



The local environment of ice particles in arctic mixed-phase clouds

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During the RACEPAC field campaign in April and May 2014, research flights were made with the Polar 5 and Polar 6 aircraft from the Alfred Wegener Institute in Arctic clouds near Inuvik, Northwest Territories, Canada. One flight with the Polar 6 aircraft, done on May 16, 2014, flew under precipitating, stratiform, mid-level clouds with several penetrations through cloud base. Measurements with HALOHolo, an airborne digital in-line holographic instrument for cloud particles, show ice particles in a field of other cloud particles in a local three-dimensional sample volume ($\sim 14 \times 19 \times 130 \text{ mm}^3$ or $\sim 35 \text{ cm}^3$). Each holographic sample volume is a snapshot of a 3-dimensional piece of cloud at the cm-scale with typically thousands of cloud droplets per sample volume, so each sample volume yields a statistically significant droplet size distribution. Holograms are recorded at a rate of six times per second, which provides one volume sample approx. every 12 meters along the flight path. The size resolution limit for cloud droplets is better than $1 \mu\text{m}$ due to advanced sizing algorithms. Shown are preliminary results of, (1) the ice/liquid water partitioning at the cloud base and the distribution of water droplets around each ice particle, and (2) spatial and temporal variability of the cloud droplet size distributions at cloud base.