

Interactive comment on “Temporal variability of mineral dust concentrations over West Africa: analyses of a pluriannual monitoring from the AMMA Sahelian Dust Transect” by B. Marticorena et al.

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Response to reviewer 1 By Marticorena et al.,

We thank Anonymous Referee 1 for his or her helpful comments on the methodological aspects of the manuscript. Corrections on wording or typography will be accounted for in the revised manuscript. In the following, we address the specific points raised as important point by the Referee.

4. IMPORTANT: In page 8054 you should also discuss results from Viana et al. 2002.

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Atmospheric Environment. Volume 36, Issue 38, December 2002, Pages 5861-5875, where daily data from 1999-2000 on ambient aerosols measured at a number of sites in the Canary Islands allowed to define the seasonal patterns and height of the impact of african dust transport towards the Atlantic on air quality.

Page 8054 discusses first, aerosol measurements available over the African continent (and in particular the AERONET network, second the altitude of Saharan dust transport. In this context, the reference to the paper by Viana et al. (2002) about surface concentrations is not extremely appropriate. However, the data from Viana et al., (2002) can be included in the discussion on the daily PM10 concentrations and in particular the comparison with measurements in the vicinity of North Africa (page 8063).

5. IMPORTANT: Section 2.2., page 8057. You should define PM10 as the inlet adapted to the TEOM used in this study. These are not particles finer than 10 microns but as defined in article 2-18 of the 2008/50/CE directive: ‘PM10’ shall mean particulate matter which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM10, EN 12341, with a 50 % efficiency cut-off at 10 μ m aerodynamic diameter. This is relevant for the modellers in case this data is used.

The capability of the PM10 inlet to properly represent the PM10 concentration will be stated in the revised manuscript.

6. IMPORTANT: Page 8057: You should test if the PM10 inlet you are using is properly performing PM size cutting off at the very high levels of PM you are measuring. Most inlets have a guaranteed cut off at PM levels lower than 100 micrograms PM10/m³. This is not referred to TEOM detector but to the size cut off process. You need to report also on the maintenance of the cut off inlet. How often was this cleaned? With the amount of dust you have the inlet should be cleaned very often.

The maintenance of the whole instrumentation, including the cleaning of the PM10

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inlet, is made once a month in routine, and each time an intense dust event occurs. The reviewer is right, the efficiency of the PM10 inlet have been tested only for concentrations of the order of 100 $\mu\text{g}\cdot\text{m}^{-2}$. so that the efficiency for higher concentration such as the one we sampled in the Sahel is questionable. The suggestion of testing the performance of the PM10 inlet is thus very interesting. However it would require additional instrumentation in the field (an inlet specifically adapted for the whole dust size spectrum, a determination of the dust size distribution combining optical counters and cascade impactor) that cannot be easily deployed except during intensive field campaign. Such experimental set-up has been deployed during the intensive field experiments of AMMA and may offer the possibility to test the PM10 inlet. That is an issue we have to further investigate.

7. Page 8057 row 21. A reference should be given for the loss of Volatile material by TEOM.

Two references (Green et al., 2009; Glover et al., 2004) will be added in the revised manuscript.

8. I recommend deleting the text: Page 8058: 'Despite this limitation, this instrument is widely used, in particular in air quality monitoring networks (i.e. AIRPARIF network in Paris, France since it provides relevant measurements with a limited cost in terms of maintenance.' This is based on the fact that it is true that this is widely used, but in air quality networks a correction of the measurements done by TEOM or Beta instruments are mandatory by law (2008/50/CE) because it is recognized that semi-volatile material is lost. Then when using TEOM in air quality networks in Europe you should also have a simultaneous reference instrument to correct measurements. This is not affecting the quality of the dust measurements because dust is not semi-volatile, but the text you added is a bit confusing.

The authors understand the point raised by the review so this sentence will be removed from the text.

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10. Page 8059: Give a reference for the 5 microgram/m³ in PM10 of sea salt (not sea salts) in the Atlantic.

We propose to use the range of PM10 concentration associated to sea-salts from Viana et. al., 2002 (3-20 $\mu\text{g}\cdot\text{m}^{-3}$).

11. IMPORTANT: Both top and bottom text of page 8060. I made already this comment in my previous review: Take also into account that if you do not take into account days when dust influence is not detected, then you can not obtain annual means. It is difficult to compare these dust data with the limit values from the EC and NAAQs_USA. You should compare the whole annual PM mean measured in your study (including Harmatan days, marine days, anthropogenic influenced days, : : : and so one) with these air quality standards that refer to annual means or annual daily exceedances of exposure levels. Later on you may discount the days you like for the dust studies. If data has to be used in future studies for health purposes, you can not delete low level measurements, these days are needed to compare health effects with those from highly polluted ones.

We removed the mention to annual means and to annual EC and NAAQs_USA limit from the text and the annual means concentrations associated to dusty days. The objective of this paper is not to make a comparison with air quality standard but to analyse the variability of the dust concentrations from the daily to the inter-annual time-scale. The comparison with daily mean limit was only to show how high the dust concentrations are in this region compared to Europe and US aerosol condition. The whole data set (without any selection on dusty days) is freely available on the AMMA data base so that anyone interested on air quality of health issue can use the relevant data for their applications.

12. VERY IMPORTANT: Page 8061: are these means obtained by excluding 'clean' days? All days? Dust days? Clarify!. In my opinion you may exclude days in which works around the site made the measure spatially not representative, but you should

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give the annual means without excluding clean days. Later on you may calculate the means for the dusty days. See the answer above.

13. Page 8063: Rows 7 to 15: See Also Viana et al 2002. They have long measurements (3 years) in a large number of sites across Canary Islands. In February 2000, daily PM10 levels reached 600 microg/m³ PM10 inside the marine boundary layer, and simultaneously recorded in a number of sites.

We agree that Viana et al. (2002) provide relevant data for this discussion that will be included in the revised manuscript.

14. In my opinion the sections on scenarios are very descriptive and may be slightly reduced in length.

We reduced this part by reducing the number of case studies by we added detail on the meteorological condition to follow the recommendation of reviewer 2.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 8051, 2010.