

Interactive comment on “An episode of extremely high PM concentrations over Central Europe caused by dust emitted over the southern Ukraine” by W. Birmili et al.

Anonymous Referee #3

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Anonymous Referee

This paper describes an extreme dust event in Ukraine and how the transported dust influences the atmosphere in Central Europe. The study is valuable and interesting and it is positive that a comprehensive study like this including observations from a large number of sites is submitted already a few months after the event has occurred. The paper is worthy of publication in ACP taking into account some modifications and clarifications listed below. Note that some of the comments are mandatory, as indicated.

Dust events have significant implications for climate and health, and therefore studies of such extreme events are valuable for several reasons. One important aspect is the

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need for improving the understanding of dust in the radiative balance in the atmosphere and further, the influence on the climate system. The main source of atmospheric dust is Sahara. This study is a significant contribution to the scientific society as the dust sources here are very different and from another region. One of my main comments is that I would like the authors to analyze and discuss the influence of biomass burning on the observations. Furthermore, in state-of-the-art aerosol research integrated observations based on several platforms is essential and valuable. My next major comment is thus that I think it would strengthen the paper if the ground-based observations were combined with more of the available relevant satellite observations during the event.

General comments The paper is fairly well organized and written, but some sections should be shortened and combined to focus and bring the results more to the point. At least one figure can also be excluded. Some clarifications are required and the use of units has to be harmonized all through the paper.

Specific Comments, sorted by sections in the paper:

Title: PM_{2.5} should be spelled out and the term also needs to be defined at the earliest appropriate point in the introduction or abstract. The various subscripts denoting the different particle size cuts should also be defined.

Abstract In general, I think the abstract gives a good overview of the paper. Line 8: change from km h⁻¹ to m s⁻¹, here and through out the rest of the paper

Section 1.1.1 Page 12233, Line 6: change to globally to the;

In a section called Wind-blown dust and climate; I miss a paragraph about radiative effects of dust. I think this is important background for this study and such a paragraph should be included with references to papers presenting forcing calculations of selected dust events to illustrate the importance. It is also possible to use the newest IPCC report on this issue (see e.g. section 2.4.4.6)

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Page 12233, Line 25; the sentence starting with "Assessments of the role"; needs to be rephrased

1.2 Page 12234, line 8: change to "and loose sediments";

Page 12237: line 14: remove the date 11 June 2007.

Page 12238: line 6: remove the date 11 June 2007.

2.3 If it is possible without too much effort I suggest that references to international networks are included here, if any.

I suggest removing Appendix 1 but keeping the Table and referring to Table 1 in the text.

2.4 I find this section too detailed, and I think it is necessary to reduce. This seems to be possible at some places without losing too much of the essential information. The authors are free to include some of the information in Appendix 2 instead to increase the readability of the paper and keep the paper more focused. Another suggestion, which I prefer, is to summarize much of this information in a table

Further, the units have to be harmonized, and this is particularly evident in this section. Use nm or micrometer, not switch between them. One example is line 10 at page 12239. I suggest the use of micrometer in the description of the size of the aerosols all through the paper.

2.5: Maybe this section can be combined with section 2.4 in a reasonable way?

2.6 I suggest that this section is removed and the main information is included in 3.2

Section 3 3.1 I suggest removing Fig 1 and keep a short description of the synoptic situation.

3.3 Please update the units of wind speeds, also in line 24 on page 12244 where it is used Kn.

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Is it any MODIS lat-long plots available with AOD for the region and relevant period? This can be explored e.g. from here: http://disc1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=MODIS_DAILY_L3

Section 4

4.1.2 Page 12246, line 25 voivodeship: please define or replace this word, also in line 16, page 12247.

4.2 Again, remember to correct the sizes to nm or micrometer and km h⁻¹ to m s⁻¹

4.3 It would also be interesting if the authors tried to show some results from CALIPSO in this study. This is not mandatory, but I think it would strengthen the paper significantly if this were included in section 4.3 or in the discussion. I can recommend this web page: <http://www-calipso.larc.nasa.gov/products/lidar/>

Page 12251, line 10: How is the range > 1.2 micron calculated from the Ångström exponent? Please define and include a reference as well (if any). Also I think it is relevant to include the Ångström exponent for this event compared to Sahara dust intrusions maybe also including to typical Ångström exponents for aged biomass burning plumes.

4.4 I find the section 4.4 to long and detailed. Try to reduce it, particularly section 4.4.4.

4.4.2 Fig 5 shows some hot spots. How might this influence the observations? Is it any CO measurements available that can support a conclusion about the influence of biomass burning? I think this is a rather important point and a discussion of this is mandatory as the MODIS Rapid Response System shows that there are fires in the region (<http://rapidfire.sci.gsfc.nasa.gov/realtime/2007082/>).

Agricultural fires are known to produce a lot of aerosols also containing elevated levels of inorganic components (e.g. Formenti, et al, (2003), Inorganic and carbonaceous aerosols during the Southern African Regional Science Initiative (SAFARI 2000) experiment: Chemical characteristics, physical properties, and emission

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data for smoke from African biomass burning, J. Geophys. Res., 108(D13), 8488, doi:10.1029/2002JD002408.

4.4.3 I suggest combining this section with section 4.4.2.

4.4.4 The first paragraph here can be reduced significantly. E.g. stop the first sentence after "fourth day"; and remove everything down to "Fortunately";.

Page 12254, line 25-26: Please explain why the location explains the concentration.

Line 15: Replace "It is very interesting"; with e.g. "It is worth noting";.

There are also other places where it should be possible to reduce the text in this section.

Section 5 5.1: I think this section is written more as a part of the conclusion than as a section in a discussion. Maybe it can be fitted into section 6? (This is also partly the case with section 5.2.)

5.3: Page 12257, line 24: change to "analysis showed that in both cases the air";

I find this section relevant and very interesting!

5.4 and section 6: Harmonize the units!

Section 6: Please include the conclusion about the possible influence of biomass burning.

Comments to Figures: Figure 1: Remove the Figure. In any case the caption need to be corrected as I assume that the date for the b-panel should be 24 March?

Figure 2: If possible in a reasonable way, please indicate the source region. Larger figures might help.

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Figure 3: The text is too small, and not possible to read.

Figure 4: Indicate with a box the area shown in Figure 5. Should there be a color scale associated with this figure?

Figure 8: Please enlarge!

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 12231, 2007.

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