

## ***Interactive comment on “Aerosol characterization at the Saharan AERONET site Tamanrasset” by C. Guirado et al.***

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The authors thank Dr. Marsham for his interesting remarks and suggestions concerning the impact of cold pool outflows (“haboobs”) from moist convection over Tamanrasset in summertime. Based on these suggestions we have performed some additional analysis will improve the paper results.

We have analyzed 21 episodes of Mesoscale Convective Systems (MCSs) to understand their influence over Tamanrasset. The events have been selected through comparison between observed AERONET AOD and NMMB/BSC-Dust model AOD over Tamanrasset (Fig. 1). NMMB/BSC-Dust model properly reproduces dust transport associated with synoptic-scale meteorological processes observed during most part

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of the year. However, from June to September the model is not capable to capture strong and fast dust outbreaks. As indicated by Marsham et al. (2011), Mesoscale Convective Systems (MCSs) cannot be well captured by global meteorological models or regional dust models. The summertime observation-model discrepancies have been used to identify potential MCSs affecting Tamanrasset. High temporal and spatial SEVIRI-MSG-2 RGB dust composites combined with ECMWF meteorological analysis have been also analyzed using MclDas to assess the convective origin of each event.

Once identified and confirmed the MCS events impacting Tamanrasset, a similar approach to Roberts (2014) and Roberts et al. (2014) has been followed. The MODIS Deep Blue composite AOD and AOD anomaly have been analyzed for the 21 daily episodes of maximum AOD during MCSs events (Fig. 2). The AOD anomaly has been calculated over the 2007-2008 summertime mean value.

Several regions of high AOD, including the surrounding area of Tamanrasset, are shown in the MODIS Deep Blue averaged AOD map (Fig 2a). However, a strong positive AOD anomaly (above 0.20) is only shown south Tamanrasset (Fig 2b) as a consequence of dust uplift associated to MCSs in this area driven by northward displacement of the intertropical discontinuity (ITD). The HYSPLIT back-trajectories show that air flow getting Tamanrasset during these events comes from the positive AOD anomaly south of Tamanrasset. Simultaneously, a negative AOD anomaly observed over eastern Mali is probably caused by rainfall associated to MCSs, since on Dmax-1 this anomaly is located to the east, south Tamanrasset (Fig 2c). These results are in good agreement with Roberts (2014) and Roberts et al. (2014) who analyzed 31 anomalously rainy episodes in the Sahara and northern Sahel linked to dust uplift in the area.

This short analysis and the corresponding results and references will be included in Section 3.2 (Potential source regions) of the paper as a complementary analysis of MCSs affecting Tamanrasset which are not properly parameterized by HYSPLIT back-trajectories. Furthermore, a short description of the NMMB/BSC-Dust model and

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MODIS Deep Blue AOD product will be provided.

#### Short Comment References

Marshall, J. H., Knippertz, P., Dixon, N. S., Parker, D. J., and Lister, G. M. S.: The importance of the representation of deep convection for modeled dust-generating winds over West Africa during summer, *Geophys. Res. Lett.*, 38, L16803, doi:10.1029/2011GL048368, 2011.

Roberts, A. J.: Anomalously heavy rainfall and dust in the arid Sahara and northern Sahel, In: *Convective Episodes near the Intertropical Discontinuity in Summertime West Africa: Representation in Models and Implications for Dust Uplift*, PhD thesis, University of Leeds, Leeds, UK, 2014.

Roberts, A. J., Knippertz, P., and Marshall, J. H.: The Formation of Convectively Generated Dusty Episodes in the Sahara during Summer, DUST-2014, International Conference on Atmospheric Dust, Castellaneta Marina, Italy, June 1-6, 2014.

Fig. 2 Full Caption: Composite Moderate Resolution Imaging Spectrometer (MODIS) Deep Blue 550 nm (a) aerosol optical depth (AOD) and (b and c) AOD anomaly at Tamanrasset (black star). The maps are shown for (a and b) the 21 days of maximum AOD ( $D_{max}$ ) during Mesoscale Convective Systems (MCSs) events and (c) the 21 days before these maxima ( $D_{max}-1$ ). Two-day HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory Model) back-trajectories arriving at Tamanrasset at ground level (black solid lines) are also displayed in panel (a).

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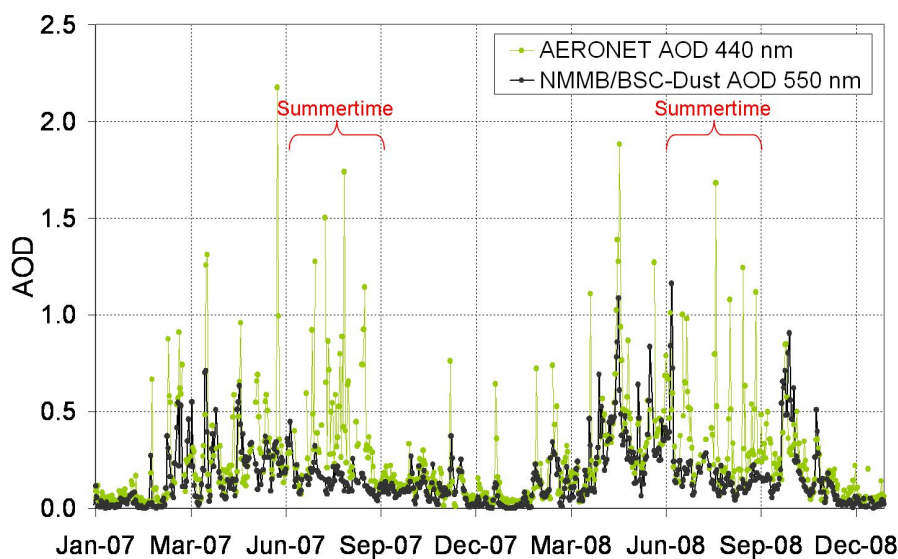
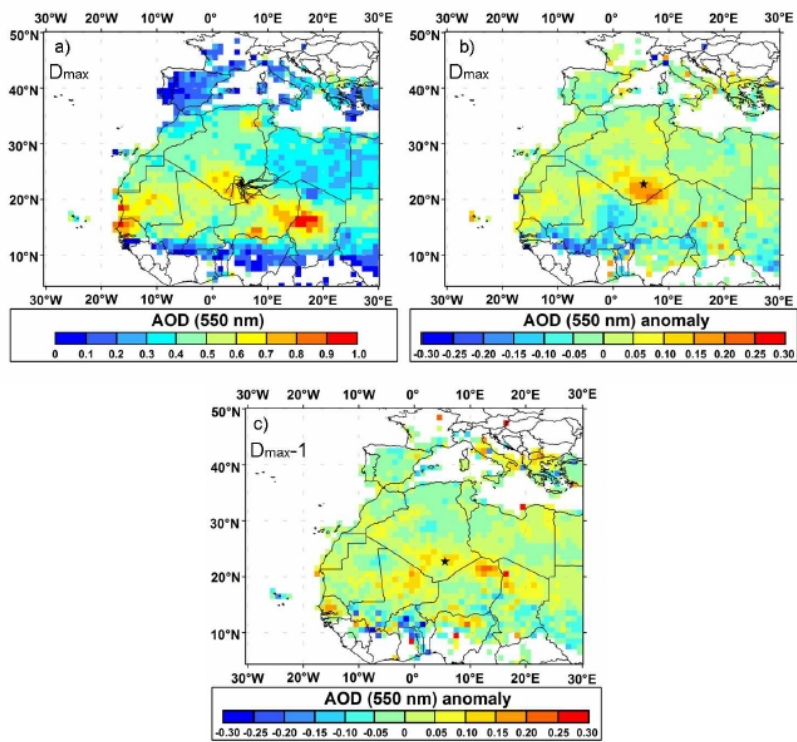


Fig. 1. AERONET and NMMB/BSC-Dust AOD daily mean values for the period 2007-2008

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**Fig. 2.** Composite MODIS Deep Blue 550 nm (a) aerosol optical depth (AOD) and (b and c) AOD anomaly at Tamanrasset (black star). Refer to the end of the text for the full caption information.