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Global in-situ cloud phase observations during the airborne Atmospheric Tomography mission and A-LIFE field experiment

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Clouds are an important contributor to the uncertainty of future climate predictions, partly because cloud microphysical processes are still not fully understood. Interhemispheric observations, providing a dataset to investigate these cloud microphysical processes, are surprisingly rare - in particular observations using the same instrumentation on a global scale.

Between 2016 and 2018, the ATom (Atmospheric Tomography; 2016-2018) mission and the A-LIFE (Absorbing aerosol layers in a changing climate: aging, lifetime and dynamics; 2017) field experiment performed extensive airborne in-situ measurements of aerosol and cloud microphysical properties in the atmosphere up to approx. 13km altitude on a global scale. Profiling of the remote atmosphere over the Pacific and Atlantic Oceans from about 80°N to 86°S during ATom and systematic sampling of the region in the Mediterranean during A-LIFE provides a combined dataset of nearly 60h of measurements inside clouds.

We developed a novel cloudindicator algorithm, which utilizes measurements of a second-generation Cloud, Aerosol and Precipitation Spectrometer (CAPS, Droplet Measurement Technologies), relative humidity and temperature. It automatically detects clouds and classifies them according to their cloud phase.

In this study we present the novel cloudindicator algorithm and the combined dataset of ATom and A-LIFE global scale in-situ cloud observations. Furthermore, we show results of the cloud phase analysis of the extensive dataset.