Atmos. Chem. Phys. Discuss., 8, S4375–S4379, 2008
www.atmos-chem-phys-discuss.net/8/S4375/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Saharan dust levels in Greece and received inhalation doses" *by* C. Mitsakou et al.

C. Mitsakou et al.

Received and published: 2 July 2008

We would like to thank the referee for his/her helpful comments on the manuscript. Most of the recommendations have been already incorporated in the manuscript at the stage of technical corrections. Therefore, the version of the manuscript that appears in the ACPD website includes all the revisions resulted from the reviewer's suggestions. The authors' responses to the comments are provided below:

1.The manuscript will be spelling and grammar checked again by the authors.

2.The 10% dust contribution refers to the annual mean of the daily values of the fraction dust conc./PM10 conc. ('The mean annual dust contribution to daily-averaged PM10 concentration values...').

3.In the revised text it is clarified that dust transport may contribute by much more than

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

20% to the annual number of exceedances ('Natural dust transport may contribute by much more than 20% to the annual number of exceedances...'). More details on how the dust contribution to the annual number of exceedances is calculated are given in another paragraph of §3.1.

4,5.The whole paragraph was re-written with the appropriate corrections, as suggested by the referee.

6.The reviewer is right; there were many publications before. We provided this reference that includes many prior studies on the topic. However, in the revised text, two recently published works on the specific topic are cited: Rodriguez et al. (2003), Escudero et al. (2007). Moreover, we cite other relevant studies in different paragraphs throughout the text (i.e. Gerasopoulos et al., 2006).

7.This is not true; in the text we did not mention explicitly that PM2.5 are attributed only to anthropogenic sources. In any case, we made appropriate rephrasing to clarify the situation.

8.The ability of SKIRON model to predict dust concentration has been evaluated by comparing the model outputs with available ground observations and LIDAR measurements, as reported in §2.1.1 of the revised text (Kishcha et al., 2007; Kallos et al., 2007b; Astitha, 2007 PhD Thesis in Greek).

9.Corrected, as suggested by the referee.

10.For the summer period and for the days recording an exceedance of the PM10 EU daily limit value, the slope of the trend line between simulated dust and observed PM10 concentrations is equal to 0.19. This slope is indicative of the percentage of mineral dust in PM10 concentrations when exceedances occur, as previously mentioned in the same paragraph. The text has been modified accordingly.

11.The clarifications have been already added (X: observed PM10 concentration, Y: simulated dust concentration).

ACPD

8, S4375–S4379, 2008

12.In addition to the previous replies (see comments 10, 11), we would like to clarify saying that the percentage range of 25-34% denotes the fraction of the PM10 mass that is made by dust during the days recording exceedances in the spring and autumn periods. Appropriate modifications are already in the text.

13.We fully agree with the reviewer about the sea salt concentrations inland, but in many coastal areas this contribution is significant. This is especially true in certain areas in the Mediterranean, where the wind-driven waves include foam and bubble bursting. For example, Kocak et al. (2007), who performed source apportionment analysis of PM10 samples that were collected from a site of the Eastern Mediterranean, found that PM10 exceedances were originated from sea salt transport by almost 50%.

14.By referring to regional meteorology, we try to interpret the moderate to low correlation coefficients found in some cases between the two datasets. Southwestern flows in the Mediterranean usually lead to stabilization in the lower troposphere and therefore result in poor dispersion and accumulation of PMs from local sources. Such features have rather local characteristics that cannot be accurately captured by SKIRON that runs with coarse resolution.

15.SKIRON outputs refer to PM10 African dust, as clarified in §2.1.1 of the revised text.

16.The methodology we followed is exactly the one proposed by the reviewer. We always (every day, even in case of no exceedance) subtract dust concentration from PM10 measurements and estimate the new number of exceedances based on the residual values ('PM10 residual contribution to exceedances' in Table 2).

17.Initially, when we started this analysis we followed exactly what is proposed by the reviewer. Then, we discovered that, for at least the Greek case, this is not correct and includes large uncertainties. In order to reduce uncertainties we had to take into consideration regional climatic characteristics that lead to air pollution episodes in Greece (i.e. Kassomenos et al., 1995). The majority of these episodes are attributed to the transport of warm air masses within the lower troposphere that are advected from

ACPD

8, S4375–S4379, 2008

Africa. These air masses are always associated with Saharan dust plumes. Therefore, by subtracting this large number of days as 'dust contaminated' we exclude several days where the concentrations of anthropogenic PMs are also high due to poor dispersion, which is not correct.

18.We agree with the referee. Actually, we have both: seasonal, with maximas during spring and autumn and inter-annual, as suggested by Sunnu et al. (2008). We made the appropriate changes in the text.

19.As described in §3.1, the 'dust contribution to exceedances' is determined through the 'residual PM10 contrubution' where the latter one (residual PM10 contribution) derives after subtraction of the daily dust simulated values from the daily PM10 measured concentrations and calculation of the new number of daily exceedances. Finally the 'residual PM10 contribution' is the fraction of the new to the total number of exceedances and the 'dust contribution to exceedances' is the supplementary fraction. Thus, if we subtract the SKIRON dust load from daily PM10 levels and the residual value still exceeds the daily limit value we attribute the exceedance to 'non-African origin'. The residual number of exceedances is attributed to an 'African origin'. More clarifications will be provided in a newer version of the manuscript.

20.The different percentiles are applied to SKIRON outputs. The present version of the model uses 4 size bins. Here, we used the first two bins that fit the PM10 size limits. Thus, SKIRON outputs provide PM10 African dust load.

21.Ok, thanks.

22.The necessary changes have been applied as suggested.

23.The additional column of the annual mean PM10 for the days free of African dust influence will be incorporated in Table 2 (as 'PM10 residual average concentration') in the following version of the manuscript.

24.See the reply on comment 19.

ACPD

8, S4375–S4379, 2008

25.We appreciate the recommended literature by the referee. However, we found the description of Kallos et al. (2007b) as more detailed and complete and therefore we provided reference to it. We believe that is redundancy to repeat again the same description. Actually, the two of the three references suggested are mentioned already in the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 11967, 2008.

ACPD

8, S4375–S4379, 2008

Interactive Comment