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High-altitude cloud characteristics in tropical deep convective clouds from Aircraft observations

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Cloud dynamical and microphysical characteristics are among the critical aspects that still produce the largest uncertainty in weather and climate models. Beyond the inherent technical limitations of these models, a major factor contributing to this uncertainty is the lack of sufficient in situ observations of cloud characteristics. Here, we use high-altitude aircraft observations from the ACRIDICON-CHUVA campaign near tropical deep convective clouds to examine the cloud characteristics and understand the dynamical and microphysical aspects. We analyse several critical parameters, including in-cloud vertical velocity, cloud water content, and particle size distribution to quantitatively explain the cloud properties. This is done through identifying updrafts and downdrafts using vertical velocity observations. In this study, a draft is defined as a region with a continuous non-zero positive or negative vertical velocity value maintained for 500 meters. Our analyses show that the updrafts and downdrafts have very similar cloud water content, along with a comparable mean cloud particle distribution, which could indicate mixing between drafts. Furthermore, we observe supersaturated regions with respect to ice in the high-altitude downdrafts, which suggests that latent cooling from sublimation might not be the driving factor of these downdrafts. Detailed discussions on these results will be presented during the conference.