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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Weekly cycles in precipitation in a polluted region of Europe" *by* C. W. Stjern

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Thank you for very constructive comments on this manuscript.

————COMMENTS————

1. "The author has provided a partial brief review of publications that addressed such hypotheses (. . .)": I agree that the introduction as a whole was on the short side. The first paragraph of Chapter 1 has been prolonged to include a few detailed examples of how aerosols are expected to influence precipitation in different meteorological conditions. The second paragraph has also been modified to include a comment on the contrasting results of previous studies of weekly cycles in precipitation.

2. "The author (. . .) stopped short of specifying what is to be expected based on these

hypotheses for the study area.": I have now tried to be more clear on what is to be expected for different seasons and precipitation types based on earlier studies, see for instance the first paragraph of Section 4.3. Throughout the manuscript, the results are to a larger extend discussed in relation to previous findings – see answers to comments below.

3. "(. . .) If the clouds are in between those two regimes, why should we expect much of a weekly cycle during summer?": Indeed, the effect of aerosols on precipitation on convective clouds vary depending on the situation, which is now pointed out in the introduction as well as later in the manuscript. For summers, the precipitation in the Black Triangle shows a mid-week enhancement in precipitation amounts, which – if caused by aerosol influence on convective precipitation – would imply that the precipitation enhancement of convective clouds is the dominant mechanism. As the reviewer suspects, however, a quick investigation shows that there are indeed almost no days (for either of the 30 stations) where the dew point temperatures exceed 20°C. I do not have data to investigate cloud base temperatures. Comments on this is now included in the manuscript.

4. "(. . .) air pollution contributes both CCN (. . .) and IN (. . .) in unknown quantities for the study area. The IN might incur an effect that is opposite to that of CCN, especially for shallow clouds with supercooled tops. I suspect that this is a common situation in the study area during winter.": Indeed, the possibility of an opposite effect due to higher mid-week IN concentrations in the presence of clouds with supercooled droplets is already discussed, for instance in section 4.3. I have also added a similar discussion at the end of the third paragraph in Section 4.2.

5. "(. . .) the authors should take the effort to explain why this negative statistical result does not mean necessarily that aerosols do not affect precipitation in the study area.": As stated in the introduction, proving cause-effect relationships between aerosols and precipitation is beyond the scope of this paper. However, I absolutely agree that the negative statistical results may lead the reader to conclude that aerosols have no ef-

fect on precipitation in this area, which was not my intention. In general, I have now strived to be more clear as to the difference between the statistical conclusions and the "microphysical conclusions". Where indications of a statistically significant weekly cycle in a variable are present, I suggest how a potential aerosol-precipitation effect may have induced this cycle, based on results from previous studies. Oppositely, where no weekly cycles are found, I discuss the possibility of a potential aerosol-precipitation signal being lost in noise or cancelling effects. I have also added a final paragraph on this at the end of the conclusions chapter.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1777, 2011.