMENTS

Page 8828 line 17: “The dry aerosol scattering measured by the nephelometer”. Was the air dried merely by its passage through the nephelometer (c.f. Waggoner, Ahlquist and Charlson, Appl. Opt. 2886-2889 (1972)) or was the air passed through a drying unit. Please describe briefly.

P 8828 Eq. (3). This is a fairly generic equation for describing the effects of humidity on particle scattering. Given that there is a wide range of different behaviors reported in the literature for different aerosol types (e.g. sea salt versus continental sulfate), would the authors provide further comment on the range of applicability of this equation and of the values they have assumed for the gamma exponent?

### TECHNICAL COMMENTS

Page 8820 line 5: There is no IPCC, 2007 reference listed. Do the authors mean to cite Solomon et al.?

P 8824 last line: “two-way transmission”. The usual term is “transmittance”.

P 8825 line 13: “black arrows in Fig. 2”. Only one black arrow appears in Fig. 2.

P 8825 line 26 and thereafter: “21.625 and 21:75 UTC” the authors’ use of this time no-

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tation is unconventional and misleading. I suggest that they distinguish clearly between fractional hour notation by using a period, e.g. 21.625 and 21.75, and the conventional HH:MM notation that uses the colon. It would help if they used only one of these notations, and informed the readers that the notation related to fractional time if they decided on that option.

Figure 2 appears to use HH:MM notation. If it is not, then it needs to be modified or the caption changed to inform the reader as to what is being used.

P 8826 line 7: “close temporal coincidence with ”.

P 8826 line 13: “contains time-height curtain summaries”. Delete the “a”.

P 8826 lines 17 – 22: Sentence beginning “The G-1 . . .” could be improved. Try breaking up and / or correcting the punctuation.

P 8826 line 25: “the ozone concentration was measured” to maintain consistent tense throughout paragraph.

P 8832 lines 1,2. “It is important to note that because. . .” .

P 8833: The last sentence needs correction or re-writing completely to read better.

Page 8835 line 4: The (Holben et al., 1998) citation is listed as 2001 in the References.

References: P8839 line2: The “nu” symbol should be a “mu”

Why do some references use “et al.” while others list all author’s names (e.g. as many as 21)?

Figure captions: In some captions the text precedes the relevant label while in others it follows the label. It would help if the authors were consistent.

Figures:

Figure 2: I can only see one arrow.

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Figure 3: See comment above on time notation and correct if necessary.

Figures 5(c), 6 and 8. Depending on the final size of the figures, the colors of the different profiles may be too similar for the size of the plots. (This was certainly the case in the “printer friendly” version. The authors may need to consider changing the line style if this is going to be a problem. Also the captions or the figures should indicate which color or style refers to which profile.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 8817, 2009.

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