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Reply on RC2

Stavros Amanatidis et al.

Author comment on "Efficacy of a portable, moderate-resolution, fast-scanning differential mobility analyzer for ambient aerosol size distribution measurements" by Stavros Amanatidis et al., Atmos. Meas. Tech. Discuss.,
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The authors would like to thank the reviewer for their constructive feedback on this paper. Our point-to-point response to the reviewer's comments is listed below.

- 1) This is correct; we have included a short discussion on the smaller sheath flow pump requirements in the revised Introduction.
- 2) Considering a DMA with given geometric characteristics, the counting rate of the downstream CPC should be proportional to the ratio of aerosol flowrate-to-sizing resolution (Q_a / R). Thus, 10 / 1 lpm sheath / aerosol flow conditions ($R=10$) would be equivalent to 0.9 / 0.3 lpm conditions ($R=3$) in terms of counting statistics (both have $Q_a / R = 0.1$).
- 3) Different sampling rates were employed due to different scan durations in the two DMA systems. In both cases the sampling rate was sufficient to capture the raw counts variation during the scan.
- 4) We have used Tikhonov regularization for both instruments. Additional details on the data inversion are included in the revised manuscript (Section 2.5).
- 5) We included a discussion in the revised manuscript (Section 3.1) on the differences involved between upscans and downscans. Regarding the inverted data, analysis of all the data collected over the testing campaign showed that upscan and downscan inverted distributions were overall consistent, with upscans yielding slightly higher ($\sim 3.5\%$) total particle number than downscans. The advantage in using both up- and downscan data is the resulting improvement in time resolution by eliminating the time required to return to the starting voltage of a single-direction scan. The accuracy of the inverted data depends on the accuracy of the transfer function model being employed. For moderately slow downscans, this can be realized with good accuracy.
- 6) We added a new figure in the revised paper (Fig. 5) to demonstrate the impact of resolution on DMA counting rate.
- 7) Those differences mainly arise due to the different time resolution of the two instruments. For each LDMA scan shown in the contour plot (every 6 min), there are about 6 Spider scans reported. The "spikes" that appear in the Spider data reflect the aerosol

variation at those faster scans, which were not captured completely by the lower LDMA time resolution. In fact, a closer look at the number traces shows that, for the majority of these events, there is also a corresponding "spike" in the LDMA number trace, albeit typically weaker. A 6-min moving average in the Spider data would have resulted in a more "rounded" particle number time series.

8) The Spider distribution appears smoother because of the combined effect of two factors: a) more smoothing was added in the Spider inversion compared to the LDMA (details included in the revised manuscript – Section 2.5); b) the 30-min average distributions shown in Fig. 6 include about 6 times more Spider scans than the LDMA (i.e., 27 vs. 5 scans), which results in a "smoother" mean distribution over the same time interval.

9) We have revised our statement to the following: *"The present results suggest that two key characteristics of ambient size distributions, geometric mean diameter and number concentration, are sufficiently captured when operating the DMA at lower resolution than is typically employed."*

10) We thank the reviewer for the suggestion; we have added the reference in the Introduction of the revised paper.