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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonal variations in aerosol particle composition at the puy-de-Dôme research station" *by* E. J. Freney et al.

Anonymous Referee #1

Received and published: 23 November 2011

This paper by Freney et al. described the chemical composition of submicron particles at the puy-de-Dôme research station, central France. They measured the composition in three seasons, autumn, winter and summer, by using the Aerodyne Time-of-Flight Aerosol Mass Spectrometer (ToF-AMS) and Multi Angle Absorption Photometer (MAAP). This paper concentrated on both the inorganic and organic fraction of particles of which the organic fraction was analyzed statistically by using positive matrix factorisation. The main conclusion of this paper was that the chemical composition at an elevated site is affected by both the season and the origin of air masses.

This paper is fluent and clear. It presents new data that is relevant and worth publishing.

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Interactive Discussion
Discussion Paper

I have only some specific and technical comments how to improve the paper.

Specific comments

Abstract

Page 27140, line 5: there are different types of Time-of-Flight aerosol mass spectrometers (HR-ToF-AMS, C-ToF-AMS, CC-ToF-AMS). Please specify what kind of AMS you used in this study.

2 Experimental

Page 27144, line 21: see first comment

Page 27145, lines 16-19: It would be nice to see how the composition dependent CE changes with time in your study. I suggest adding this CE vs time in supplements.

Page 27145, lines 21-29: It was mentioned in text that the total volume from the AMS and MAAP was compared to that from the SMPS. What value of density did you use for BC?

2.4. Positive Matrix Factorisation: I suggest adding more discussion about the selection of fpeak and the number of PMF factors. It would be useful to add some validation plots to supplements, e.g. fpeak vs. Q/Qexpected, PMF-solution with 3 factors (MS and timeseries), at least for some campaigns, so that reader can see why you ended up to 2F- solution with fpeak of 0.

3 Results and discussion

Page 27148, lines 1-2: Regarding the contribution of BC to submicron particle mass, how would you estimate the uncertainty of BC measurements for submicron particles (<1 um) since MAAP sampled behind WAI inlet (with a cut-off of 30 um)?

Page 27148, lines 23-24: I suggest adding neutralisation plots for supplements.

Page 27149, line24: Why LV-OOA correlated with BC in summer? Could part of LV-

ACPD

11, C12210–C12213, 2011

OOA be related to traffic?

Page 27151, lines 8-11: You mentioned that in autumn the correlation (r2) between SV-OOA and BC was 0.33 but based on Table S1 it was only 0.12.

Page 27149-27152, PMF in general: I suggest adding more discussion about the sources and characteristics of LV-OOA and SV-OOA based on Table S1. e.g. LV-OOA correlates better with inorganics in all seasons, chloride correlates very well with LV-OOA in winter (does that mean biomass burning?). How about correlations with the reference mass spectra? Earlier you said that the resolved PMF factors were similar during all the seasons. If that is true why the correlations with ref MS changed that much from season to season (Table S1)? Could you describe shortly how MS for LV-OOA and SV-OOA varied from campaign to campaign?

Technical corrections

Title: I suggest adding France in title

2 Experimental Page 27146, lines 1-3: Could you clarify the sentence with slopes and r2 for SMPS AMS comparisons? I didn't quite understand which numbers referred to which values (r2 in %?). Is SMPS:AMS average for the whole campaign?

3 Results and discussion Page 27147, line 10: parentheses are missing for BC

Tables and Figures

Table 1. Page 27162: Check the labels for the columns and the units. They are mixed now.

Fig. 3. Page 27166: (a), (b) and (c) are missing in Fig 3.

Fig. 5, Page 27169: (a)-(f) are missing in Fig. 6.

Supplements

Fig. S2: Comparison for summer is missing. There are a) and b) in Figure but (c) and

ACPD

11, C12210–C12213, 2011

(b) in Figure caption. In Figure caption add . . .measured by the AMS and MAAP . . .

Figure S5: (a)-(d) are missing in Figure S5.

Table S1: Change Table 1 to Table S1.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 27139, 2011.

ACPD

11, C12210–C12213, 2011

Interactive Comment