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Comment

## ***Interactive comment on “Improvements to the OMI near UV aerosol algorithm using A-train CALIOP and AIRS observations” by O. Torres et al.***

### **Anonymous Referee #2**

Received and published: 26 July 2013

The paper describes important improvements to the algorithm for the retrieval of aerosol properties in the UV. Generally, the manuscript is in good order, describes the used procedures and shows the results of the improvement.

The main criticisms I would have is the suitability of CO measurements to distinguish biomass burning from other aerosol types. Certainly, the use of these measurements in the algorithm is an improvement compared to no distinction or a climatology, but the claim that it can be used in this way is not substantiated by references or an own study, nor validated and quantified. The pathways of CO and biomass burning from any source will differ as time progresses, leading to uncertainties in the dust-smoke differentiation. This should at least be mentioned in the manuscript. Furthermore, no comments are made about the possibility of dust and smoke that can be mixed, a

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common situation in the Sahel and over North China, among others. In these case it is not clear from the manuscript what would happen. If CO would be present in the same air mass it is likely to be labeled as biomass burning aerosols. This should be investigated. I am aware that these are difficult cases, but these cases are the main reason why aerosol retrievals are still highly uncertain. This should also at least be mentioned in the paper and investigated.

I recommend the manuscript for publication when these above issues are resolved. More detailed recommendations and minor revision are provided below.

### Abstract

Indeed, in the abstract the main difficulty becomes clear: it states that the "AIRS CO measurements are used as a reliable traces if carbonaceous aerosols". This reliability should be estimated and substantiated.

### Section 2.2

As an AMT manuscript, one should expect a thorough description of the methodology. This is done throughout most of the paper, but section 2.2 relies too much on Figure 1. A better description of the algorithm is needed here in the text, explaining the reasons behind the thresholds that are used.

E.g. In paragraph 5625, 20-24 add the number for Delta R, and explain why it is used.

Similarly, paragraph 5626, 4-14 describes the AIO and COIO threshold, but no references or explanations for these thresholds are given. Only later in the text (5631, 1-2) the reasons are explained. This should be incorporated or referred to here.

In paragraph 5626, 15-20 the cloud flagging is described, but lacks an explanation of the threshold that are used. This should be explained better in the text, and substantiated with references.

In contrast, paragraph 5627, 3-20 is an excellent example of a well written informative

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algorithm description. I would suggest to do this for all panels in Fig. 1.

5627, 22-24. I think the reference to Penning de Vries (2009) is more appropriate here.

5630, 17. "...shows the unmistakable presence of the Greek fires smoke." What it shows is the presence of CO. It also shows the likely presence of the Greek smoke. No validation of any kind, or reference to the reliability of CO as smoke tracer is given, so this statement is premature.

Furthermore, in section 3.3 a word or two should be given to the likelihood of dust-smoke mixtures, which are common in at least the Sahel and northern China.

5630, 21. After "... undetected by the AI." add ", which is sensitive to elevated aerosols."

5634, 17. Change "is shown on" to "in"

5635, 18. was -> were

Section 4.4 I would suggest to replace the terms Spring, Summer and Autumn (Zclp) to April, July and October (Zclp). Although the images in Fig. 6 are shown as representative for the season, it doesn't actually show the seasonal Zclp.

5636, 28. Please, indicate clearly which plume or area is described here (probably the plumes over the Arctic?)

5637, 2. "3.5-40" -> "3.5-4.0"

5638, 2. Small -> A small 5638, 3. height -> height is used.

5639, 3-5. I disagree with this statement. It has been shown in this paper that the algorithm is improved using the CO measurements (statistically compared with AERONET data), but the reliability of the CO measurements as a tracer for smoke is not shown in this paper. Nor are any references given for this.

5639, 5 "Because CO is an adequate tracer of carbonaceous aerosols.." Please, sub-

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stantiate this.

5639, 21. I think "when" -> "after which" is more appropriate here?

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Interactive comment on Atmos. Meas. Tech. Discuss., 6, 5621, 2013.

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