



Supplement of

Improved counting statistics of an ultrafine differential mobility particle size spectrometer system

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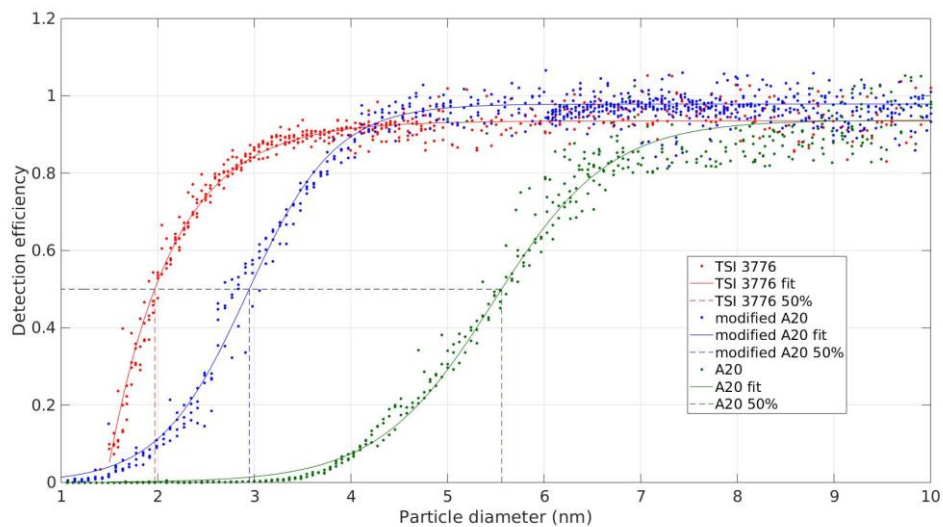


Figure S1. Cut-off calibration curves for a non-modified Airmodus A20 CPC and the modified Airmodus A20 CPC. On the x-axis is the particle diameter (nm) and on the y-axis is the detection efficiency determined as the ratio of concentration measured by the CPC and the reference instrument. The cut-off sizes of the traditional Airmodus A20 CPC and the modified Airmodus A20 CPC are approximately 5.5 nm and 2.9 nm, respectively.

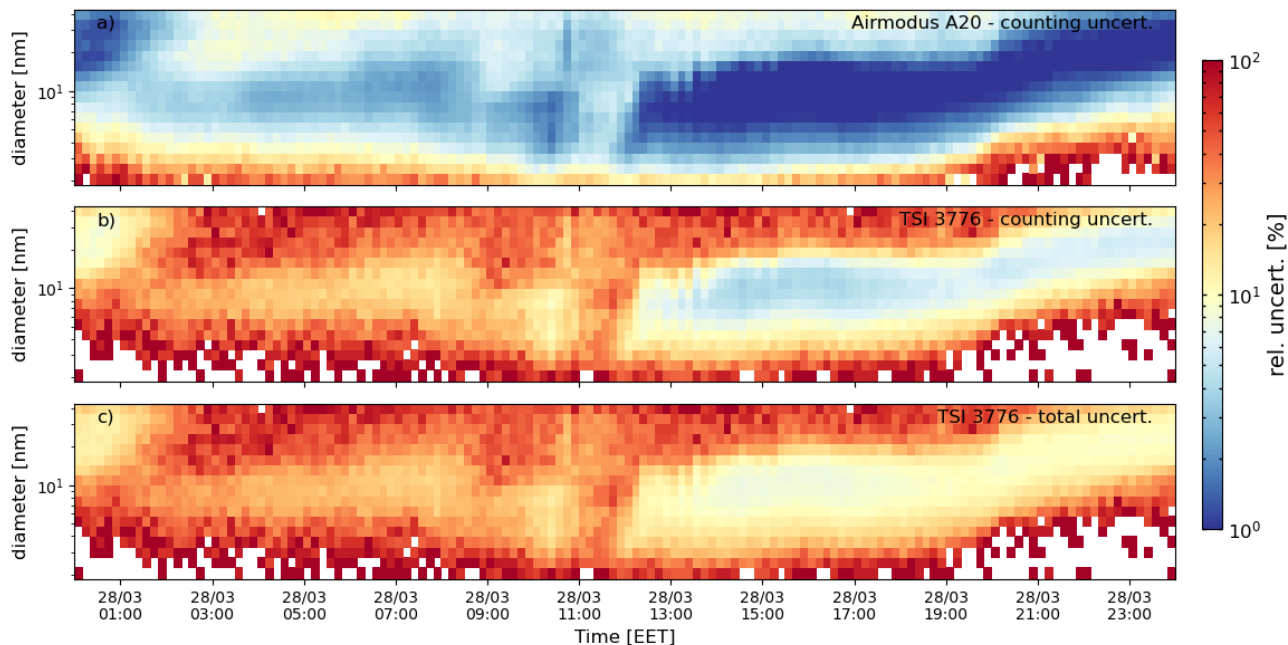


Figure S2. Relative uncertainty ($\Delta N/N$ in %) of each individual size-distribution measurement (at a certain diameter, i.e. fixed DMA voltage and time) during the 28th March 2017 (strong NPF event day) with the relative uncertainty calculated from the counts measured in the modified Airmodus A20 assuming a Poisson counting error only (a), calculated from the counts measured in the TSI 3776 assuming a Poisson counting error only (b), and calculated from the counts measured in the TSI 3776 assuming a total error as shown in Fig. 8. Zero counts are assigned no error and remain white.

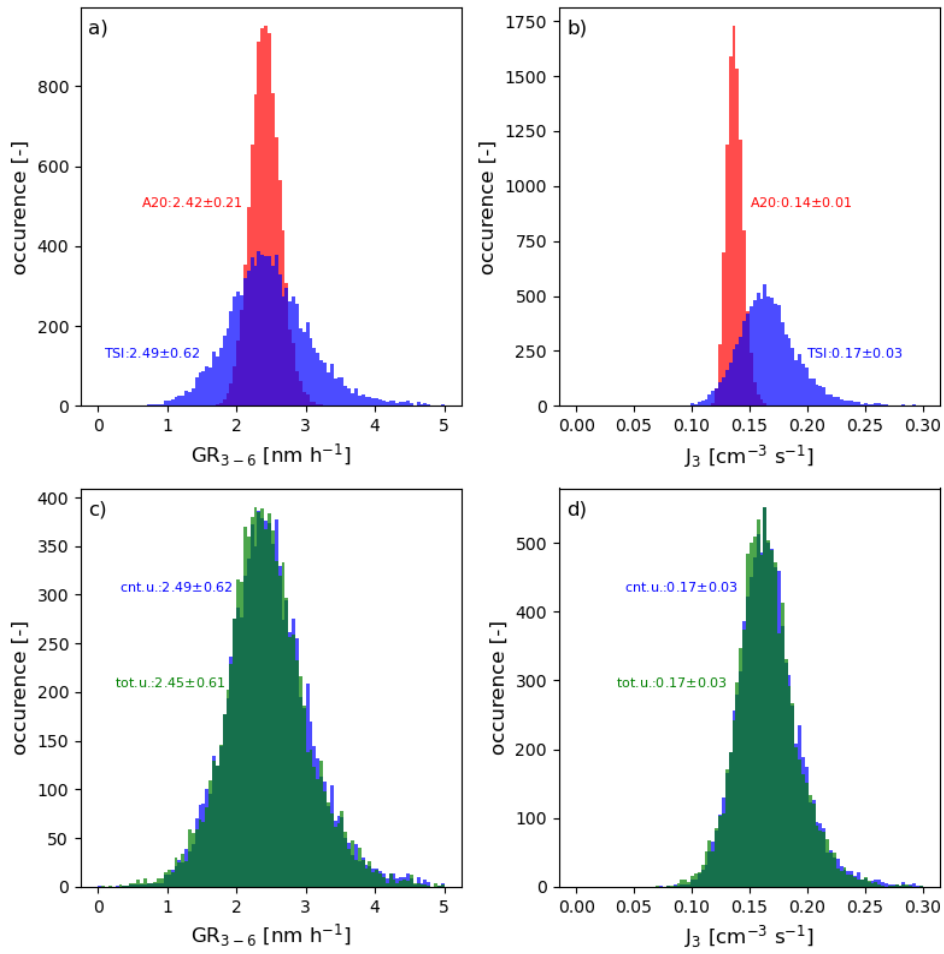


Figure S3. Results from the Monte Carlo simulations testing the influence of a pure counting error and an additional measurement error on the size distribution-derived quantities J_3 and GR_{3-6} for a weaker NPF event ($J_3 \sim 0.15 \text{ cm}^{-3} \text{ s}^{-1}$). The histograms of the Monte Carlo results for the GR_{3-6} (a) and (c) and J_3 (b) and (d) are shown. The red histograms correspond to values derived from the modified Airmodus A20 data assuming only a counting error, the blue histograms correspond to values derived from the TSI 3776 data assuming only a counting error, and the green histograms correspond to values derived from the TSI 3776 data assuming the total error upper estimate as given via Eq. (6) and the fit of Fig. 8.