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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Composition and sources of particulate matter in an industrialised Alpine valley" *by* N. Perron et al.

Anonymous Referee #1

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General Comments:

The paper presents speciated measurements of PM10 at four locations in an Alpine valley over a three-week sampling period. It additionally presents speciated PM1 measurements at one of these locations. The paper is well organized and well written and the data are original and of high quality. The authors should be complemented for their detailed description of methods.

The main general concern I have with the paper is the small data set used for the week day vs. Sunday comparison. Measurements were made over three weeks, however only one week was chosen to demonstrate the impact of different sources on the valley region. Comparing the average of three week days to one Sunday seems insufficient to demonstrate actual trends in source impacts.

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Interactive Discussion
Discussion Paper

Overall, I recommend the paper for publication after this general comment, and specific comments listed below, are addressed.

Specific Comments:

1) Pg. 9403, ln. 24 – Pg. 9404, ln. 2: The authors infer a prominent contribution from traffic to PM10 concentrations. Indeed, the differences between Sunday concentrations and work day concentrations seem to support this idea. However, in Table 1, Saxon is described as having exposure to "intense" traffic, compared to the other three sites which have exposure to only "medium" traffic. But concentrations in Saxon were not higher than at the other sites – why is this?

2) On this same point: for the week 1 period selected, there certainly is a large difference in PM10 concentrations between the working days and Sunday. However, it appears that this is not the case for the remainder of the study period. The following week (4 Dec – 10 Dec) it does not appear that Sunday concentrations are lower. This may be due to unstable meteorology (Section 2.2), however, it also appears that Sunday concentrations on 17 Dec. were higher than work day concentrations on 11 Dec – 15 Dec. This period is described as "stable" similar to week 1 period (Section 2.2). If the week 1 fluctuations were due to traffic, why was a similar pattern not observed in the third week?

3) Since the choice of "week 1" period is based on meteorological stability, more than temperature in Figure 2 is needed (i.e., at least show wind speed/direction data for the entire study as well).

4) Pg. 9403, Ln. 8-13: Regarding the high unaccounted for PM10 fraction on workdays but not Sundays: This is systematic, and the discussion of possibilities for the unaccounted mass (particle-bound water, or biased OM/OC ratios) are not likely to vary between work days and Sunday. Please explore this point further.

5) Pg. 9404, Ln. 26 – Pg. 9405, Ln. 4: "The lower value found in our case suggests

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other origins of non-fossil OC than primary wood-burning." It seems Figure 5 suggests the opposite: the Puxbaum et al. (2007) study suggests an OC/levoglucosan value of 7.35, but here an OC/levoglucosan slope of 3.5 is observed. This suggests that either OC is a factor of 2 lower, per levoglucosan, than the other study or some missing OCnf? If it were SOA formation from biomass burning emissions, then the OC/levoglucosan slope would be higher.

6) Section 4.1.4 and Figure 6: If unaccounted-for PM10 mass contributed 11-29% (average = 19%) to PM10 concentrations during work days, then how is the "others" contribution from the source apportionment analysis so small?

7) Pg. 9406, Ln. 2-4: "The lower agreement observed for the days with lowest PM1 loadings stems probably from the lack of accuracy and precision of the TEOM at low concentrations." This is possible, but other possibilities should be acknowledged as well: it is known that the AMS collection efficiency changes with changing chemical composition and changing ambient conditions (i.e., RH). It is very hard to tell from the resolution of Figure 7a, but it appears that the low concentration days (for example, 3-6 Dec) also correspond to periods of low organic aerosol concentrations. During this time, the collection efficiency may drop compared to periods of higher organic concentrations. Figure 7b with an added dimension of organic mass fraction would be helpful in this regard.

8) Figure 9 and Section 4.2.3: What was the overall correlation between OOA and P-WBOA? From the time series in Figure 9, the two look highly correlated, and from the diurnal profiles they do as well (except for the small increase in OOA around 3pm local time). Pg. 9408, ln. 11-14 even indicates that OOA may come from wood burning. Additionally, the high correlation seen between EMwb and OMnf suggests that much of the OOA is likely from wood burning. For this study, can OOA and P-WBOA truly be distinguished as different?

9) Why are secondary inorganics higher on Sunday than on the working days?

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Technical Corrections:

Pg. 9401, Ln. 12: change “Relying on the work by Sandradwei. . .” to “Following the procedure of Sandradewi. . .”

Pg. 9405, Ln. 17: delete “the” before Sunday

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 9391, 2010.

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