

## ***Interactive comment on “Weekly patterns of aerosol in the United States” by D. M. Murphy et al.***

### **Anonymous Referee #3**

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The paper on weekly aerosol patterns in the United States by Murphy et al. gives an overview basically on IMPROVE data. I have read it with great interest. It is especially important to mention that all applied station data are measured in usually rather clean air, not in urban areas, but in National Parks etc. Nevertheless, the anthropogenic fingerprint "weekly cycle" in various aerosol components is very widespread. The paper is very interesting and within the scope of ACP, it contains new results, and therefore it should be published, without any doubt. I have some suggestions as for e.g. references, conclusions and presentation of statistics as listed in detail below.

### **Specific Comments**

Concerning the abstract, the authors should mention that the data is measured at remote sites and, therefore, not in the middle of anthropogenic activities. I would not use an expression like "handle with caution" as for nitrate (line 9) in an abstract. As for Pb,

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is the explanation "general aviation" certain enough to be part of the few main results presented in an abstract? And is "general" true here, by the way? Please rephrase if you think it is necessary. The suggestion for future studies on meteorological weekly cycles might be reasonable, although in general I would not only focus on the direct effect, interaction of aerosol and radiation, but also for indirect effects, aerosol-cloud interaction, which might be very important as well for non-absorbing aerosols in generating weekly cycles in meteorological variables. This is also valid for the "Implications" section. The authors just might give more facts in the abstract.

Page 523, line 6, one could add the reference Murphy et al. (2006) here as for recent work on ozone weekly cycles (and PM10) in the US. Similarly, in addition to the work of Jin et al., Bäumer et al. (2008) recently have found weekly AOT cycles in Central Europe based on AERONET ground-based photometer data.

In the "Data" section, again it would be good to emphasize the remote character of the stations. The urban station data is not applied. A comment on this in the final paper would be fine. By the way: What about the weekly cycles in urban station data? That would be very interesting, too. On page 525 in the last paragraph, it is said that "one cannot average the United States". But later on results are presented where this averaging is carried out. The statement might be removed/rephrased, since I would say it is somehow reasonable to present US averages (in addition to the cluster averages). Also the last sentence in this abstract might be rephrased, although it is probably true.

As for the "Results" section, a complete overview about the (US) averages of the different aerosol components, average weekly cycle amplitudes, the percentage of clusters with cycles etc would be helpful. For instance, in the present form I could not find coarse mass average, so it is difficult to follow some of the interpretations. Nevertheless, the results are very interesting, and the Figures give good overviews of the weekly cycles in the aerosol components. Since the way the Figures are designed (comparing e.g. Fig. 2 and Fig. 3) is not completely consistent, it is very important to at least present the most important selected results also in a table as already men-

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tioned. Page 529, line 15ff: The Thursday maximum is, indeed, worth mentioning. Is it possible that some people stop work already at Friday noon? That would lead to reduced (integrated) emissions on Friday, too. The soil equation (1) on page 530 should have a reference in my opinion, and might be explained more in detail. Page 531, second paragraph, is there a reference on the open questions mentioned here? Last paragraph on 531, is there any scientific reference you can give on the diesel weekend/weekday emission ratio that supports this comparison in line 18f? Similarly, Page 532 lines 5ff might be supported by references. The same is the case for the vehicle emissions addressed in line 22f. Page 533, line 2 ff, the minimum is on Monday (not on Sunday) as far as I can see (Fig. 7). So there is just one day difference which might be real in my opinion. If you really think that there is some kind of artifact on Tuesday you at least should mention that shortly as well in the caption of Fig. 7. On page 535 in "Implications", paragraph two, the topic "resuspension of street dust" can be dealt with more in detail. There is some literature about that (e.g. Venkatram et al., 1999), and one can find work especially on source partitioning. It might be possible to use weekly cycles also for learning something about the street dust source strength in US, by the way. Paragraph 3 contains a very interesting issue about aerosol-health interaction and weekdays (and possible statistical errors). As mentioned above, the last paragraph is not wrong, but neglects the aspect of indirect effects. That might be rephrased or supplemented correspondingly.

#### Technical Corrections

On page 523, in line 2 it must be "Beierle". On page 536, line 22, there is a "?" that should be "/". As for the Fig. 1, the two NOAA site names could be given in the caption. In the caption of Fig. 8, one better should write "ratio of Pb to Pb+Zn" to avoid some kind of contradiction.

#### References

Bäumer, D., Rinke, R., and Vogel, B.: Weekly periodicities of Aerosol Optical Thick-

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Murphy, J. G., Day, D. A., Cleary, P. A., Wooldridge, P. J., Millet, D. B., Goldstein, A. H., and Cohen, R. C.: The weekend effect within and downwind of Sacramento &#8211; Part 1: Observations of ozone, nitrogen oxides, and VOC reactivity, Atmos. Chem. Phys., 7, 5327-5339, 2007.

Venkatram, A., Fitz, D., Bumiller, K., Du, S., Boeck, M., Ganguly, C.: Using a dispersion model to estimate emission rates of particulate matter from paved roads. Atmos. Environ., 33, 1093-1102, 1999.

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