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Comment

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

**Anonymous Referee #1**

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The paper presented here is of high quality and it addresses a topic of high scientific and environmental relevance: The African dust influence on air quality in the Mediterranean areas and the possible exposure levels in view of human health. In this last topic, specially, the studies are very scarce.

The group is highly experienced in the above R+D fields. It is clearly reflected in the quality of the paper. There are a few moderate changes that I would like to suggest. Please take into consideration specially n. 17.

Specific comments

1. Revision of English is needed in some sections.
2. Clarify in Abstract if the 10% dust contribution refers to the dust the annual means

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of PM10.

3. Also clarify in abstract if In case of exceedances -PM10 EU limits- mineral dust aerosol may contribute by 20%. Do you mean that for the days recording an exceedance of the PM10 EU daily limit value it is calculated that natural African dust contributes with 20% to the PM10 levels??

4. Introduction: Error here: 1999/30/EC does not contain PM2.5 reference values at all. It is the new 2008/50/EC from 11 June (CAFE Air Quality) Directive that contains PM2.5 limit, target values, and obligations. It also references to natural sources as 1999/30 did. Also the annual and daily PM10 limits value are in force since 2005, not in 2010 as stated here.

5. Also in introduction: The second stage of the 1999/30/CE for PM10 will be not in force because was not supported by the evaluation of the directive. IN the new 2008/50/EC directive the limit values of the second stage are not in force. Re-write completely second paragraph of introduction to clarify comments 4 and 5.

6. At the end of this paragraph there is a reference to a study from 2007 to evidence the influence of African dust on air quality in Greece. There are a lot of prior studies on this topic. Since 1998 there are studies on the attainability problems in Europe of PM10 limit values due to African dust. Even in Greece there are also prior studies to the one from 2007 on this issue.

7. Section 2.1: As demonstrated in many studies, PM2.5 is also clearly influenced by African dust. Maybe with lower extent than PM10, but even the new EC directive on air quality recognizes that PM2.5 is also influenced by natural episodes. In this section you attribute PM2.5 exclusively to anthropogenic sources.

8. End of section 2.1. It would be very interesting to see a little on the validation of SKIRON PM10 outputs with experimental data. Please, could you report on it a little??

9. Section 3.1. you mentioned: ...when dust concentration during this month is...

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Replace by: ...when African dust concentration is....

10. Section 3.1. Page 9: Clarify the question on 0.19 Do you mean that in summer for the days recording an exceedance of the PM10 EU daily limit value, it is calculated that natural African dust contribute with 19% to the PM10 levels, or that the daily mean dust contribution for all days is 19%?? Please clarify.

11. The same paragraph: you mentioned:....The high intercept values for the site of Patra...; Clarify here what parameters are you taking to make the equation. Define X and Y.

12. The same paragraph: you mentioned:....PM10 exceedances in Athens by 25 and 34% during the spring and autumn periods...; Do you mean 25-34% of PM10 made by dust for all days of spring and autumn???, or 25-34% of the PM10 mass is made by dust during the days recording exceedances during these periods? Or do you mean that 25-34% of the exceedances are caused by dust outbreaks during these periods? Please clarify

13. Page 9. I agree that sea spray influence PM10, but this is usually very low in absolute levels, and not enough to induce exceedances of the daily limit value in most of the cases. The contribution of sea spray is of high relevance in Atlantic sites, but lower in Mediterranean sites, specially if these are located a few miles from the coast.

14. Page 9 you mentioned: ....Moreover, southwestern flows that enhance dust transport from the African continent, could lead to severe air pollution episodes as they are combined with an abrupt temperature change (Kallos et al., 1993).; Yes, but I do not understand why this is a problem. If you have the output of the model you may subtract this to the bulk PM10 levels.

15. It is also important to specify if SKIRON output refers to PM10 African dust or to African dust (TSP), because in most of the paper you refers to African dust.

16. Page 9: you mentioned:....The residual PM10 contribution was determined by

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re-calculating the number of exceedances after subtraction of dust simulated concentration values from the PM10 measured values and estimating the ratio of the new (after dust elimination) to the total number of exceedances....; To do this right you should subtract the African dust contribution to every day (with or without exceedance). Suppose a site close to Africa with values of 49 microg/m<sup>3</sup> for many days in the year and with 25 microg/m<sup>3</sup> of dust contribution during the high PM10 days. Since no exceedance of 50 is recorded you will never subtract 25. Specify how this subtraction was done?

17. Page 10 first paragraph. I suggest a test to check the accuracy of the model outputs. You calculate the mean PM10 for each sites with all the available data. You take the data and you subtract all days with African dust. With the remaining days you calculate the mean PM10 annual value for every site. The subtraction of mean annual values for the non African days to the total annual PM10 means will yield the African dust contribution mean to the annual PM10 values. After obtaining this you may compare the results with the direct annual PM10 dust obtained by SKIRON to validate the modeling results.

18. Page 10: you mentioned: ...Indeed, mineral dust transport performs seasonal rather than inter-annual variation,....; This needs supporting a lot since high inter-annual variability in the number and intensity of dust episodes has been reported by many autors.

19. Page 10: Specify how you attribute an exceedance to an African origin. Do you subtract the SKIRON dust load from daily PM10 levels and if still exceeding the daily limit value then you attribute the exceedance to the natural contribution? Or if an exceedance is produced during an African episode you attribute the exceedance to natural causes? The first is much preferable.

20. Page 10 specify to what data you apply the percentiles 90, 95, 99.5, 100??? Is it PM10 African dust, bulk dust?

21. I am not expert on exposure and I am not reviewing how lung deposition for dust

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was calculated. However, in my opinion this is a very important contribution of the paper.

22. Conclusions: Apply the same changes suggested for the abstract.

23. Table 2 should contain the annual mean PM10 for the days with African dust and those for the days free of African dust influence.

24. Table 2. In text it should be clear how you consider an exceedance to be caused by African dust as listed here. See comment 19.

25. Page 2: Introduction: It is not very relevant for the content but I think that the paper will benefit if a short discussion of the papers by Moulin et al., Rodriguez et al., and Escudero et al., and other papers, on the meteo scenarios causing transport of dust towards Europe, is introduced here.

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