

Interactive comment on “Weekly periodicities of aerosol optical thickness over Central Europe – evidence of an anthropogenic direct aerosol effect” by D. Bäumer et al.

Anonymous Referee #2

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General comments

The analysis of weekly periodicities is a valuable tool to support and understand anthropogenic impacts on natural systems. Hence the paper presented by Baeumer et al., analyzing weekly periodicities of AOT over Europe, is interesting and illuminative, and the study is generally suited for publication in ACP.

However,

a) according to the title, the authors present “evidence of an anthropogenic direct aerosol effect”. But to my knowledge, nobody doubts that anthropogenic aerosols have

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a direct effect on shortwave radiation (or could be easily convinced by showing photos of e.g. Beijing). The current uncertainties on the actual radiative forcing are indeed high (11546, 22), but this is not further discussed nor resolved in this paper.

b) the authors claim to go further than previous studies that analyzed weekly patterns in urban aerosol datasets, and to present weekly cycles “with a considerable horizontal extent” (11550, 27). But the selected AERONET stations are almost all within or close to large cities.

c) the last conclusion is that the weekly cycle of aerosols could explain weekly temperature patterns presented earlier. This is an obvious hypothesis, but it should be discussed that there are also possible links in the other direction: Since the AOT measurements are influenced by clouds, weekly patterns of meteorological parameters might affect the retrieved AOTs.

To deal with these items, I suggest

a) to focus the study on the concrete patterns: what is the time delay between the minimum in emissions and in AOT, and what can we learn from that (e.g. on secondary aerosols)? The authors discuss this aspect at some points, but to my view this should be the central topic of the presented study.

For this purpose, it would be good to have more stations included (see b)). In any case, the grouping of the stations under “national” categories is probably not the best. For the actual pattern, it is more relevant how far the station is away from the sources (how old the aerosol actually is). Hence, the results from the 3 stations in Greater Paris should be discussed in more detail, since the weekly patterns are quite similar for Mo-Fr, but totally different for the weekend (stable for Paris, strong decrease at Fontainebleau); is this behaviour expected?

b) to include more (rural) stations in the study; even if data quality level is below best (what would this mean in detail?), it provides the chance to get a better spatial repre-

sentation.

c) to add a discussion, how far the weekly periodicities in meteorological parameters (11547), mainly cloud cover, could affect the AOT retrieval.

Specific comments

- Abstract: “all over Europe” suggests a good spatial coverage and representativeness of the selected AERONET stations. But in fact they are rather clustered (e.g. 3 stations in Greater Paris) and generally located in or close to large cities.

Technical corrections

- The reference to Shutters and Balling (2006), cited in 11547, 22, is missing.
- 11549, 8: “these two weekdays” -> “the respective (two) weekdays”

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 11545, 2007.

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