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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the aerosol weekly cycle spatiotemporal variability over Europe" *by* A. K. Georgoulias and K. A. Kourtidis

Anonymous Referee #2

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In this manuscript the authors study the large-scale weekly cycles of the Aerosol Optical Depth (AOD) over Europe, by means of a dataset recorded from MODIS instruments, during the 2000-2009 period. I think that the paper is very interesting and provides an important contribution on the field of atmospheric weekly cycle research over large-scales. The paper is well written and structured, with clear figures and tables. I recommend its publication, although some issues must be addressed before its acceptation.

General comments

1) From Fig. 1 I understand that the most reliable data are shown in panels g and h. In Section 3.1 the authors focus their attention in the results shown in panels a and b. I think that they should to focus on the results using the datasets with more quality and

omit to extract conclusions from Fig. 1a and Fig. 1b. On the other hand the different maps in Fig. 1 are hardly visible and legible. Please, increase the size of the maps, or simply delete some of the panels containing not very relevant information (e.g. panels c,d,e, and f).

2) I would like to know if the corrected dataset (after to correct the data with flags 1 and 2) is also used for the APD results showed in Section 3.2. It is not specified in the text and I think that they will might to use and comment only the results for the dataset with the better quality.

3) Fig. 4 is hardly legible. I think that the authors should to keep only some of the panels. For example I suggest to keep only one of the two MODIS datasets (or AQUA or TERRA) panels since both show very similar results.

4) I would like to know why in Section 3.4 the authors not focus only their descriptions and discussions in the datasets with the corrections (which appear in Fig. 8). I think that it is a bit confusing for the reader to follow the text, especially concerning the differences between Fig. 5 and 8. I will appreciate if they can clarify the goal of the section and try to simplify the text. Also I would like that the authors will consider to delete Fig. 5 or 8 and keep only the most interesting maps for the discussion of the main results.

5) I would appreciate more discussion about the negative weekly cycles found over the South-Western Europe (region SWE). The authors detect the strongest negative weekly cycles during the summertime, arguing that "this is a local weekly cycle" (p. 1408, line 3). I cannot think that local emissions are greater during the weekends in the summer period over the Iberian Peninsula. One hypothesis can be linked to a possible indirect aerosol effect of the aerosols on the convective clouds (in line with Bell et al., 2008), with an enhancement during the mid-week due to the increase in aerosols emissions and a possible wash out of the aerosols by the rain. On the other hand I consider that the authors might point that Xia et al. (2008) showed some indications of

negative weekly cycles over the Iberian Peninsula and Eastern Europe (see Fig. 9 in Xia et al., 2008).

Specific comments

1) p. 1387, lines 12-13. There are works previous to 1958 analyzing the weekly cycles in urban pollution and their possible effect on meteorological variables (e.g. Ashworth, J. R., The influence of smoke and hot gases from factory chimneys on rainfall, Quarterly Journal of the Royal Meteorological Society, 55, 341-350, 1929). Rephrase the sentence.

2) I agree with the interactive comment by Dr. Schultz. I think that in the Introduction, especially after to show the list of citations finding significant weekly cycles (p. 1389, lines 3-7), you might include some of the other works that did not find cycles. To complete the references suggested by Dr. Schultz I also recommend to cite the following comments and replies papers which focus on Europe:

- Hendricks Franssen, H. (2008): Comment on "An unexpected pattern of distinct weekly periodicities in climatological variables in Germany" by Dominique Bäumer and Bernhard Vogel, Geophysical Research Letters, 35, L05802, doi:10.1029/2007GL031279.

- Hendricks Franssen, H. J., Kuster T., Barmet P., and Lohmann, U. (2009): Comment on “Winter ‘weekend effect’ in southern Europe and its connection with periodicities in atmospheric dynamics” by A. Sanchez-Lorenzo et al., Geophysical Research Letters, 36, L13706, doi:10.1029/2008GL036774.

- Sanchez-Lorenzo, A., J. Calbó, and J. Martin-Vide (2009), Reply to comment by H. J. Hendricks Franssen et al. on “Winter ‘weekend effect’ in southern Europe and its connections with periodicities in atmospheric dynamics”, Geophysical Research Letters, 36, L13707.

- Bäumer, D., and B. Vogel (2008): Reply to comment by H J Hendricks Franssen

on ‘An unexpected pattern of distinct weekly periodicities in climatological variables in Germany’, Geophysical Research Letters, 35, L05803, doi:10.1029/2007GL032432.

3) Due to the results of the current manuscript for Eastern Europe, I suggest to cite (in the list which report significant weekly cycles) and discuss somewhere a recent paper published by Dr. Sitnov:

- Sitnov, S.A. (2010): Weekly Cycle of Meteorological Parameters over Moscow Region, Doklady Earth Sciences, 431, Part 2, 507–513.

4) p. 1389, line 11. Delete the details of the periods that span the MODIS TERRA and AQUA. Few paragraphs ahead (in section 2.1) the periods for the analyzed data are specified.

5) p. 1391, line 8. Add Kistler et al. (2001) reference.

- Kistler, R. et al. (2001): The NCEP/NCAR 50-year reanalysis: Monthly means CD-ROM and documentation, Bull. Am. Meteorol. Soc., 82, 247–267.

6) p. 1391 line 12 – p. 1393 line 14. I will appreciate more paragraphs in this text in order to clarify the different indexes used (APD and WCI), the test to improve the datasets, etc.

7) p. 1393 line 19. Delete “, as used originally in Quaas et al. (2009)”.

8) p. 1395 lines 14-20. In this sentence delete “2000-2009”, “(Kalnay et al, 1996)”, and “The wind data are available on a 2.5x2.5° spatial resolution.”. You described these details in previous Section 2.1.

9) p. 1403, lines 5-15. The paragraph might be rewritten deleting details about the reanalysis data which has been explained in previous sections.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1385, 2011.