

Answers to Reviewer 2

We thank the reviewer for useful comments, which we addressed in details in the following pages.

Specific comments

1. The methods operated on board of the ATR include an absorption measurement (spectral Aethalometer), scattering coefficient measurement (Integrating Nephelometer), size distribution measurement by means of an optical particle counter OPC (GRIMM 1.108), and sampling for post-flight chemical analysis. All applied methods require considerable corrections for mineral dust: Aethalometer correction for the conversion of an attenuation measurement to an absorption coefficient measurement; truncation angle correction for the Integrating Nephelometer; refractive index adjustment and particle non-sphericity effects of the OPC response. Since all of these correction schemes were not developed for irregularly shaped super- μm sized dust particles, the manuscript requires a careful discussion of potential uncertainties arising from these correction methods.

A more complete error analysis has been added to the paper (sections 2.3, 2.4 and 4.4).

2. The authors compare some of their results with results from ground-based measurements during the recent SAMUM-1 study in Morocco. However, from SAMUM also airborne observations of dust size distributions (Wagner et al., 2009; Weinzierl et al., 2009) and dust refractive index (Petzold et al., 2009) are available. I suggest to compare AMMA airborne observations also with SAMUM airborne observations. In particular the data for the imaginary part of the refractive index are in the same range as the values reported for fresh dust from the northwest Sahara (Petzold et al., 2009). The comparison of the presented size distributions with airborne observations of fresh dust from the northwest Sahara may extend the interpretation because in the current version the authors refer only to dust size distributions measured after several days of atmospheric transport. Including the SAMUM size distributions data may also allow the investigation of potential differences in size distributions of dust from different sources.

Further comparison to SAMUM airborne data has been added. However, the reviewer should note that the number size distributions reported in the paper refer to dust which is freshly emitted (erosion episodes, few hours after emission) up to 2 days of transport (data from flight V021).

3. The spectral single-scattering albedo is presented in Figure 12. Respective data stem from the Aethalometer and from the Integrating Nephelometer. Since both methods required significant correction of data, an evaluation of the resulting errors of the single-scattering albedo is essential for the presentation of these data. The current presentation does not allow to decide whether or not the shown differences are statistically significant. An error analysis is definitely required for the single-scattering albedo. This error analysis is also an indispensable pre-requisite of the conclusions drawn on the single-scattering albedo and potential radiative effects.

Further error analysis has been added to the paper (sections 2.3, 2.4 and 4.4). Error bars have been added to Figure 11 (previously Figure 12). For sake of lisibility, these have been added on data from flights V018 and V019

Minor comments:

Abstract: Please rephrase the last two sentences of the abstract (page 2550, line 16ff). In the current version this statement is not understandable.

The sentence has been removed. The abstract has been rephrased to improve clarity.

Page 2557, line 18: the sentence suggests that total particle number concentrations were measured, but since the instrumentation does not include a CPC, I assume that this sentence refers to the number concentrations obtained from OPC data. Please specify.

The reviewer is right, number concentrations are obtained from the OPC. The sentence has been rephrase to improve clarity

Figure 3, 5: x-axis and y-axis grid lines will improve the quality of the figure significantly. Figure 6-9: x-axis and y-axis grid lines will improve the quality of the figure significantly.

We have tried adding grid lines but in our opinion they do not improve the quality of the figures.

STP definition in the figure caption does not agree with the STP definition on page 2557.

This has now been corrected.