

Open Discussion of manuscript:: ACPD, No. acp-2012-1044

Title: Changes in Particulate Matter Physical Properties during Saharan Advections over Rome (Italy): A Four-Year Study, 2001-2004; Author(s): G. P. Gobbi et al.

## Authors Reply to Reviewer #2 Comments

We thank the Reviewer for taking the time to revise our work. Our detailed replies to the referee's comments (in black italics) follow (in blue).

*The paper "Changes in Particulate Matter Physical Properties during Saharan Advections over Rome (Italy): A Four-Year Study, 2001-2004" is an interesting improvement of the existing method for estimating Saharan dust contribution to surface PM concentration in Central Mediterranean areas. The study combine the results of lidar observation and BSC-DREAM8b regional dust model to evaluate the additional aerosol load during Saharan dust events. An interesting improvement is the change of the number of days considered to evaluate the reference PM value during non-dusty days: the method followed in the paper (average of PM concentration during the 5-7 days preceeding the event) seems to be more suitable than the method suggested in EU guidelines (average of PM concentration recorded during the 15 days before and after he event). Also, the "local station" approach is demonstrated to be as valid as the "regional background" approach, opening the interesting possibility of evaluating the spatial variability of Saharan dust effects on PM concentration. The paper is clear and well written, its overall quality is very good. It is recommended for publication, after addressing the specific minor comments reported below*

### Specific comments

*page 4967*

*line 3: Time and altitude characterization... (please complete: i.e of the event);*

Answer: Done

*line 4: changes in PM10 (please add: concentration)*

Answer: Done

*line 13: the variability in the number of days chosen to calculate the no-dust PM concentration (5-7 days) is not clear at this initial point of the discussion*

Answer: We agree that this initial sentence in the "Methods" section could be confusing. We removed that sentence at that point of the text as not necessary, the full methodology being thoroughly described in the relevant section 2.4

*page 4971, lines 26-27: general information about the time lenght of the events (as reported at page 4975, line 13) could be useful to the reader*

Answer: This sentence was rephrased as follows: 'Average variations recorded during each whole Saharan event, are reported at time zero, regardless of the actual length of the event (on average 3 days, e.g., Section 3.1).'

*page 4972, lines 25-29: the authors should be more clear about the recommended length of the averaging period in the lucky case of full data availability (5, 6 or 7?)*

Answer: We rephrased the sentence as follows: "For these reasons we decided to restrict the averaging period to the 7-5 days (depending on data availability) preceding each advection event. If available, the full 7-day record is preferable to avoid possible week-cycle effects. In fact, the weekly PM<sub>10</sub> cycle present at all stations was evaluated to impact results of averaging over five rather than seven days by some 0.5 µg/m<sup>3</sup> at VA and FC and by at most 1.4 µg/m<sup>3</sup> at MG".

*page 4974 lines 21-23: the sentence "i.e., it counts as..." is not clear to me*

Answer: We rephrased the sentence as follows: "Average extinction values reported in Figures 2d and 2e are referred to the overall advections frequency (28.6%), regardless of the altitude range of each single event (i.e., for an event occurring at level X but not at level Y, in the averaging procedure level Y has a weight of zero)".

*page 4976, line 9: 3550 ug/m3 exceedances???*

Answer: This was a problem of the ACPD typesetting (it was intended as 35 exceedances of the 50  $\mu\text{g}/\text{m}^3$  daily limit). However, the Referee comment helped us realize that this was a repetition as the same information was also given in lines 15-16. Therefore we removed the sentence at this point of the text.

*Table 1 requires units; I would also suggest to decrease the number of significant figures from two to one*

Answer: Units added and number of significant figures reduced to one.

*Table 3: I would suggest to decrease the number of significant figures of concentrations and number of exceedances from two to one (lines 4-8, 10-11, 14-15)*

Answer: Done.

*Figure 2: please, add units to both axis and use the same scale for Y-axis*

Answer: Done