The manuscript by Fachinger et al. describes technical improvements applied to a previously developed ion trap aerosol mass spectrometer (IT-AMS). The IT-AMS measures the chemical composition of aerosol particles by means of flash vaporization followed by electron impact ionization and ion analysis with an IT mass spectrometer. While the mass spectrometer and ion detection unit were developed in-house, the vacuum chamber with its aerodynamic lens inlet and the vaporization/ionization unit are identical to the Aerodyne AMS vacuum chamber. The most commonly used commercially available aerosol mass spectrometers nowadays use time of flight (ToF) mass spectrometers, which e.g. allow to derive information on the origin of the organic fraction of the aerosol constituents due to the high mass resolving power of a ToF. However, an IT has the capability of performing so-called MS^n studies, which can help to distinguish between fragments with different isomeric structures. Therefore, the IT-AMS has, in principle, an important advantage over other commercially available aerosol mass spectrometers.

The capabilities of the IT-AMS are demonstrated by lab experiments, where generated organic particles are analyzed by MS^n studies. The different fragmentation patterns show clear differences between different compound classes. Furthermore, measurements during a field campaign indicate very similar results for the IT-AMS and a ToF-AMS for the nitrate, organic and sulfate fraction of ambient aerosols.

Regarding the description of the modifications, I agree with referee #2 that these need to be explained in much greater detail. Just referring to a German PhD thesis is not sufficient, especially since the chosen journal (AMT) is actually well-suited for a description of technical details that improve a measurement technique.

However, overall the paper is well-written and should be published in AMT after addressing the comments listed in the following as well as the requested improvement on describing technical details.

Specific comments:

Page 1, line 19: change „was demonstrated“ to “is demonstrated”

Page 2, line 3: the paper by Schramm et al. (2009) should also be cited in this respect, especially since the paper makes uses of a similar ion trap as used in the present study

Page 4, line 12: please mention how many ruby spheres were used

Page 4, line 27: please explain what “modified” exactly means

Page 4, line 29: the reason for using the deflection plate and its functionality should be discussed

Page 5, line 2/3: please explain how the semi-automatic tuning of operation parameters works

Page 5, line 26: up to what m/z can the mass range be extended? Up to what m/z was the set-up tested?

Page 6, line 9/10: what about other compounds like water, ammonium and chloride? If the usable mass range starts at 30 amu, it means that the important compound class ammonium cannot be measured as in the standard AMS, please discuss

Page 7, line 1: should there be a “≥” sign instead of “>”?

Page 7, line 20-23: this cannot be the only explanation as the signals are well above the LOD (1.3 / 0.7 µg/m3), any other ideas?

Page 8, line 26: what is the fraction of the doubly charged ions? where are they coming from (from the ion source or from reactions inside the ion trap)?

Page 9, line 24: please explain better how the value of the ion recovery is exactly determined

Page 10, line 27: please add “and pinonic acid“ after „… (pink color)“

Figure 1: (i) the photographs in panel b) are too small, (ii) the functionality of the deflection plate shown in panel c) should be explained in more detail in the text

Figure 2: is this the final data after correcting for the backgrounds, etc.? it says the IT-AMS has a lower signal to noise, but why are the IT-AMS signals larger by a factor of 10? if this is the case then the sensitivity could be significantly improved by reducing the noise; what is causing the high noise?

Figure 3: sulfate: memory effects? heater temp. the same?

Figure 6 and Figure 7: explain what "fraction” means as the fragments do not seem to add up to 100%

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References:

Schramm, E., et al.: Trace Detection of Organic Compounds in Complex Sample Matrixes by Single Photon Ionization Ion Trap Mass Spectrometry: Real-Time Detection of Security-Relevant Compounds and Online Analysis of the Coffee-Roasting Process, *Anal. Chem.*, 81(11), 4456–4467, DOI: 10.1021/ac900289r, 2009.