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# Long-term observations of cloud condensation nuclei in the Amazon rain forest

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Size-resolved long-term measurements of atmospheric aerosol and cloud condensation nuclei (CCN) concentrations and hygroscopicity were conducted at the remote Amazon Tall Tower Observatory (ATTO) in the central Amazon Basin over a full seasonal cycle (Mar 2014 - Feb 2015). The measurements provide a climatology of CCN properties characteristic of a remote central Amazonian rain forest site [1,2].
The CCN measurements were continuously cycled through 10 levels of supersaturation (S = 0.11 to 1.10 %) and span the aerosol particle size range from 20 to 245 nm. The particle hygroscopicity exhibits a pronounced size dependence with lower values for the Aitken mode ($\kappa$Ait = 0.14 $\pm$ 0.03), higher values for the accumulation mode ($\kappa$Acc = 0.22 $\pm$ 0.05), and an overall mean value of $\kappa$mean = 0.17 $\pm$ 0.06, consistent with high fractions of organic aerosol.
The hygroscopicity parameter, $\kappa$, exhibits remarkably little temporal variability: no pronounced diurnal cycles, only weak seasonal trends, and few short-term variations during long-range transport events. In contrast, the CCN number concentrations exhibit a pronounced seasonal cycle, tracking the pollution-related seasonality in total aerosol concentration. We find that the variability in the CCN concentrations in the central Amazon is mostly driven by aerosol particle number concentration and size distribution, while variations in aerosol hygroscopicity and chemical composition matter only during a few episodes.
For modelling purposes, we compare different approaches of predicting CCN number concentration and present a novel parameterization, which allows accurate CCN predictions based on a small set of input data.
In addition, we analyzed the CCN short-term variability in relation to air mass changes as well as aerosol emission and transformation processes. The CCN short term variability is presented for selected case studies, which analyze particularly interesting and characteristic events/conditions in the Amazon region.

References:
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[2] Pöhlker, M. L.., et al. (2016), Atmos. Chem. Phys., 16, 15709-15740.