

Comparison of Concurrent Radar and Aircraft Measurements of Cirrus Clouds

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The North Dakota Citation Research Aircraft conducted measurements of cirrus cloud particles produced by Florida thunderstorms in 2015 (CAPE2015 field project). The CAPE2015 field project observed pure ice particles between an altitude of 29,000 and 40,000 ft during eight research flights. Cloud sampling instruments included the two-dimensional stereographic probe (2D-S) and the Nevzorov hot wire probe (Nevzorov). Remote sensing observations were made by the US Navy's Mid-Course Radar (MCR) using both a narrowband (37 m resolution) and a wideband (0.546 m resolution) beam. The wideband beam was set such that it tracked just ahead of the aircraft as the aircraft flew over the MCR, thus enabling in-situ and remote measurements to be obtained concurrently. Analysis includes a direct comparison between derived reflectivity from in-situ probe data and measured narrowband MCR reflectivity. The derived radar reflectivity is calculated using data from aircraft cloud sampling instruments and compared to MCR narrowband reflectivity when the MCR is operated in a vertical stare mode and when the aircraft is within 10 nautical miles from the MCR. Results show that direct comparisons between the derived aircraft and measured narrowband reflectivity is problematic, and a statistical comparison between these data sets is required. The research project also includes particle habit classification to more accurately calculate reflectivity from the in-situ probes and a direct comparison between the wideband MCR and derived reflectivity data sets.