Reviewer #1

Reviewer's Specific Comments
Are absorptive aerosol optical depths available during the MILAGRO field campaign? What about AERONET single scattering albedos (from which the absorptive AODs can be derived)? If available, then the comparison of the OMI absorptive optical depths with the correlative measurements would add substantially to the value of the paper, since the paper points out on page 9968 that the OMI absorptive AODs are more reliable than the total AODs. Please cite references to the validation of absorptive AODs, if available.

Authors' Response
Unfortunately, no acceptable AERONET SSAs and AAODs at any of the AERONET sites are available near the time of satellite overpass (20:07 UT) over the Mexico City area on 19 March. Almucantar scans were performed at T0 near 19:47 UT and 20:47 UT, but the solar zenith angles (SZA) were ~25 deg and 36 deg, respectively, and these are much less than the minimum acceptable SZA of 50 deg for trustworthy retrieval of SSA and AAOD. At T2, there was an almucantar scan at 19:03 UT (about an hour before the Aura overpass), but the SZA was 48 deg. Furthermore, the measured AOD at 440 nm at that time was much less than the direct sun measurements near the time of satellite overpass and also much less (and inconsistent with) the direct sun measurements at 18:59 UT and 19:14 UT. We note that we included the following text on page 9987 of the original submitted manuscript:

"No trusted AERONET retrievals of SSA at T0 or T2 are available for comparison near the times of Aura or J31 overpass. At T0, the only trusted SSA retrievals are for AERONET almucantar scans acquired 5–6 h before (at 13:49, 14:10 and 14:56 UT) and 2–3 h after (at 22:37, 23:22 and 23:43 UT) the Aura overpass time, but the AERONET direct sun measurements indicate that the particles were much larger while the J31 was there than they were during these times."

Reviewer's Specific Comments
Use "above sea level" and "above ground level" instead of "a.s.l." and "a.g.l." in the abstract. Define these abbreviations in the text.

Authors' Response
We will make the recommended edits in the revised manuscript.

Reviewer's Specific Comments
Page 9967, line 15: Change "and uses only a small part in the near UV" with "and uses only a small range of wavelengths in the near UV.

Authors' Response
We will make the recommended edit in the revised manuscript.

Reviewer's Specific Comments

Page 9979: Are MODIS AODs not available? If available, they could be place in Figure panel 7e. I particularly think it is good to see the MODIS data in the figures, since they indicate the wavelength dependence of the AODs.

Authors' Response
We too think it is instructive to include MODIS AODs in the figures. Perhaps the reviewer missed lines 23-24 on page 9979 of the manuscript, where we stated the following: "Unfortunately, there are no MODIS aerosol retrievals or cloud fraction data available along the J31 track due to sun glint, as noted in Sect. 3.1."

Reviewer's Specific Comments
Page 9983: Are MODIS AODs not available? If available, they could be placed in Figure panel 12c.

Authors' Response
We have taken another look at the coincident MODIS AOD retrievals for this day. There were retrievals in two MODIS pixels coincident with the J31 flight track over T0, but we rejected these because neither has an acceptable quality assurance flag. There was a retrieval in one pixel near T2 with the highest quality assurance flag, and we will include this in frames (a) and (c) of Figure 12 in the revised manuscript. We will also extend the wavelength range of the AOD comparison shown in 12c to 2.2 microns to show the full MODIS and AATS AOD spectra. The MODIS spectrum is somewhat steeper than any of the AATS spectra, but the magnitude falls within the upper range of those measured by AATS, although it is significantly less than the mean AERONET AOD spectra at T2.

Reviewer's Specific Comments
Page 9984: Revise to "layer near T2, combined with variable surface terrain below the flight track, prevented the".

Authors' Response
We will make the recommended edit in the revised manuscript.

Reviewer's Specific Comments
Page 9989: It would be helpful to mention in the Figure 12 figure caption that the J31 never flew lower than 420 m. There will be some readers who will quickly scan through the paper, and not be aware of this important. Add the information in the figure caption to avoid the careless reader from forming an incorrect conclusion.

Authors' Response
This is an excellent recommendation that we will implement in the revised manuscript.

Reviewer's Specific Comments
Page 10008: Add the MODIS label in panel 9b.

Authors' Response

We assume the reviewer means panel 9d, and we will add the label in the revised manuscript.

Reviewer's Specific Comments
Page 10013: Figure 14: The figure legends are very hard to read. Please increase the font of these legends.

Authors' Response
The reviewer is correct. This figure was intended to be a full page portrait mode figure. We will work with the ACP editor to make sure this happens, as this will lead to about a 75% increase in the figure size in the final ACP publication compared to what is in the online ACPD version.

Reviewers #2 and #3

Reviewers' General Comments
It is readily apparent that both reviewers found the manuscript to be long, but their recommendations totally disagree. Reviewer #2 states that "the discussion on the aircraft measurements is way too long," and recommends that the authors "condense the text and present the key findings such as they did for the SSFR instrument." Reviewer #3 states: "This comparison verges on being tediously long, but given the paucity of appropriate data the authors made the right choice to go into such detail. I think this sort of detail is often lacking in satellite validation papers, so I am glad that it is here, especially since the conclusion is well written."

Authors' Response
Unfortunately, we cannot satisfy both reviewers. We acknowledge that the manuscript is long, but we must side with Reviewer #3. A thorough comparison of aircraft and satellite measurements demands attention to detail, and we feel strongly that it would be a disservice to the reader to omit these details, even if it does result in a paper that borders on being "tediously long." In fact, the manuscript actually focuses on the 10 March over-water and 19 March over-land aircraft/satellite coincidences, and does present the 3 March and 17 March cases in somewhat less detail.

Reviewer #2 Specific Comments
"The paper is useful but not that scientifically important. Ground based measurements can serve the same purpose."

Authors' Response
We respectfully disagree. AERONET is invaluable for validation of satellite AOD (and AAOD) measurements, but it does not offer the mobility or the satellite in-pixel areal coverage afforded by an airborne sunphotometer, especially for over water AOD comparisons.

Reviewer #2 Specific Comments

"I was also very concerned that over land the plane flew 400-500 m above the ground and they claim there was no way to estimate the aerosol loading below the plane. Not very useful for satellite validation."

Authors' Response
We share the reviewer's concern here. Unfortunately, visibility-related safety concerns and air traffic control restrictions dictated the minimum altitude of the J31 over the Mexico City rural and urban areas during the 19 March flight. Admittedly, the Mexico City AATS data set would have been more valuable for satellite validation if the J31 had flown a low altitude horizontal transect and if the plane had been equipped with in situ scattering and absorption instruments. Even so, we're not sure that the reviewer is justified in saying the measurements were "not very useful for satellite validation". While recognizing the AATS inherent measurement limitation (no absorption retrieval capability) and its aircraft-related limitations (minimum altitude a few hundred meters AGL, track covered only a small fraction of the OMI pixel), we note that AATS was able to provide information on spatial variability within a satellite pixel that was not possible with a single ground-based site (T0 or T2).

Reviewer #3 Specific Comments
Section 3.5.3: "Please be more specific about the type of surface albedo that is applied here. I suspect it is the Bihemispherical Reflectance (BHR) or 'white-sky' albedo in MODIS terminology (which also assumes isotropic downwelling). MODIS BHR may also be available for this area, even if the aerosol retrievals were not applied. It might be interesting to compare the MODIS 460-480nm band to SSFR and OMAERO retrievals."

Authors' Response
The SSFR-derived surface albedo we show in Figure 14a and 14c is the "actual" or "blue-sky" albedo, as explained in Coddington et al. (2008). The OMAERO quantity that we plot is the archived hdf file Scientific Data Set parameter "terrain reflectivity". This is defined in Kleipool et al. (2008) as a "Lambertian equivalent surface albedo." It is comparable to the SSFR-derived surface albedo. Unfortunately, the OMAERUV SDS parameter that we plot is the "reflectivity," which incorporates the combined 3-D effect of surface, clouds, and aerosols, and therefore is not just "terrain reflectivity." Hence, this is not directly comparable to the SSFR and OMAERO quantities, and we will delete it from the revised Figure 14 and where discussed in the text.

Coddington et al. (2008) presented comparisons of SSFR spectral surface albedos and those derived from the MODIS BRDF/albedo model parameters product (MCD43A1) for the J31 flights over Mexico City on 6 March and 15 March. They described in detail the effort required to calculate blue-sky albedos from the white-sky and black-sky MODIS measurements calculated along the J31 flight track specifically for the Coddington et al. paper by members of the MODIS team. In particular, the Coddington et al. paper found that MODIS surface albedos exceeded SSFR values by 0.02-0.05 at T2 and were less than SSFR albedos by 0.025-0.05 at T0. We will edit the text to refer the reader to these results. However, we feel it is beyond the scope of our manuscript to calculate and present these calculations for the 19 March J31 flight.

Reviewer #3 Specific Comments

"I found many of the plots to be small and difficult to read, both in the onscreen and printer friendly versions. This was especially the case for the plots like in Figure 2b. I would like to see some of these multiple panel figures split into separate figures. I think figures 2, 7, 9 and 13 are especially in need of this. I would also caution against plotting with yellow, as it is nearly invisible."

Authors' Response

We appreciate the reviewer's pointing this out, and of course we are very interested in the figures being legible. However, we prefer not to break up any of the figures. This is particularly true for Figures 2, 7, 9, and 13, which we designed as multi-frame figures because the information presented in the various frames is complementary and, we feel, it is best grasped when viewed together. We are currently redoing some of the figures to increase the font sizes. We will iterate with the journal editor(s) to maximize the size and readability of all the figures. In some cases, such as Figures 2, 12 and 13, this may be as simple as stacking the frames vertically to fill one column. Figures 7 and 9 could be more problematical and may need to be full pages.