Supplement of Atmos. Meas. Tech., 16, 2771–2780, 2023
https://doi.org/10.5194/amt-16-2771-2023-supplement

Atmospheric Measurement Techniques
Open Access
EGU

Supplement of

A multiple-charging correction algorithm for a broad-supersaturation scanning cloud condensation nuclei (BS2-CCN) system

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Supplement

Table S 1. Coefficients and goodness of fit for calibration curves for dT = 8 K condition before and after applying the multiple charge correction algorithm. Three different statistical values are used for goodness of fit: Error sum of squares (SSE), coefficient determination (R^2), and root mean square error (RMSE).

Equation	$F(x) = a \times acos(b \times x) - c$	
	Before the correction	**After the correction**
Coefficient (with 95% confidence bounds)	a = 0.4056 (0.3790, 0.4322) b = 0.9534 (0.9307, 0.9760) c = 0.0464 (0.0142, 0.0786)	a = 0.3994 (0.3710, 0.4277) b = 0.9468 (0.9201, 0.9736) c = 0.0554 (0.0198, 0.0910)
Goodness of fit	SSE = 0.000403 R^2 = 0.9983 RMSE = 0.005565	SSE = 0.000421 R^2 = 0.9982 RMSE = 0.005694

Coefficients and goodness of fit were calculated by the MATLAB curve fitting toolbox 3.5.8.

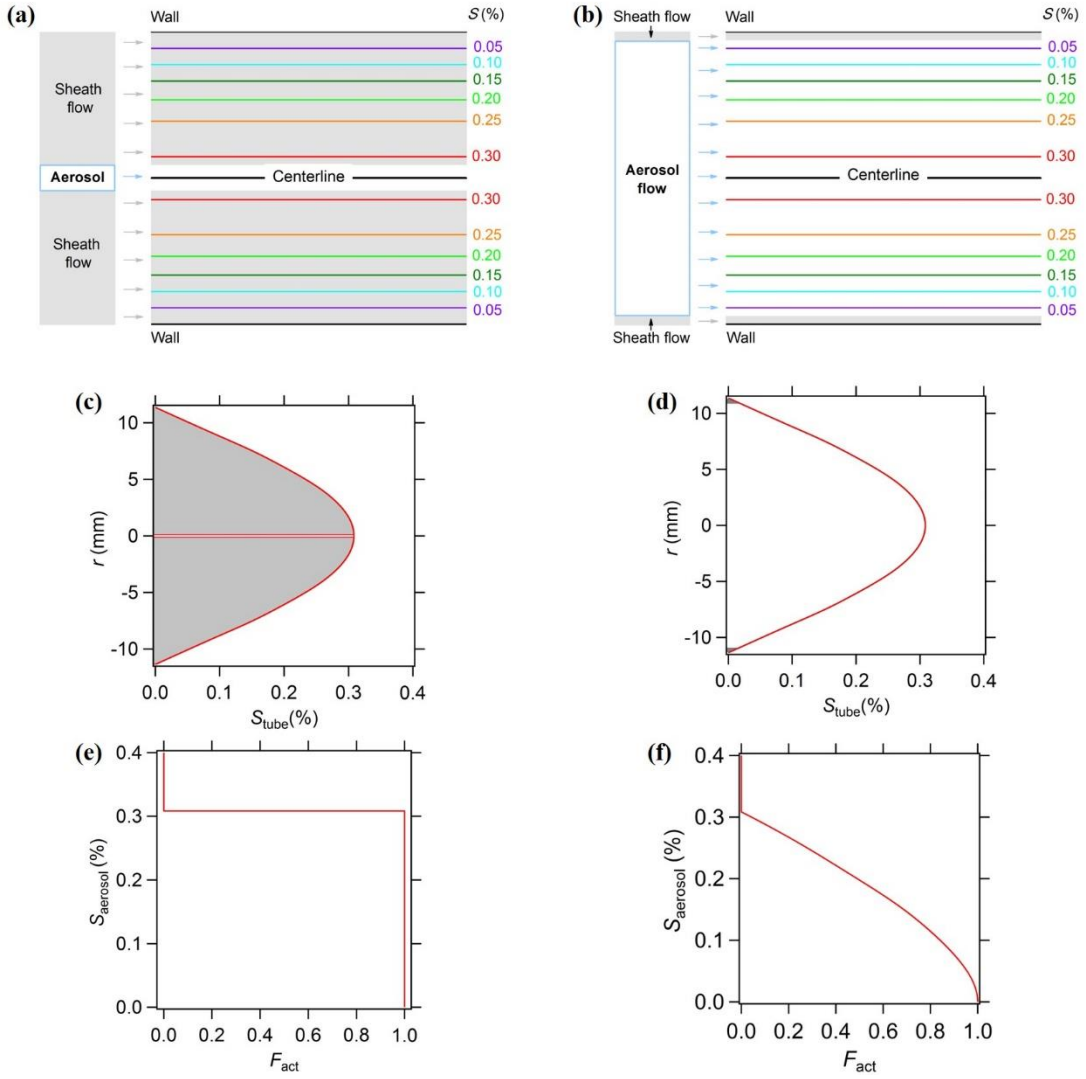

Figure S 1. Schematics of typical CCN ((a), (c) and (e)) and BS2-CCN measurement ((b), (d) and (f)). (a) and (b) Contour of supersaturation in the CCN activation unit and configuration of aerosol and sheath flow; (c) and (d) Distribution of supersaturation in the activation unit (S_{tube}). r is the radial distance to the centerline. The shaded areas represent the sheath flow part, and non-shaded areas represent the aerosol flow part. (e) and (f) Plot of the activation supersaturation of aerosol particles S_{tube} against the activation fraction F_{act}. Reprinted from Su et al., (2016) under the Creative Commons Attribution 4.0 License.

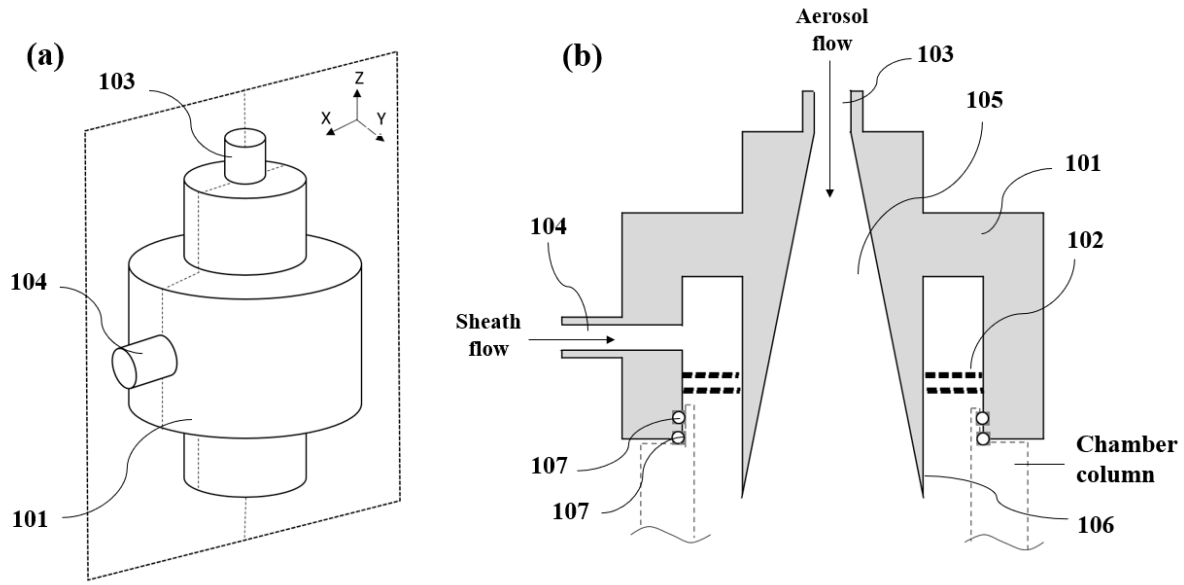

Figure S 2. (a) Front perspective view of an embodiment of the diffusive inlet. (b) Longitudinal sectional (the cross section in X-Z surface) view of Fig.A1 (a). Each of numbers in the figure is as follows: main body (101), a sheath flow straightener (102), an aerosol inlet (103), a funnel-shaped region (105) where the cross-section of the aerosol is smoothly expanded, the angle (106) of the wall of the funnel-shaped region, the inlet of sheath air (104) at the side of the main body and two rubber O-rings (107) at the lower end of the main body to keep the activation tube air-tight. Reprinted from Kim et al., (2021) under the Creative Commons Attribution 4.0 License.

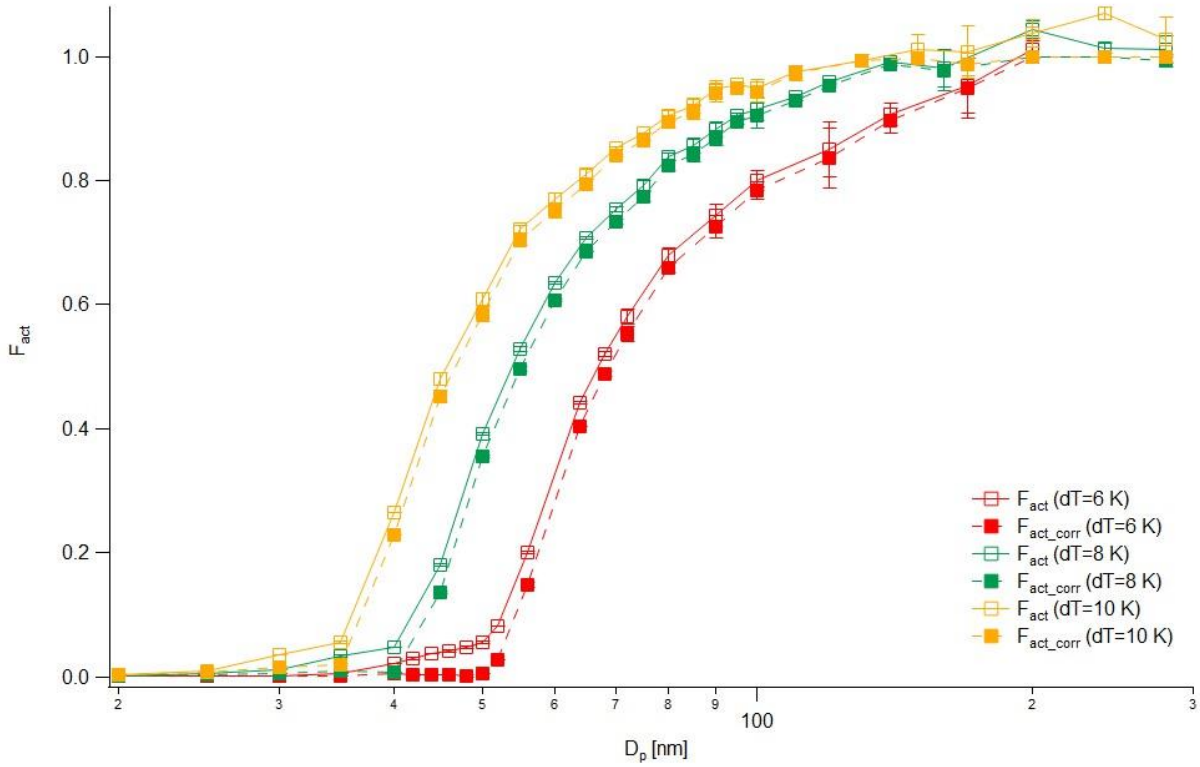

Figure S 3. Activation fraction (F_{act}) curve for dT = 6K (red), 8K (green) and 10K (orange). Square and error bar indicate the average and standard deviation of measurement points, respectively. Solid and dashed line with squares indicate results before and after the correction.

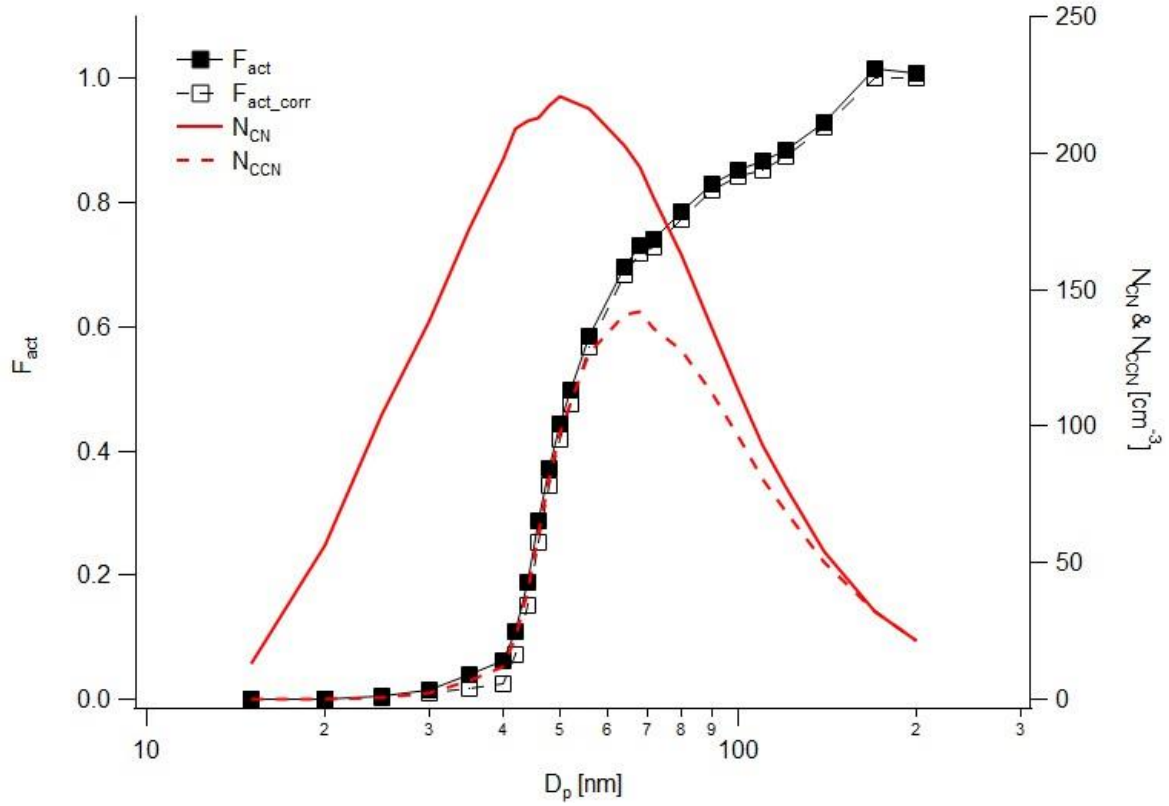

Figure S 4. Particle (red solid line) and CCN (red dashed line) number size distribution, and activation fraction (F_{act}) curve before (black solid line) and after (black dashed line) correction for dT = 6 K of sodium chloride (NaCl) particles. Squares indicate measurement points.