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Measurement report: Cloud processes and the transport of biological emissions affect southern ocean particle and cloud condensation nuclei concentrations

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S1. Derivation of Critical Supersaturation with UHSAS and CCN concentration.

The following equation is used to derive the hygroscopicity parameter for ambient particles,

$$\kappa = \frac{4A^3}{27D_{UHSAS}^3(\ln S_c)^2}, A = \frac{4\sigma M_w}{RT\rho_w}$$

where ρ_w is the density of water, M_w is the molar mass of water, σ is the surface tension of water, R is universal gas constant and T is the absolute temperature (273.15 K), D_{UHSAS} is the smallest diameter measured by the UHSAS (0.07 µm) and S_c is the critical supersaturation in which the CCN concentration is equivalent to the total UHSAS concentration (see Figure S1). This equation is similar to that of Petters and Kreidenweis (2007), which uses the dry diameter at which the CCN reaches 50% of the total particle number concentration at a specified supersaturation as the activation diameter. Here, instead of determining the activation diameter from a specified supersaturation we are determining the critical supersaturation for a specified activation diameter (0.07 µm).

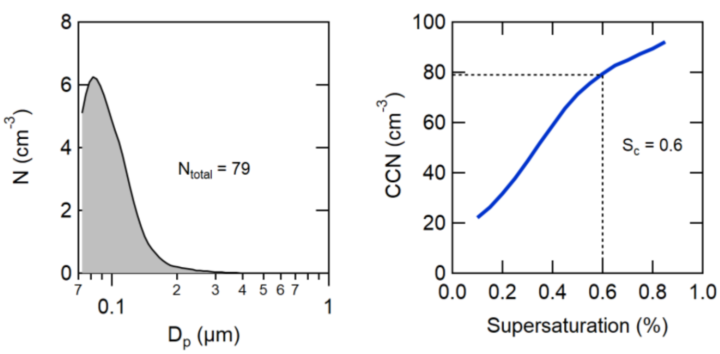

Figure S1. The UHSAS number distribution (left) is integrated to determine the number of particles greater than 0.07 µm (79 cm-3). Then the CCN critical supersaturation is determined with the CCN spectra (right), by identifying when the total UHSAS concentration was equivalent to the CCN concentration.