

***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.**

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Answers to Referee #1

1. Page 23095, line 2: should be '+0.35 μm '

→ done (was on the original “word” doc.).

2. Page 23095, line 24: some previous work has been carried on remote sensing of aerosols and dust in the IR, e.g. Klüser et al. (2011), Klüser et al. (2012), Brindley & Russell (2009), and Banks & Brindley (2013). These studies have looked at dust loading over land, using the IASI and SEVIRI instruments.

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→Line 24: one sentence modified: Instead of: “In contrast, remote sensing of aerosols in the infrared domain still remains marginal.”, the new sentence reads :

“After a long period of relative disinterest in aerosol remote sensing in the infrared (one of the oldest reference is by Legrand et al. (1989) using the low spectral resolution, one window-channel, radiometer on board Meteosat), a marked growing interest in the infrared is now observed with the emergence of hyperspectral instruments as AIRS and IASI (Pierangelo et al., 2004, 2005; De Souza-Machado, 2006; Klüser et al., 2011, 2012).”

Also, 4 references added:

- Legrand, M, Bertrand, J. J., Desbois, M., Menenger L., Fouquart, Y. : The potential of infrared satellite data for the retrieval of saharan-dust optical depth over Africa, *J. Appl. Meteorol.*, 28-4, 309-319, doi: 10.1175/15200450, 1989. - De Souza-Machado, S., Strow, L. L., Motteler, H., and Hannon, S.: Infrared dust spectral signatures from AIRS, *Geophys. Res. Lett.*, 33, L03801, doi:10.1029/2005GL024364, 2006. - Klüser, L., Martynenko, D., Holzer-Popp, T.: Thermal infrared remote sensing of mineral dust over land and ocean: a spectral SVD based retrieval approach for IASI. *Atmos. Meas. Tech.* 4, 757e773. doi:10.5194/amt-4-757, 2011. - Klüser, L., Kleiber, P., Holzer-Popp, T., Grassian, V. H.: Desert dust observation from space- Application of measured mineral component infrared extinction spectra, *Atmos. Environ.*,54, 419-427, 2012.

3. Page 23101, line 4: 'Only night-time observations are analyzed'- could the authors comment please on any day-time/night-time bias that we might thus expect to see, and whether or not this would be significant over the ocean?

→ Because they mix several dust events transported over sea, monthly averages, either obtained from day or from night observations, are not expected to differ significantly.

4. Page 23103, line 6: in the AS region where is the predominant source of the dust?

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Arabia or South Asia?

→ Sahara and Arabia are the predominant sources. There are less important sources eastward. See for example: Leon and Legrand, GRL,2003.

Léon, J.-F. and Legrand, M.: Mineral dust sources in the surroundings of the north Indian Ocean, Geophys. Res. Lett., 30, 1309, doi:10.1029/2002GL016690, 2003.

5. Page 23105, line 17: the region which the AERONET sites are assumed to be representative for is +/-3 degrees in both longitude and latitude. This seems to be quite a large area, please comment on this choice of range from the AERONET site.

→ new figures have been plotted at a resolution of +/- 1.5°. They show similar results.

6. Page 23106, line 1: the authors comment on the difference in the AOD peak months between IASI/MISR/AERONET and MODIS/PARASOL. Do they have any suggestions as to why this may be?

→ not really. We have clarified the sentence which now reads : “At Dakar, IASI is more in phase with MISR and AERONET (several months missing) than with MODIS or PARASOL which peak months appear two to three months later.” The reason of this difference is still unclear.”

7. Page 23106, line 8: might we expect the Karachi site to be contaminated by significant amounts of urban and industrial pollution? The same may also be true of Dakar.

→ in principle yes, but not significantly for IASI, almost not sensitive to fine mode aerosols.

8. Page 23109, line 1: beyond the systematic bias of 0.35 microns, what is the significance of the results shown in Figure 11? Please elaborate further.

→ Two sentences added in §3.5: - line 15 of 3.5 :”This 5-year monthly climatology reveals relatively small variations of Reff, from highest values of about 2.2-2.3 μm close to the African coasts and over the Arabian Sea to lowest values around 1.8-1.9

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μm , mostly at the southern or northern edges of the dust layer.” - line 5 of p. 23109 :
“Here again, small variations of Reff are seen, slightly larger far from the sources (La Parguera).”

9. Page 23110, line 6: it would be worthwhile to make a quantitative statement on the AODs in this paragraph.

→ Sentence modified :

“Maps of the aerosol 10 μm IASI AOD over the Atlantic Ocean illustrate the main patterns of dust transport: during the May–September dust season, a fast westward decrease of the optical depth is observed, from about 0.2 at the African coast to about 0.1 at $\sim 55\text{W}$. This value remains approximately constant up to the Caribbean. MODIS, MISR and PARASOL visible AODs at 550 nm confirm these results.”

10. Page 23111, line 9: is this westward decrease consistent with what we might expect of the aerosol altitude from the behaviour of the Saharan Air Layer?

→sentence changed to :

“A relatively slow regular decrease of the altitude from east to west (from about 3 km at 20W to 1.5 km at 80W), already reported in several studies (see, for example, Colarco et al., 2003a,b; Ben-Ami et al., 2009; Tsamalis et al., 2013), appears on Figure 9b, for both CALIOP and IASI. The decrease is somewhat faster for CALIOP ($\sim 25 \text{ m deg}^{-1}$) than for IASI ($\sim 20 \text{ m deg}^{-1}$).”

Two references added : - Ben-Ami, Y., Koren, I., and Altaratz, O.: Patterns of North African dust transport over the Atlantic: winter vs. summer, based on CALIPSO first year data, *Atmos. Chem. Phys.*, 9, 7867– 7875, doi:10.5194/acp-9-7867-2009, 2009.

- Tsamalis, C., Chédin, A., Pelon, J., and Capelle, V.: The seasonal vertical distribution of the Saharan Air Layer and its modulation by the wind, *Atmos. Chem. Phys. Discuss.*, 13, 4727-4784, 2013.

11. Page 23112, line 12: 'increasing IASI performance twofold'- by which metric?

→ sentence changed to : "IASI NG will improve the IASI performances by a factor of two in both the spectral resolution and radiometric noise, leading to major improvements in the accuracy of retrieved aerosol characteristics: AOD, altitude, and, particularly, effective radius."

12. Page 23127, Figure 7: AERONET and MODIS have very similar colours, more differentiation would make the plot much easier to read, especially since AERONET is being used as the reference.

→ MISR now in black

13. Page 23129, Figure 9a: visual comparisons between regions may be hindered by the inconsistent altitude scale between panels. I would recommend setting a consistent altitude scale ranging from 0.5 to 3.5 km.

→ done

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

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