SI1:

The size-resolved elemental carbon (EC) concentrations are derived by offline analysis of BERNER impactor filters. The samples were only taken during cloud events. The sampling time periods spans from 15, September, 2010 to 24, October, 2010. In total, 10 size-resolved samples were collected. The mean size-resolved EC concentrations are used to simulate the EC mass size distribution function.

Step 1: To convert the size-resolved EC concentration (M) to particle mass size distribution (dM/dlogDp).

$$dlogD_p = \log(D_p 2) - \log(D_p 1) \qquad [1]$$

here DP1 and DP2 are respectively the lower and upper cut-off diameters of each stage, as given in Table 1. For example, in the first stage, Dp1 and Dp2 are 50 and 140 nm, respectively. dM is EC mass concentration for each stage.

The geometric mean value (Dp,m) of upper and lower diameters presents the mean diameter for each stage.

$$D_{p,m} = \sqrt{D_p 1 \times D_p 2} \qquad [2]$$

Table 1:

stages	1	2	3	4	5
Size ranges, nm	50-140	140-420	420-1200	1200-3500	3500-10000
$D_{p,m}$, nm	83.67	242.49	709.93	2049.39	5916.08

Step 2: To utilize the Interpolating Polynomial method to simulate EC mass size distribution with bin of 5 nm from 50 to 6000 nm. The Piecewise Cubic Hermite Interpolating Polynomial (PCHIP) method is used here. The comparison of dM/dlogDp between calculated in step 1 and simulated by PCHIP function is shown in Fig. 1.

Step 3: To integrate the curve shown in Fig.1 for the size ranges in question to estimate the mass concentration.

$$M_i = \int_{dp2}^{dp1} dM/dlogDp \times dlogDp \qquad [3]$$

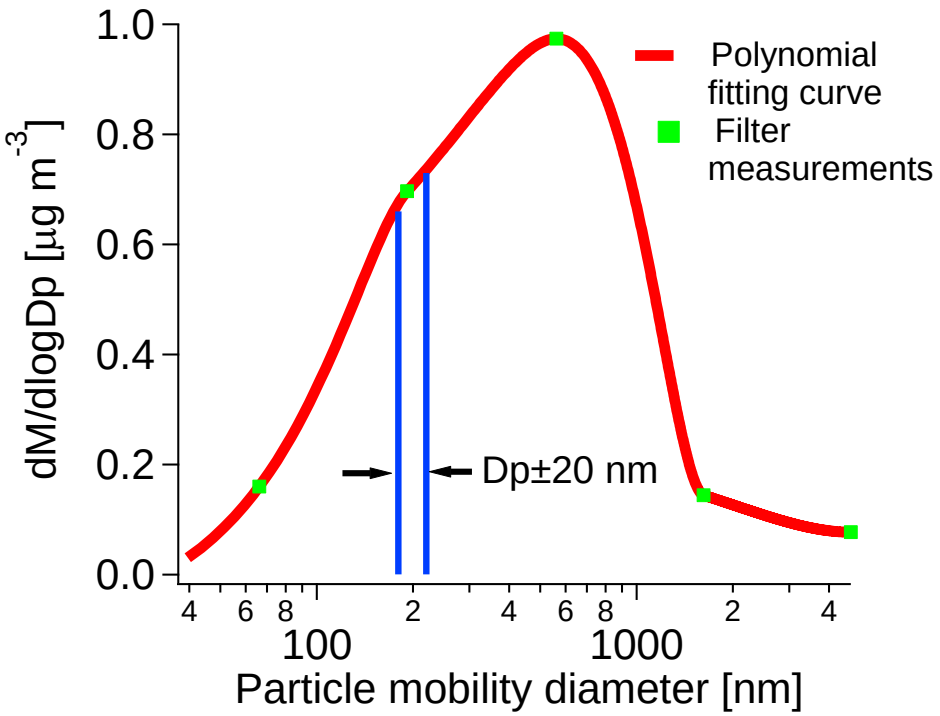

Fig.1 : Red line is produced by PCHIP function. Green dots are dM/dlogDp derived from Berner measurements. Here, the particle aerodynamic diameter was converted to mobility diameter by division of particle density (1.6 g/cm^3).

SI2:

The uncertainty of supersaturation in CCN counter is quantified using the following method. The data from calibrations (standard salt: ammonium sulfate) done for our CCNc were collected and evaluated together, as show in Fig. 2. Within 95% confidence range, the uncertainty for supersaturations $\geqslant$ 0.2% is 0.068*SS. For supersaturations < 0.2%, the same absolute uncertainty as for 0.2% was assumed: (0.1 +/- 0.014)%.

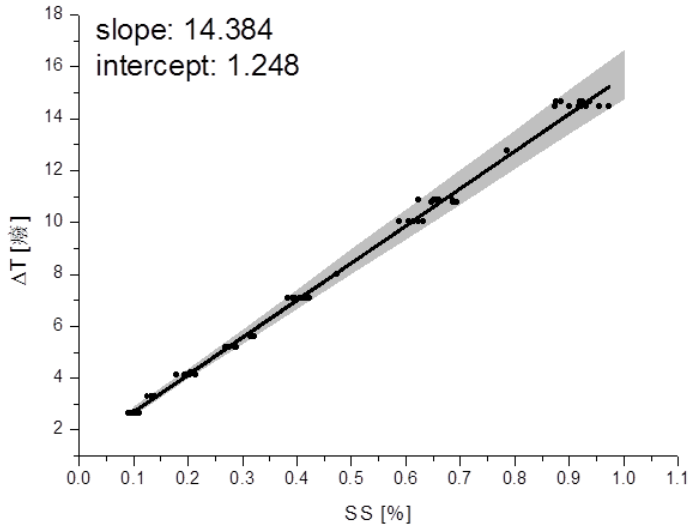

Fig. 2: The relationship between ΔT and supersaturations (SS). The grey area shows the uncertainty in the derived supersaturations with the 95% confidence range.