Supplement to "A high transmission axial ion mobility classifier for mass-mobility measurements of atmospheric ions"

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Supplementary material

Additional information is given below.

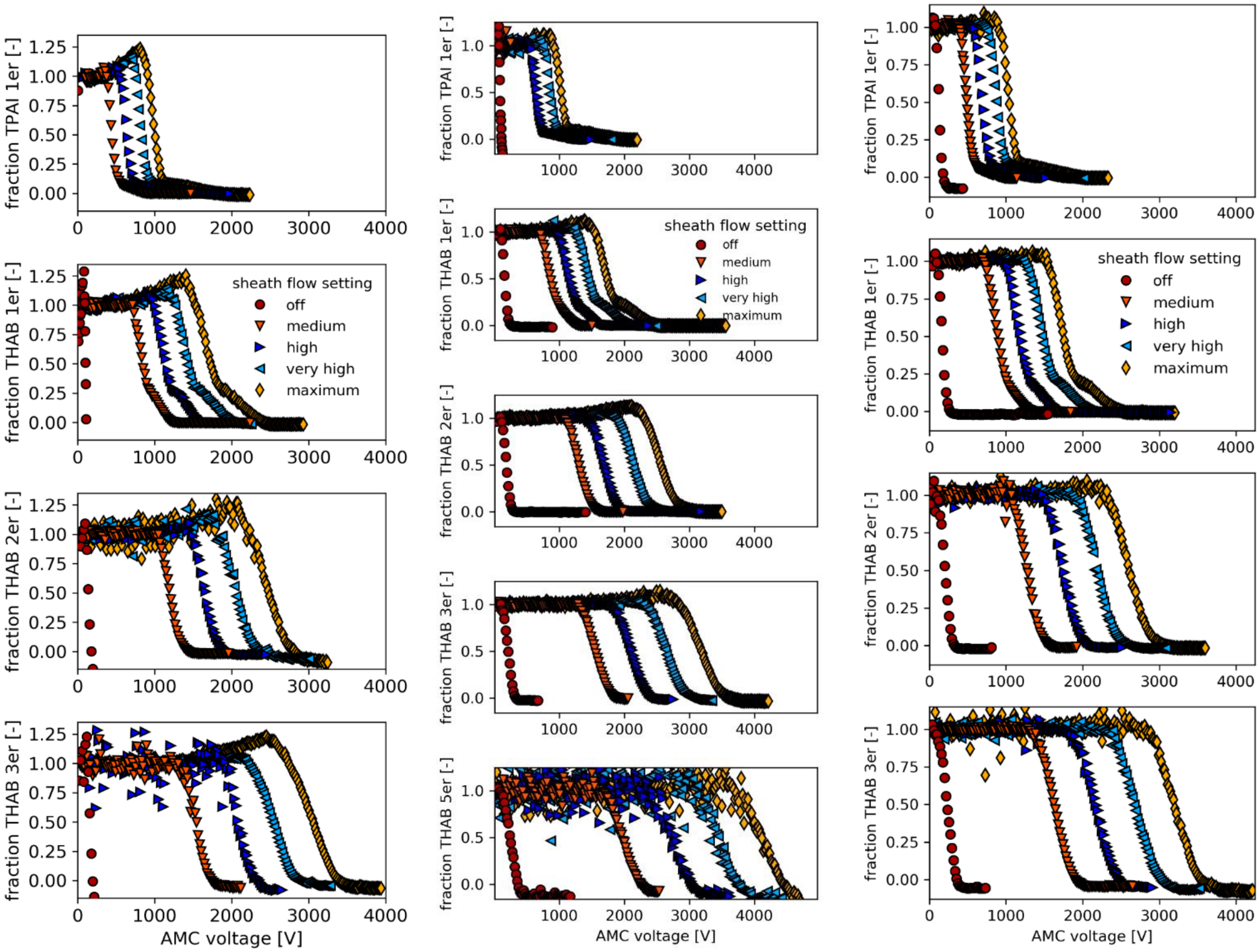

Figure S1. Additional data of all other experiments about the characterization of the AMC. In the left column, the data is acquired for a sample flow setting of 5 L/min, whereas the sample flow rate is about 9.6 L/min in the middle and 12.4 L/min on the right. As in the main text explained, the sheath flow is set to zero in the first row and increases from the second to the last row (off: 0 L/min, medium: 50 L/min, high: 70 L/min, very high: 85 L/min, maximum: 105 L/min).

We conducted experiments of a tandem UDMA-AMC-ioniAPi-TOF setup, Fig. S2. These revealed a second peak at an inverse mobility of roughly 1.25 Vs/cm^2 and in this case also a third peak at 1.4 Vs/cm^2 as shown in Fig. S3. Results from a tandem experiment of UDMA-AMC-ioniAPi-TOF 1000 presented in Fig. S4 reproduced the slope of the impurity at an inverse mobility of 1.25Vs/cm^2. In linear scale, the slope in the carried-out AMC scan of THAB monomer resembles the slopes in **Fehler! Verweisquelle konnte nicht gefunden werden.**. In the mass spectrum, we found a peak at m/z 800 that most likely is a cluster consisting of the THAB monomer and an impurity from the setup. This becomes evident in the AMC mobility spectrum on the right in Fig. S4. So far, we did not find any meaningful composition of this cluster. We guess that it might be coming from our setup, either a siloxane or a compound of our electrospray setup.

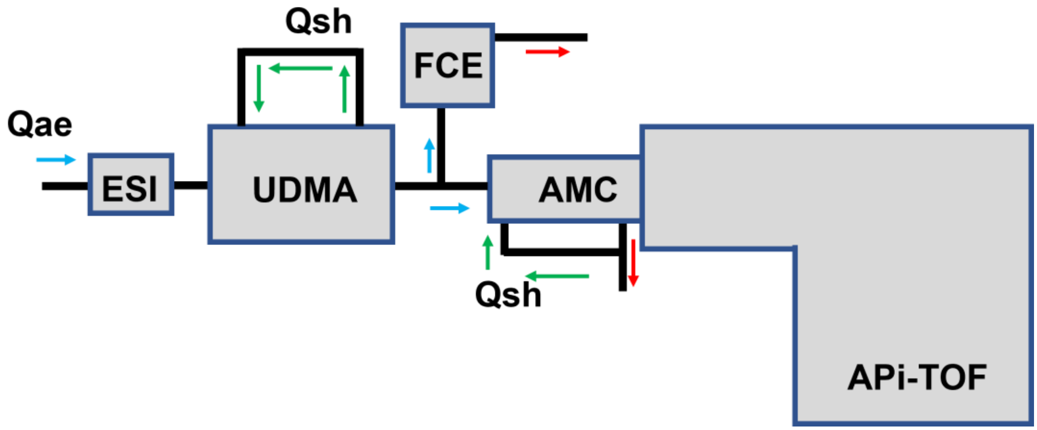

Figure S2. Setup of the tandem UDMA-AMC-ioniAPi-TOF experiments. The sample aerosol flow Q_{ae} is colored in blue, the sheath flow Q_{sh} in green and the exhaust flow in red.

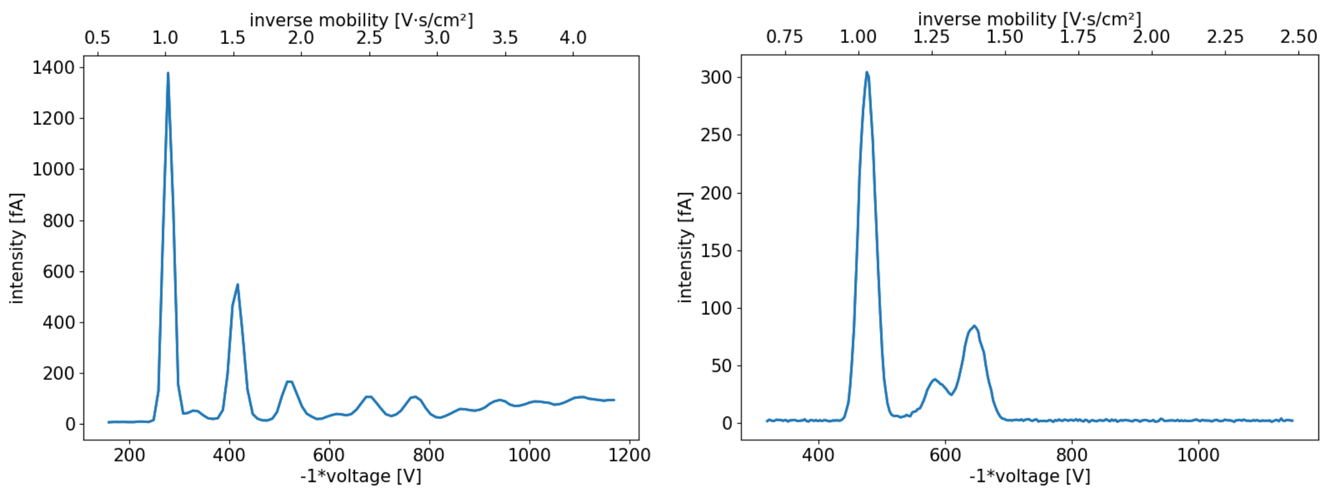

Figure S3. Results from the tandem UDMA-1 UDMA-4 experiments: mobility spectrum from first stage UDMA-1 on the left, and mobility spectrum from second stage UDMA-4 for THAB monomer on the right. Even though only the THAB monomer peak is classified with UDMA-1, accompanying peaks in the mobility spectrum after the second UDMA, UDMA-4, are detected in the FCE. Experimental setup is introduced in Brilke et al. (2019).

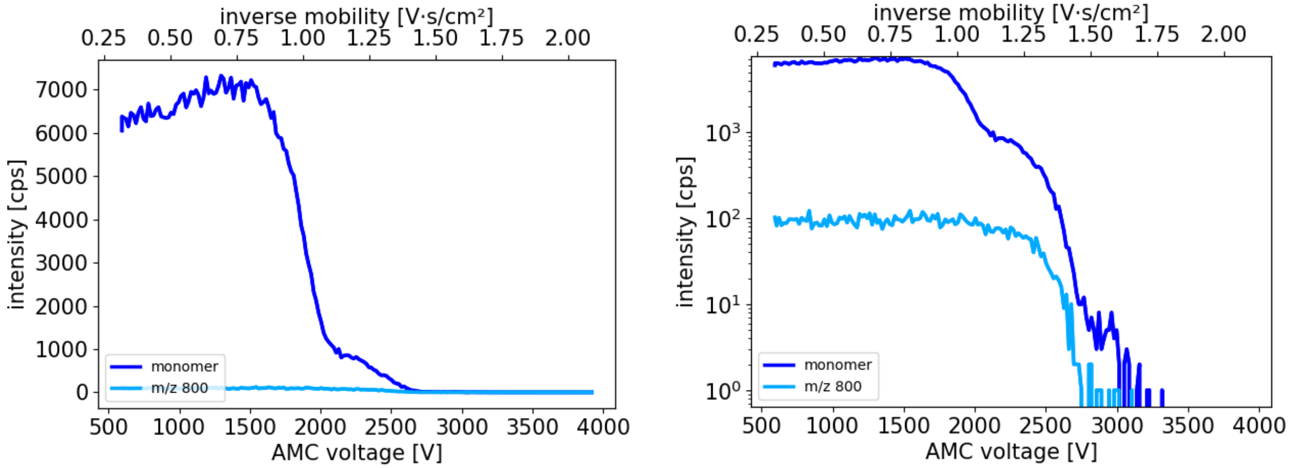

Figure S4. Results from the tandem UDMA-AMC-ioniAPi-TOF experiments in linear scale on the left, and in log scale on the right. Mobility scan of the AMC with the THAB monomer being classified by UDMA-4. Impurity peak at m/z 800 seems to contribute to the second slope of the THAB monomer mobility peak. During ion transfer in the APi-TOF, m/z 800 seems to dissociate to a major fraction into the THAB monomer.

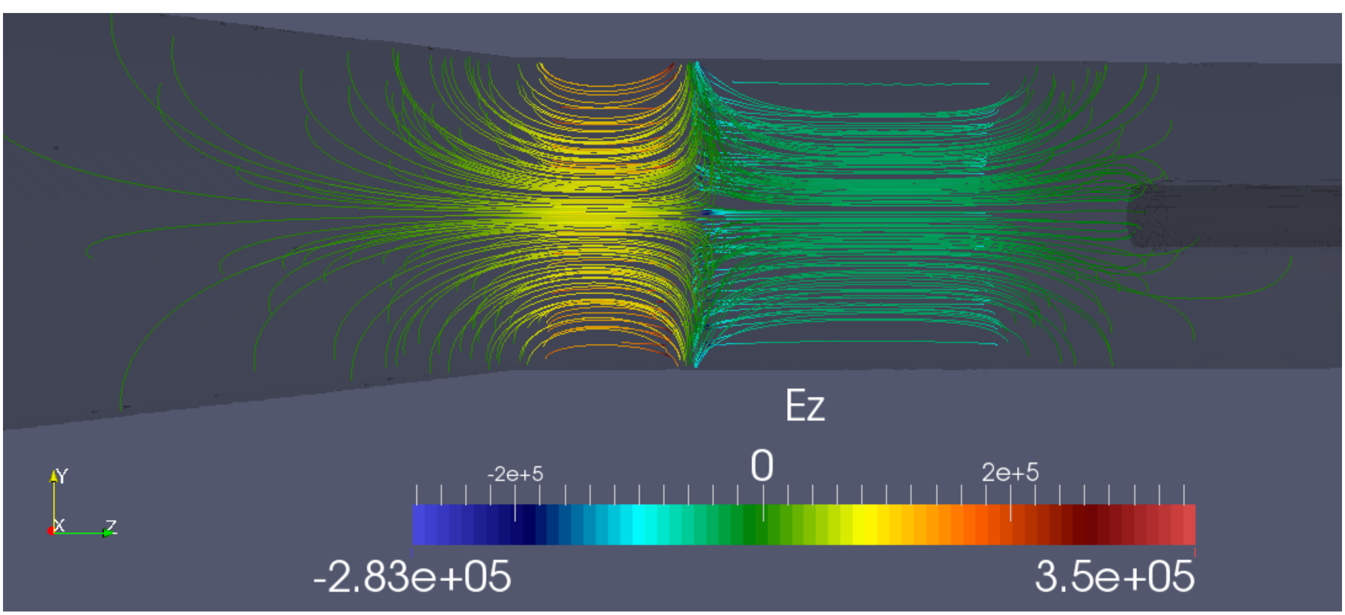

Figure S5. 3D view of the electric field lines in the AMC inlet for exemplary 800 V. The magnitude of the electric field is given in units of V/cm. In the center of the tube, where the size segregation is supposed to happen, the lines are parallelly aligned for a preferably homogenous electric field. The core sampling inlet is shown on the right. In the laboratory experiments the distance from AMC electrode to the core sampling is much larger than shown here.

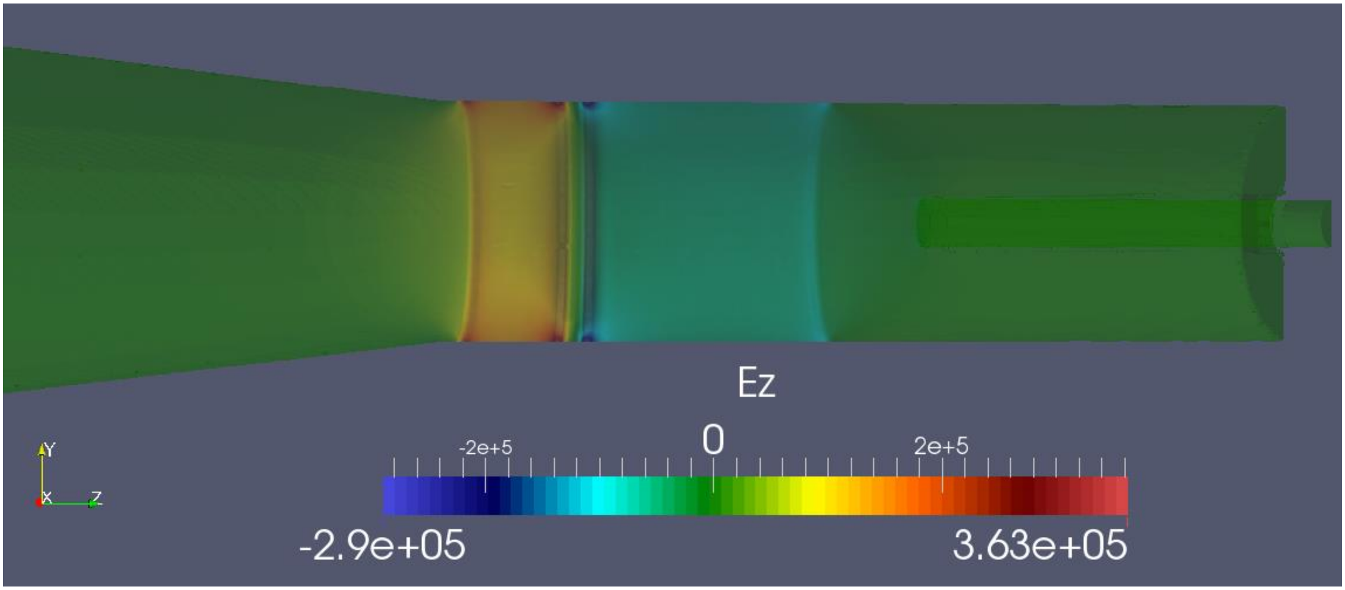

Figure S6. 2D view of the electric field magnitude in the AMC inlet for exemplary 800 V.

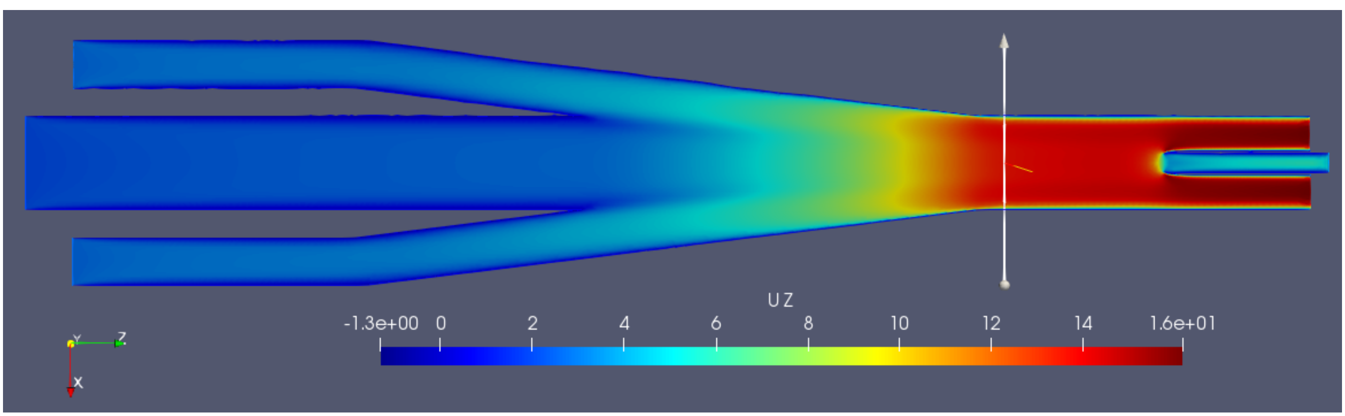

Figure S7. Side view of the flow field simulation in the AMC inlet. Velocity in z-direction Uz is given in units of m/s. Inlets are on the left and outlets on the right. The sample flow enters in the central tube and is mixed with the sheath flow as a coaxial jet flow in the tapered region. The arrow marks the position of interest for the size segregation. The coaxial outlets are on the right. Sample air of 1 L/min is drawn into the core sampling whereas the rest of sample and sheath flow leave through the outer tube.