Closure between HALO measured CCN(S), cloud base updraft and cloud droplets concentration

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During CHUVA-ACRIDICON campaign over the Amazon basin the HALO aircraft measured the spectra of CCN(S), cloud base updraft (W) and droplets concentration (Nd). Since the combination of CCN(S) and W determine Nd and the supersaturation (S), we could calculate the consistency between the measured and theoretical relationships among these measurements. However, W and Nd have large variability along a cloud pass. We have to find the statistical representation of the range of values of measured W and Nd that fulfill best the closure. For example, our previous studies showed that $W^* = \int W^2 / \int W$ represents best the integrated properties of the cloud drops. Predicting N_d by application of W* to the measured CCN(S) matches best the 66th percentile of the measured N_d, which is defined as N_d^{*}.

Characterizing the CCN(S) and the cloud by W* and Nd* provides a fairly complete description of its base properties. Using Nd* is useful for identifying which of the measured Nd from the various instruments that measured it is likely to be closest to the true value. W* and Nd* are useful for both validating explicit cloud models and parameterizing models that cannot resolve the individual clouds.