Answers to Reviewer 3

We thank the reviewer for useful comments. We have grouped our replies in two sections. The first concerns the intercomparison of the data presented in this paper with those from other dust field campaign that had been taken place in western Africa.

"The paper presents original material and is clearly worthwhile to be published in ACP. Because the other two reviewers point to the right direction of recommendations I can keep my report short.

I learned from these two other reviews (and a bit deeper study of related literature) that there are obviously two major activities of field campaigns in northern and western Africa during the last 5 years, the AMMA/DABEX project and the SAMUM project. In the introduction, I miss a paragraph in which these activities are mentioned. A broader picture of all the efforts done in this region in the recent five years is needed (for the readers). In this way, the idea for the AMMA summer campaign becomes more clear. All these activities are obviously performed to better understand climate, weather/precipitation, and dust conditions (including the role of dust in atmospheric processes of clouds/precip. formation) over northern/western Africa as a whole. So, what were the goals of these field campaigns, of AMMA, DABEX, DODO and SAMUM (2006, 2008)? This SAMUM/Cape Verde project in 2008 seems to be rather similar to the AMMA activities, but there is no hint to these studies. I understand there are almost no publications yet, but does this justify to say nothing to all these efforts? It seems to be that the field studies are complementary, AMMA is operating in the center (source) of all these dust and smoke plumes and SAMUM in 2008 focusses on the same aerosol, but later during the outflow to the west (aged aerosol). So it should be easy to formulate the overall picture of these activities. Other point here: Even if there is no official publication to SAMUM in 2008, the data analysis should be close to be completed. There is a special issue of SAMUM in 2006 (Tellus, 2006). I could imagine that they do the same with the SAMUM 2008 data. Please clarify. So, I would appreciate if there are more comparisons in the paper. All in all the focus (just on AMMA) in the introduction is too narrow at the moment."

"Section 4.2: This is one of the subsection where I expected to find some comparison with the SAMUM studies."

"Section 4.3.6: Even here, there is no hint to any of the SAMUM activities in 2006, which focussed in dust profiling as Cuesta et al. (2008)."

"Section 4.5: For the first time (after almost 30 pages), a hint to the similar SAMUM activities is given: 'These values are consistent with most of the available in situ measurements for African dust (. . ..Muller 2009, Kandler 2009).' But that's it already (almost)!"

"Figure 12: I would like to see a similar curve from the SAMUM 2006 campaign (for pure dust) in this plot."

To take into account the comment of Reviewer 3, we have added a short paragraph to the introduction to put all these campaigns into context. However, we do not want to indulge too much on the description of other campaigns whose results have already been published and motivations are available in the open literature. The exception is the SAMUM 2008 campaign whose results are not published yet. However, the comparison of results of this campaign to that of the AMMA wet season which are presented in this paper is not pertinent as the SAMUM 2008 campaign took place on short-range transport zone and in wintertime, when sources other than mineral dust (typically, biomass burning) are active in western Africa. Notably, the SAMUM 2008, when available, will nicely complete the body of observations obtained during the AMMA SOP0/DABEX and the DODO campaigns. Reviewer 3 should note that the DABEX campaign was already mentioned in the submitted version of the paper as DABEX is name of the airborne component of the AMMA SOP0 campaign which is already presented in the paper.

In the submitted version of the paper, we also made the decision of presenting our data in section 4 and subsections with limited reference to other published data, and dedicate section 5 to the discussion and comparison with other data sets. In accordance with the recommendation of the reviewer, we have added some reference to SAMUM work in section 4 (e.g., reference to the paper of WEINZIERL et al. (2009)).

Nonetheless, the reading of all these dust papers should have convinced the reviewer that properties of mineral dust are very variable depending on source region, residence time and height of transport in the atmosphere. Therefore we agree that a detailed comparison of results from these different field campaigns is necessary and very useful but this has to be conducted on a case-study basis and surely deserves a dedicated paper which is surely beyond the scope of this work. We have very good collaboration with all the groups involved in SAMUM, AMMA and DODO and we will organise this activity in the near future.

Regarding comment on Figure 12 "I would like to see a similar curve from the SAMUM 2006 campaign (for pure dust) in this plot." Mean single scattering albedo values from the SAMUM 2006, DODO and the AMMA-SOP0/DABEX campaigns, as well as AERONET retrievals have been added to the Figure.

Other issues

"Section 2.: A new inlet is used, the passing efficiency for 9 microns diameter particles is mentioned to be 50%, and a particle counter (GRIMM, 0.3-20 microns diameter) is used. What is the maximum diameter you can handle with this setup?".

The GRIMM OPC has two size classes above 9 µm: a first one at 12 µm and a second one at 17 µm. These values are mid-point diameter of the upper-size bins of the OPC, which are found at 10, 15 and 20µm.

The wind-tunnel calibration of the AVIRAD inlet (performed with a GRIMM OPC as a reference counter) has shown than the passing efficiency of the inlet of ~50% at 9-µm diameter, ~40% at 12-µm diameter and ~20% at 17-µm diameter.

We therefore believe that, despite some corrections, the full size range of the GRIMM OPC can be handled with this setup.

"Section 3, at the end: You mention that there was a ground-based super site at Banizoumbou. Did you have lidar optical profiles for comparison with the aircraft optical properties? Could help to assure that the aircraft profiles describe almost ambient aerosols."

A lidar described in Cavalieri et al. (Cavalieri O., Di Donfrancesco, G., Cairo, F., Fierli, F., Snels, M., Viterbini, M., Cardillo, F., Chatenet, B., Formenti, P., Marticorena, B. and Rajot, J. L.: The AMMA mulid network for aerosol characterization in West Africa, Int. J. Remote Sens., doi:10.1080/01431161.2010.502156, in press, 2011) was operated daily in Banizoumbou in the early mornings and in the late afternoon in order to optimise the signal-to-noise ratio of the instrument.

Few profiles were acquired simultaneously to the aircraft overpass of the site. These were compared and are presented in the AVIRAD characterisation paper (Formenti et al., The AVIRAD aerosol airborne sampling system: design and validation, in preparation for Atmos. Meas. Tech.) as a validation of the in situ aircraft measurement. We believe that this comparison is beyond the scope of the present paper which is more dedicated to the geophysical description of the dust occurrence and properties in Western Africa during the wet season.

"Figure 10 and 11: Are there AERONET (or even AMMA) photometers available, providing size distributions for comparison? Such comparisons would be helpful."

Due to the stratification of the atmosphere, the in situ size distributions measured by the aircraft are not easily comparable to those measured by the AERONET sunphotometer on the entire atmospheric column.

However, in order to take into account the reviewer's suggestion, AERONET-retrieved single scattering albedo have been added to the Figure.