

Interactive comment on “Laboratory and field evaluation of the Aerosol Dynamics Inc. concentrator (ADlc) for aerosol mass spectrometry” by Sanna Saarikoski et al.

Anonymous Referee #1

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This paper introduces ADlc – a particle concentrator designed to increase particle concentrations for sampling with Aerodyne AMS or ATOFMS. Through both lab experiments and field deployments, the authors showed that ADlc can achieve a theoretical concentration factor of 8 – 21 for particles with long-term stability, indicating that ADlc can be a very useful device for enhancing chemical characterization of particles by real-time aerosol mass spectrometry, especially in clean environments where aerosol signals are usually low and frequently close to the instrument detection limits. This work is of high quality and the manuscript is logically organized and generally well written. The topic is a good fit for AMT and I recommend the manuscript be accepted for publication following attention to several issues.

C1

More details on the physical aspects of the ADlc may need to be reported. For example, it would be helpful to know the dimensions of the ADlc growth tube and the residence time of particles for a certain flow rate. Also, for the sake of clarity, consider to add on Figure 1 references to the parameters reported in Table 1. In mentioning the importance of minimizing the time the particle being a droplet inside the growth tube (line 113), it would be useful to quote the approximate time scale. In addition, the issue whether the ADlc modifies the shape or phase of particles should be addressed, at least briefly. Such changes could significantly affect aerosol quantification by the AMS.

Detailed comments:

Line 18, change “ultrafine” to “fine” since ADlc can clearly concentrate particles beyond the ultrafine mode.

Figure 2 shows the size dependent concentration factors for particles only up to 400 nm in mobility diameter. What are the concentration factors for larger particles? Also, the blue circles appear to show in two different shades. Are these from two separate sets of experiments? If so, explain the differences.

Line 201, the sentence “. . . measured size distributions were normalized to the mass spectra” is vague. Consider to revise.

Line 237, how often was SP-AMS switching between laser-on and laser-off?

For the evaluation of ADlc's influence on aerosol composition and size, Figure 4 is presented to compare the average high resolution mass spectra for organics and rBC from an SP-AMS downstream and bypass the ADlc. The measured-CF for Cx was significantly higher than for the other ions. Could it be due to change in particle shape, thus particle collection efficiency in the laser beam? It would be also interesting to see an evaluation of the ADlc's influence on bulk PM composition, including both inorganics and organics.

Line 311 – 313, this sentence is a bit confusing. Consider to revise.

C2

Line 355 – 358, does it mean that the Q-AMS and the SP-AMS report different ammonium concentration for the same air mass? Won't this discrepancy correctable through proper relative ionization efficiency calibration and fragmentation table adjustment (e.g., for better ammonium quantification)?

Fig 8, the ammonium measurement after ADIc shows more spikes. Is this an artifact induced by the ADIc?

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