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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of dust aerosols in the infrared from IASI and comparison with PARASOL, MODIS, MISR, CALIOP, and AERONET observations" *by* S. Peyridieu et al.

Anonymous Referee #2

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This paper describes the application of an existing aerosol retrieval for infrared spectrometers to the IASI instrument on Metop, and comparison of these retrievals with existing products. The work is largely a rehashing of that done by Peyridieu et al. 2010, the main difference being that in 2010 the algorithm was applied to the AIRS instrument rather than IASI. The findings of this paper are also largely the same as those presented in the 2010 paper.

Additionally, I don't feel the science presented is particularly strong in either paper. The authors are essentially attempting to validate their product by making comparisons between AOD in different spectral regions, using averages over large spatial areas and

times. This essentially removes the random error component of the comparisons (thus hiding the retrieval precision) and leaves the systematic errors. These, in the case of AOD, are then removed by arbitrarily scaling the AOD in the visible to match the infrared value. There is very little attempt to physically relate the AOD measured in the thermal infrared to that seen by instruments measuring in the shortwave. There is a hint of this on page 23104, where the authors use Mie code to calculate the ratio they would expect to see between the IASI 10 μm AOD and the PARASOL NSCM AOD at 865 nm, but the authors do not describe what they have done, or what the implications of the theoretical calculations are to there observations.

Having said that, the results of the analysis performed in both the 2010 paper and this one are interesting, and was worthy of being published, once. However, given the lack of genuinely new results in the current work, I feel that the paper should not be published in Atmos. Chem. Phys. without significant improvement. The authors need to produce new science results – simply rehashing the same analysis, using the same retrieval, with a new instrument is not sufficient in my opinion.

Specific points:

Pg 23095, Ln 24: While it is true that it is unusual to use thermal infrared measurements for the retrieval of tropospheric aerosol properties, the algorithm presented in this work is by no means unique. See the work of Carboni et al., "Intercomparison of desert dust optical depth from satellite instruments",Atmos. Meas. Tech., 5:1973âĂŤ2002, 2012, and references within. This study includes three separate aerosol retrieval schemes which utilise thermal infrared measurements, including a retrieval from the AIRS spectrometer.

Pg 23095, Ln 25: Reword this sentence: "Yet not only is knowledge of the effect of aerosols on terrestrial radiation needed for their total radiative forcing, but infrared remote sensing also provides a way to retrieve other aerosol characteristics..."

Pg 23097, Ln 1âĂŤ8: This sentence is far too long, please reword into at least two

separate sentences.

Pg 23097, Ln 14: “detail” not “details”.

Pg 23097, Ln 25: Capitalise “radius” (first word of the sentence).

Pg 23098, Ln 13-16: I am not clear on the meaning of this paragraph. Do the authors mean that lookup table vertices are calculated using the 4A/OP-DISORT code, and intermediate values interpolated?

Pg 23098, Ln 26: The statement describing the CALIOP measurement should be a separate sentence. “CALIOP, which is also part of the A-train, provides a measure of the aerosol vertical distribution.

Pg 23099, Ln 4: Replace “samples” with “channels”.

Pg 23099, Ln 7: Readers might also like a description of the spatial resolution and coverage of IASI.

Pg 23099, Ln 11âĂŤ14: The sentence beginning “Despite this temporal shift...” doesn’t really make sense.

Pg 23100, Ln 12: Replace “interpret statistically” with “statistically interpret”.

Pg 23102, Ln 14, 16, 24: The sentences giving the “scaling factor” for each comparison are superfluous and should be removed.

Pg 23103, Ln 4: “source” not “sources”.

Pg 23104, Ln 10: I don’t understand the statement “show the same sharp transition in May/June when PARASOL NSCM lies significantly below IAIS outside the summer months”. Any comment on the PARASOL fitting better during summer months is non-sense, as the authors have chosen to to scale the PARASOL values so that they fit best during summer!

Pg 23104, Ln 21: Another possible explanation is that the observed discrepancy is just

due to the fact that the authors have chosen to scale the PARASOL result to agree during the peak AOD period. The presence of a 10% fine mode AOD in the peak IASI AOD would go some way to explain the difference seen outside of the dust season.

Pg 23104, Ln 24: “On a theoretical basis” – please describe what was actually done for these calculations. I think I can guess, but I shouldn’t have to.

Pg 23105, Ln 17: Does the spatial average include results over land for those products which provide it?

Pg 23106, Ln 2: The IASI AOD is never higher than the other measurements; this is just an artefact of the fairly arbitrary scaling applied to the other products!

Pg 23106, Ln 23: The claim that the change in the IASI AOD is more in phase with the MODIS Angstrom exponent gradient is dubious. I might believe it for Barbados, but I would suggest that, if anything, PARASOL NSCM shows better agreement in La Parguera.

Pg 23106, Ln 28: Four to five year averages over a 3x3° latitude-longitude box is not “small scale” in anyone’s book, especially for aerosol measurement!

Pg 23107, Ln 11: This statement requires further explanation. The CALIOP data shows no missing values, only the IASI. If I understand correctly, the IASI retrieval provides a height for all retrievals, so how are the authors determining which heights should go into the comparison?

Pg 23107, Ln 21: If the authors want to use the monthly standard deviation of the average layer height here, they need to introduce and describe it separately, perhaps even including error bars in Fig. 9a. Introducing the values here just makes the sentence confusing.

Pg 23108, Ln 22: The sentence starting “The first is measured...” is superfluous and should be removed.

Pg 23109, Ln 26: Frankly, as both retrievals are dependant on the particular aerosol models chosen, it would be amazing if there wasn't a bias.

Pg 23110, Ln 5: Either show the results for Tenerife in Fig. 11, or don't mention them. Also, what happened to the Karachi site?

Pg 2311, Ln 11: The statement that the difference between the IASI AOD and the shortwave estimates is roughly equal to the differences between the shortwave estimates themselves is wrong. Adding a something like "neglecting a regionally constant scaling factor" would fix this problem.

Pg 2311, Ln 25: The sentence starting "Another explanation..." doesn't make sense.

Pg 2312, Ln 10âĂŤ13: I think the relevance of this statement to this paper is rather tenuous and it should be removed.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 23093, 2012.