

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.

W. Birmili et al.

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Reply to the Anonymous Referee 3

First, thank you for your referee comments. We have addressed the points you raised individually below. Your comments are repeated in italics while our reply appears in normal typeface. All minor formatting issues have been corrected for without exception unless mentioned.

“One of my main comments is that it I would like the authors to analyze and discuss the influence of biomass burning on the observations”.

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This issue is now extensively discussed in the new discussion Section 5.3., and has been mentioned in the conclusions and the abstract. Our impression is that despite a few visible fires, biomass burning does not have a major impact on the observed dust plume. We made reference to the Formenti et al. (2003) study, and also included CO and CO₂ measurements into the discussion. CO and CO₂ at the station Neuglobsow (near Berlin) do not show enhanced values on March 24 compared to the days before and after. Unfortunately these gas data are still preliminary, so we cannot show them explicitly in the paper.

“...it would strengthen the paper if the ground-based observations were combined with more of the available relevant satellite observations during the event.”

Unfortunately, the mentioned lat-long MODIS plots are not available yet on their website. It is also a very useful idea to use CALIPSO data. Unfortunately, CALIPSO data are not available for the entire first half of 2007.

“PM should be spelled out and the term also needs to be defined at the earliest appropriate point in the introduction or abstract..”

As suggested by the referee we have accordingly modified the title and defined PM in Section 1.3.

“change from km h⁻¹ to m s⁻¹”

All wind speed units are now m s⁻¹.

“ Wind-blown dust and climate: I miss a paragraph about radiative effects of dust...”

Such a paragraph has now been added to Section 1.1.

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

I presume that the referee asks us to refer to international networks such as Global Atmosphere Watch (GAW)? In fact, the GAW stations lay outside the observational area of the dust plume and were thus not of much use for the present study. The main effort consisted of contacting the various government institutions and kindly ask them for the data. (While numerous PM₁₀ data products are available on the web, half-hourly time series are, in general, not.) We believe that it is appropriate to highlight the institutions that supplied PM₁₀ data, as done in Table 1.

We also added a sentence “PM₁₀ measurement data from 360 government monitoring stations across Central Europe served as a powerful tool..” to the conclusions in the hope that the scientific community and EU officials will recognise the huge asset that this (fragmented) network represents.

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

We completely agree. Appendix 1 was accordingly removed and embedded into the Section 2.3.

“2.4 I find this section too detailed, and I think it is necessary to reduce...”

As suggested by the referee, much of the information on measurement techniques was included in a new Table, which allowed to greatly condense Section 2.4.

Further, the units have to be harmonized...”

Particle diameters and wavelengths are now generally μm , except when speaking about the nucleation mode in Section 4.2.

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“2.5: Maybe this section can be combined with section 2.4...”

Section 2.5 was shortened and is now incorporated in Section 2.4.

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

Done.

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

Done.

*“Is it any MODIS lat-long plots available with AOD for the region and relevant period?
...”*

See above. Unfortunately, the mentioned lat-long MODIS plots are not yet available for March 2007 on their website.

“Section 4.1.2 Page 12246, line 25 voivodeship”

Voivodeships are the geographical units of administration in Poland. We found it appropriate to add a footnote here.

“It would also be interesting if the authors tried to show some results from CALIPSO in this study...”

See above. Unfortunately, CALIPSO data are not available for the entire first half of 2007.

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“Page 12251, line 10: How is the range > 1.2 micron calculated from the Ångström exponent?”

1.2 micron is a threshold value based on observational experience. Since it requires a lengthy explanation for its justification, the statement about 1.2 micron was dropped and rewritten as “indicative of coarse particles”.

“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.”

Done. In the corresponding Section 4.3. reference is now made to the world-wide observations summarised in Müller et al. (2007).

“4.4 I find the section 4.4 to long and detailed...”

Section 4.4. was greatly condensed, thereby incorporating Section 4.4.4. into Section 4.4.3.

“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?...”

See above.

“Please explain why the location explains the concentration.”

The idea was that Schwartenberg is the location that lies the most upwind in the plume. As the statement is not important for the discussion it was dropped in the

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revised version.

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

See above. Section 4.4. was rewritten and condensed.

“Section 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.”

Section 5.1. was relabelled “Causes of the extreme PM concentrations” and rewritten by employing more discussion elements. Section 5.2. was in fact dropped and its information incorporated into the Conclusions section.

“5.3: Page 12257, line 24: change to “analysis showed that in both cases the air” I find this section relevant and very interesting!”

Thank you for this comment. We have meanwhile extended this section (now Section 5.4. “Long-term representativeness”) and included the ratio of PM_{2.5} (data available since 2004) versus PM₁₀ into the discussion.

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

This was done according to the new results obtained in the new Section 5.3.

“Figure 1: Remove the Figure.”

In view of condensing the whole paper this Figure was eliminated.

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“Figure 2: If possible in a reasonable way, please indicate the source region.”

Done.

“Larger figures might help.”

We have originally designed the Figures to comply nicely with the final ACP style (A4 format, two columns). Unfortunately such Figures may turn out extremely small in the ACPD style file, which uses landscape paper format. This issue has been discussed with the editor of ACP and will be improved for any subsequent submissions. In any case, the Figures will be much better legible in the final ACP style.

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

See above.

Figure 4: Indicate with a box the area shown in Figure 5.”

We have discussed this comment. However, we do not know whether it is really useful to put a box, or frame around the dust source region. The MSG dust index Figure is filled with plenty of information in different colours etc. A problem is that Figure 4 precedes Figure 5, and a reader who looks at the MSG dust index image might be irritated by the box, which only explains itself after having looked at Figure 5.

The intention of the arrow is to direct the untr

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

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