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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Elucidating determinants of aerosol composition through particle-type-based receptor modeling" *by* M. L. McGuire et al.

Anonymous Referee #1

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This paper describes one of the most comprehensive analyses of ATOFMS field campagin data to appear in the literature to date. The single particle mass spectral dataset has first been clustered into 33 particle types which have then been subject to PMF analysis to further group the particles into source related types. While this approach has been reported previously, this is one of only rather few papers to have used the approach. The authors are to be congratulated on their very thorough approach to data analysis and a well thought out interpretation. The use of CPF plots and PSCF analysis has proved useful in assigning sources to the PMF factors.

The paper could be improved by attention to the following points:

(1) The analysis of the ATOFMS data is purely in terms of particle number counts, yet air quality regulations are in terms of mass. The authors refer to size dependent transmission losses in the ATOFMS and indicated that they looked into the possibility of correcting for these losses. The resulting data did not lead to robust PMF solutions and hence the particle data were left unscaled for PMF analysis. This is a rather surprising finding and some explanation would be helpful. No indication is given of how the correction was applied. Were independent measurements of the particle number size distribution made alongside the ATOFMS?

(2) Related to the above point, the methods section indicates that PM2.5 mass concentrations were made using a TSI DustTrak instrument but these data are not presented. It would give added perspective to the paper to add a time series of PM mass to Figure 2.

(3) A intriguing facet of Figure 2 is that there is a period almost in the centre of the time series where there are no significant counts of any particle type (on 29-30/06/2007). Was significant mass measured during that period? The ATOFMS is known to be far more sensitive to some particle types than others. Was this a period where mass was contributed by particles undetected by the ATOFMS?

(4) There has been rather little attempt to compare the individual particle types with those reported in earlier work with the ATOFMS by other groups. Prather's group has published a large number of particle signatures including some from source studies. It would be useful for the reader to know how closely the particle types identified in this work map onto those in earlier published studies and particularly those which were source related. For example, did any of the EC, OC or organic particle types compare closely with those determined by Prather's group in engine exhaust?

(5) The behaviour seen for nitrate is very interesting but should be compared with that reported by Dall'Osto et al. (Dall'Osto M, Harrison RM, Coe H, Williams PI and Allan JD, 2009, Real time chemical characterization of local and regional nitrate aerosols,

Atmos. Chem. Phys., 9, 3709-3720). It would be useful to compare the particle mass spectra but also the behaviour of nitrate as Dall'Osto and co-workers also reported long-ranged transported and local nitrate particles and a diurnal pattern of nitrate association and release from particles.

(6) On page 9855, line 20, the particle of m/z -59 [C2H2OO-] is described as formate. There is clearly an error here particularly as the suggested elemental composition does not give this mass number.

(7) Particle type C29 has a composition suggestive of aged sea salt. Is this likely at a location so far inland?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 9831, 2011.