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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval of aerosol absorption properties using the AATSR satellite instrument: a case study of wildfires over Russia 2010" *by* E. Rodríguez et al.

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General comments:

The authors thank Dr. Jethva for his excellent suggestions which surely contribute to improving the presentation of the paper. The title has been changed to emphasize that the aerosol retrievals are only for fine aerosol particles. The AOD uncertainties have been included in the scatter plot. A better explanation about the OMI product we use has been included and also we took into account your suggestion about the AAI limits. We decided to focus the results only in the case study considered for the paper so the

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results related with the global SSA were removed.

Specific comments:

Page 9839: Title: Consider changing the title of the paper to something like: "Retrieval of biomass burning aerosol absorption properties..."

Title has been change to: "Retrieval of absorption properties for fine aerosol particles using AATSR satellite instrument: Case study of wildfires over Russia 2010"

Page 9840: Abstract: Abstract should be initiated with a sentence on the AATSR on board ENVISAT satellite stating its channels and capability of aerosol retrieval.

The abstract has been changed as suggested.

Page 9840, Line 13: Here, the results of the sensitivity analysis shown in Figure 1 should be referred by stating that at moderate to higher aerosol loading it is possible to discriminate the aerosol type or model using the TOA spectral reflectance which forms the basis of the SSA retrieval.

The text has been changed as suggested.

Page 9841, Line 23: Torres et al. (2013) introduced an updated version of the Interactive OMI/OMAERUV algorithm in which the observations from A-train sensors CALIOP and Comment AIRS have been ingested for the improved

The text has been changed as suggested.

Page 9842, Line 2: biomass burning regions.

The text has been changed as suggested.

AMTD
7, C5157–C5162, 2015

Page 9842, Line 13: Add here something like this: "Later in the paper, we show that the mixture of aerosol models or types has a pronounced effect on the TOA reflectance.Thus the aerosol mixture which provides the best fit between simulated and measured reflectance can be used to infer the single-scattering albedo."

The text has been changed as suggested.

Page 9842, Line 16: for wildfires over western Russia...

The text has been changed as suggested.

Page 9843, Line 28: The radiative transfer calculations are time consuming and therefore the look-up-tables are created for certain...

The text has been changed as suggested.

Page 9845, Line 12: The message of Figure 1 can be delivered more effectively if the % change in the TOA reflectance is plotted against the AOD instead of absolute reflectance versus AOD.

We agree that the relative change in reflectance would show a clearer difference but we want to show how the different aerosol types are taken into account in the actual retrieval. The figure with absolute reflectance also emphasizes the need for the 0.2 constraint for AOD.

Page 9846, Line 1: "...our main interest is in testing the possibility to retrieve SSA..."

The text has been changed as suggested.

Page 9847, Line 11: Given an error of 0.03 in SSA, an error in AAOD could be 30%. For instance, for an AOD and SSA of 1.0 and 0.9, respectively, the AAOD would be

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7, C5157–C5162, 2015

0.1. Now, a perturbation of plus/minus 0.03 in SSA would provide AAOD of 0.07/0.13 which is 30 % deviation from the reference case.

*The uncertainty in the AAOD considered here was suggested by O. Dubovik (private communication), but also if you consider (1-0.03)*0.01=0.0097 which can be considered 0.01*

Page 9848, Line 27: The lower values of SSA only indicate the presence of absorbing aerosols. Lower SSA along with higher AOD values indicates larger concentration of absorbing aerosols.

The text has been changed as suggested.

Page 9849, Line 7: Why such a big spatial-temporal window? For satellite AOD validation such as performed for MODIS, MISR, and OMI aerosol products, 0.5 deg square region for spatial averaging and plus/minus 30 minutes for temporal average of AERONET data are selected which have become a well-accepted standard. For OMI vs. AERONET SSA comparison such as recently carried by Jethva et al. (2014)-JGR, a spatio-temporal scheme with 0.5 deg square region for averaging OMI retrievals and plus/minus 3 hours for averaging AERONET inversion in time.

The number of samples is reduced here due to the limited swath of the in- strument which is 512 km leading to an overpass every time of 3-4 days over this area, this condition together with the limitations to obtain results in level 2 from AERONET inversion products force us to extend the limits of the spatial-temporal windows out of what is usually the standards for satellite comparisons.

Page 9849, Line 18: What are the expected uncertainties in the AATSR AOD retrieval? These error bars should be drawn in the Fig 5a.

The error bars for AOD have been included.

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7, C5157–C5162, 2015

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Page 9850, Line 7: Fig 5 SSA plot shows outliers for larger SSA values (>0.92) where AATSR retrieves significantly lower SSA in comparison to AERONET inversion. Make sure the text is correctly written.

This explanation has been changed

Page 9850, Line 18: How do the OMI SSA retrievals in the near-UV region being converted to 0.555 micron? Extrapolation? Author should be cautious while comparing OMI-retrieved SSA against AATSR. Though, OMI derives SSA for lower values of UV aerosol index, the uncertainty in the SSA can be larger than 0.03 for UV-AI values lower than 0.5 [Jethva et al., 2014]. Also, OMI does not retrieve SSA for low values of UV-AI (<0.3) where it employs single-channel algorithm for which it assumes a fully scattering aerosol model with SSA of unity. Under these conditions, OMI reports SSA of 1. These retrievals should not be included in the spatial averaging of OMI data. For SSA comparison, I strongly recommend including only those OMI retrievals with observed UV-AI greater than 0.5.

We are not processing the SSA OMI results. The product we are using is OMI-Aura_Ł3-OMAERUVd it has a grid size of 1°x1° pixel. It is a daily product and the name of the product is "Final aerosol single scattering albedo 500 nm", as you mention in your paper the wavelength difference between both satellites is insignificant so we are comparing the SSA values directly with no further correction for wavelength.

Page 9851, Line 1: rephrase this statement.

The statement was rephrased.

Page 9851, Line 15: The ADV algorithm assumes a fixed fraction of coarse mode aerosols, i.e., dust and sea salt, the present technique, therefore, derives the SSA of fine mode biomass burning aerosols. Applying the current algorithm globally would

AMTD
7, C5157–C5162, 2015

be inappropriate particularly over dust regions, i.e., Sahara and Arabian Peninsula. I would suggest replacing the global picture of SSA with three sub-plots, each showing SSA distribution over central Africa, South America, and Russia. Since the ADV retrieval of SSA is processed for entire globe for September 2010, it is desirable to compare it with AERONET and OMI for above-mentioned three regions.

We decided to use only the case study in the revised paper, so the global comparison has been removed.

Page 9863, Figure 4: Three plots showing AOD distribution in the first panel and same for the SSA in the bottom panel would be better for comparison.

We fully agree and it was a matter of not being able to edit the figure in the way suggested.

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7, C5157–C5162, 2015