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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 helpful comments on this manuscript. As for your general remark, I can only agree that the word "significant" has been used somewhat lightly, and that it should be restricted to referring to the results of actual statistical tests (in this case, the Kruskal-Wallis test). The use of the word has been reconsidered throughout the manuscript. Also, the readability of sections 4.2 and 4.3 have been improved so that there is no confusion as to what variable, period and season is being discussed, and so that the results of each of the three tests are stated in each case.

———-COMMENTS————

1. Specific and general comments given in Short Comment by Mr. Kuster: See sepa-

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rate response letter to Mr. Kuster for replies to these comments.

2. Title: I agree with Mr. Hendricks Franssen and yourself that the title should reflect the fact that I have studied other meteorological variables in addition to precipitation. The title is now changed.

3. Use of the word “regional”: Yes, the term “regional” always refers to the average of all the stations within the Black Triangle. To avoid confusion this is now stated clearly in the first paragraph of Section 3 where the term appears for the first time. Figure captions are improved by writing “regional mean (average of the 30 stations in the Black Triangle)” instead of simply “regional mean”.

4. Page 1784 Line 6-9: Thank you, this was also brought to my attention by Mr. Hendricks Franssen, and I have now removed the reference to these two papers in this and other places of the manuscript. I have however included them instead in the introduction, together with references to the works questioning them, as an illustration of the conflicting results of studies of weekly cycles and the role of statistical methods in this.

5. Page 1784 Line 22: I absolutely agree, and I never meant to indicate that the fact that 3 significant weekly cycles out of 30 was a strong indication of anything else than chance. I have clarified this in the text by pointing out that 3 stations is only slightly more than the 1.5 expected to show falsely significant results when using the 5 % significance level. Why only the raw (and not the anomaly) data produce the 3 out of 30 stations with significant cycles is difficult to say, but I do not find it surprising that the results based on anomaly and raw data are not identical as the anomaly data are naturally more smoothed than the raw data. I would have been skeptical if the differences in results were large, but they are not. For neither anomaly nor raw data, the regional mean time series in precipitation passed the Kruskal-Wallis test for neither 6-, 7- nor 8-day weeks. I have now for all parameters also tested the 6- and 8-day weeks using the Kruskal-Wallis test, as suggested by yourself and Mr. Kuster. For instance, the weekly cycle in SO2 passed the Kruskal Wallis (KW)-test only for the

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7-day week, while for precipitation neither the 6-, 7- or 8-day weeks passed the test. The three tests already applied (improved now by KW-testing the 6- and 8-day weeks as well) should indicate the presence of a potential weekly cycle. However, in cases where there are in fact indications of a significant weekly cycle in a parameter, I agree that extra testing would be in place. For those cases (specifically: NO2, summertime light precipitation, summertime cloud amount, and wintertime cloud amount for the polluted period) I have therefore performed an additional Monte Carlo experiment to further check the robustness of the weekly cycle in question and to get an indication if for instance it passed the KW-test by chance.

6. Page 1785 Line 1-3: I agree that the wording of this sentence was a bit too strong, and that the current formulation implies an out-of-the-place assumption of what the lack of a more pronounced cycle in the polluted period would mean (namely, no influence of aerosols on precipitation). This has now been changed to "As previous studies have reported stronger weekly cycles in periods of higher pollution loads (e.g. Gong et al., 2006; Bell et al., 2008), the weekly cycles in precipitation for the polluted period 1983-1987 have been compared to the weekly cycles of the cleaner 2004-2008 period."

7. Page 1786 Line 12: The references to the period in question could be more clear throughout the entire manuscript, and care has now been taken to make sure what period the presented results are valid for. In the specific case mentioned by the reviewer, the given summertime amplitude in the light precipitation weekly cycle were for the total 1983-2008 period, which is now stated in the text.

8. Page 1787 Line 1: Yes, the "non significance" was here a reference to the result of a Kruskal-Wallis test, which is of course now clarified in the text. The previous sentence, where the word "significant" were used for the other tests as well, has now been rewritten from "the summer cycle in light precipitation is only significant by one of the three tests" to "the summer cycle in light precipitation is only significant by the Kruskal-Wallis test and show no distinct cycles by the two other tests".

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————————MINOR COMMENTS————————-

1. Page 1785 Line 17: Thank you, a version of your suggested revision has now replaced this rather confusing sentence: “Again, however, neither summertime nor wintertime data showed clear weekly cycles by any of the three tests for neither the total, the polluted nor the cleaner period”.

2. Page 1789 Line 8: I agree, and in lack of a better replacement word this sentence has now been changed from “(..) passed all three tests for significance of the weekly cycles” to “(..) passed all three tests for robustness of the weekly cycles”, which hopefully makes the point without falsely referring to statistical significance.

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