

Interactive comments on:

“Effect of aerosols and NO₂ concentration on ultraviolet actinic flux near Mexico City during MILAGRO: measurements and model calculations”

by G. G. Palancar et al.

Anonymous Referee #2

Received and published: 7 September 2012

We thank the referee for the insightful and helpful suggestions which resulted in an improved manuscript.

General Comments

The MILAGRO campaign offered a unique opportunity to assess the role of pollution in modifying actinic flux; thus impacting the photochemistry that regulates the pollution itself. This field study is especially useful given the range of aerosol loadings, SSAs, and NO₂ levels observed. The analysis is appropriate and insightful, although some assumptions (e.g., wavelength independence of some aerosol properties extrapolated from 441 nm) were needed since aerosol radiation observations do not emphasize UV wavelengths. In a few cases discussion of the figures should go into more depth, but these are not major issues. This paper should be published after the following comments have been addressed.

Specific Comments

Page 19250, line 14: The authors note that due to the sparse availability of data for aerosol optical properties, daily averages were used. In this case, it would be appropriate to note why this data is sparse. It is my understanding that these properties can only be retrieved by Aeronet through almucantar scans that can only be accomplished at high solar zenith angles. Since these scans are time consuming and can only be accomplished at certain times of day, this information should be shared with the reader to clarify that the data collection method rather than missing data is responsible for the sparse nature of these observations.

Answer: The reviewer is right, that there are multiple quality criteria limiting the number of AERONET retrievals, as described in detail by B.N. Holben, T.F Eck, I. Slutsker, A. Smirnov, A. Sinyuk, J. Schafer, D. Giles, and O. Dubovik. AERONET’s Version 2.0 quality assurance criteria.

http://aeronet.gsfc.nasa.gov/new_web/optical_properties.html.

Almucantar retrievals are limited to $SZA < 50^\circ$, to obtain sufficient signal over a range of scattering angles. To clarify this point we replaced the sentence at page 19250, lines 13-14 for the following sentences:

Because of the nature of the data collection method for almucantar retrievals ($SZA < 50^\circ$) and the version 2.0 constraints to assure the data quality, daily observations for g441,

SSA441, and α were very sparse. Thus, for these parameters the daily averages of the available data were used for the corresponding day.

Figure 2: There appears to be a strange jump in the impact of NO₂ on actinic flux on each day around 12-12:30. The authors should provide an explanation for this or at least acknowledge it. This feature is not of major concern to the conclusions drawn from this work.

Answer: From Fig. 1, it is seen that NO₂ has a daytime maximum near noon. In Fig. 2, this is seen as a slightly larger correction for NO₂ around noontime. To explain this fact we added the following sentence in the text:

"The concentrations of NO₂ reach daytime maxima of 10-15 ppb (see Fig. 1) near noon, and the corresponding reductions in UV radiation are also discernible in Figure 2."

Figure 4: The data in this figure seem inconsistent with figure 2 where Corr SSA appears to fully correct model-versus-observed actinic flux. I realize that figure 2 is for integrated actinic flux and figure 4 is for 368 nm only. I am wondering if there is a spectral dependence in the simulation that can account for this. Earlier in the text, the authors state that SSA is assumed to be wavelength independent. Corr et al. (2009) also states that there is insignificant spectral variation in SSA from 332-368 nm. Is it possible that extending the Corr SSA to the longer wavelengths (368-420 nm where there is more actinic flux) is allowing for a stronger aerosol absorption effect than is reasonable, thus correcting the gap for integrated actinic flux in figure 2 while falling short of agreement at 368 nm? The authors should comment on this.

Answer: The reviewer is right but the reason of the inconsistency is a mistake in this plot. Data for actinic flux did not correspond to 13 March but to 12 March. Figure 4 is now corrected (Actinic flux agreement is now consistent with Fig. 2) and both magnitudes are now shown in the same units following a suggestion of Reviewer #1. A sentence has been added (see reply to reviewer #1) on this comparison.

Figure 5: The C-130 overpass time in this figure seems rather long. Did it pass over the site multiple times?

Answer: Correct. Between 14:44 and 16:15 LT the aircraft overpasses T1 site 4 times, lasting between 2 and 3 minutes each.

Typos corrected:

Page 19250, line 7: "cloud cleaning" should be "cloud clearing"

Page 19253, line 28: "the 95%" should be just "95%"