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Atmospheric Measurement Techniques Discussions

Interactive comment on "Understanding of atmospheric aerosol particles with improved particle identification and quantification by single particle mass spectrometry" *by* Xiaoli Shen et al.

Anonymous Referee #1

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General comments: This manuscript evaluates the capability of a type of Single particle mass spectrometry (SPMS) to quantify the mass concentration of individual particles, with 6-week field measurement data. Seven major particle classes were concerned through using fuzzy classification, peak area information, and laboratory-based reference spectra. They show the significant difference between the observed particle number fracion and estimated mass contribution. It is interesting that the provided approach could assign the non-refractory compounds measured by AMS to different particle classes measured by the LAAPTOF. The authors also carefully estimate the error associated with the approach. I recommend publication of this manuscript with minor revison.

Specific comments: 1. A discussion on the representative of the field measurement data would be necessary in the revised version. For example, a detail comparison of the identified particle classes with those previously observed in similar region.

2. Healy et al., 2013 has quantitatively determined the mass contribution for each carbonaceous particle classes. Inclusion of this in the introduction and discussion would be necessary for completeness.

3. Lines 57-60: "This provides different sources for the non-refractory species measured by AMS and indicates different sources of aerosol" might be not appropriate. I think a major part of non-refractory species measured by AMS should be secondary.

4. Fig. 2: it is possible to compare the mass concentration of AMS and LAAPTOF in different size range? From Fig. 1, it can be seen significant difference of ODE in difference size range? A comparison of AMS and LAAPTOF in different size range might help reduce the difference.

5. Section 2.2 line 10-15. I do not understand why "A direct class-dependent quantification of particle mass is therefore not possible."

Is it possible that the threshold values set for the positive and negative spectra correlation influence the assignment of individual particles to difficult particle types?

6. Page 4 Line 29 "This leads to an uncertainty of $\sim$100% in particle mass." is it only for sea salt like particles? How about other particle classes?

7. Page 4 Lines 35-40: The assumption of single density value for each particle classes might introduce large uncertainty. The author should adapt a possible density range through the previous publications and evaluate the uncertainty for each assumption. This would also help reduce the overall difference between the comparison with AMS results.

8. Page 6 Line 25 I think it would be better to include some references for the identification of amines.

References Healy, R.M., Sciare, J., Poulain, L., Crippa, M., Wiedensohler, A., Prevot, A.S.H., Baltensperger, U., Sarda-Esteve, R., McGuire, M.L., Jeong, C.H., McGillicuddy, E., O'Connor, I.P., Sodeau, J.R., Evans, G.J., Wenger, J.C., 2013. Quantitative determination of carbonaceous particle mixing state in Paris using single-particle mass spectrometer and aerosol mass spectrometer measurements. Atmospheric Chemistry And Physics 13, 9479-9496.

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