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Interactive comment on "Constructing a data-driven receptor model for organic and inorganic aerosol – a synthesis analysis of eight mass spectrometric data sets from a boreal forest site" *by* Mikko Äijälä et al.

Anonymous Referee #2

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The manuscript "Constructing a data-driven receptor model for organic and inorganic aerosol - a synthesis analysis of eight mass spectrometric data sets from a boreal forest site" introduces a novel receptor model for organic and inorganic aerosol measured in Hyytiälä, Finland between 2008 and 2010. The measurements were performed with a CToF aerosol mass spectrometer and receptor model was applied to unit-mass-resolution mass spectra. The benefit of this receptor model for organic and inorganic aerosol over traditional PMF/ME2 for organic MS is that it yields useful information for the modelling of submicron atmospheric aerosols physical and chemical properties,

and the results illuminates the division between organic and inorganic aerosol types and dynamics of salt formation in aerosol.

General comments

This paper is written precisely, logically and clearly. It presents novel methodology and scientific results that are very useful for atmospheric scientists, both experimentalists and modelers. I think this paper should be published in ACP after minor revision.

Specific comments

1. Page 1, Abstract; line 24; "simplistic inorganics apportionment methods" is unclear to me, do you mean PMF/ME2?

2. Page 4, CToF-AMS; what is the mass resolving power of CToF? Is it possible to use high resolution mass spectra instead of UMR-MS? How reliably you can identify alkalimetals, especially rubidium, with CToF?

3. Page 5, Section 2.2.2 Data preparation and down-weighting; Could you explain here (shortly) how RIEs and fragmentation table were taken into account?

4. Page 6, line 28-29, "all the source profiles are constrained, but allowed to vary within narrow limits", what alpha-value (constraning value)?

5. Page 11, line 1; "we applied an ion ratio Rcalib = 0.42, taken as the average of mass spectrum based AN calibrations (S.I Sect S.6)". Do you mean m/z 46/30 in Fig. S3? It seems to be much larger than 0.42. In general, Figure S3 is very difficult to read because it is unclear and has very small fonts. Please improve the quality of the figure.

6. Page 15, line 16-18; similar comment, for cluster #8 m/z 46/30=0.44, according to Figure 3 the ratio is larger

7. Page 30, line 12, what is the origin of KNO3 in Hyytiälä?

8. Results and discussion in general: diurnal trends of the factors are not utilized at

all when interpreting and identifying aerosol components, and similarly, any auxiliary gas (or particle) data is not exploited. Couldn't this additional data help interpreting the results?

9. Supplemental material, Figure S5; could you add total mass for each data set?

Technical corrections:

10. Page 11, line 18-19, second parenthesis is missing

11. Page 30, line 11; non-quantitative

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