Geophysical Research Abstracts
Vol. 20, EGU2018-11912, 2018
EGU General Assembly 2018

Observations of Ice Particles in using Concurrent Radar and Aircraft Measurements

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The Citation Research Aircraft conducted measurements of cirrus cloud particles in Florida thunderstorm anvils during 2015 (CAPE2015 field project). During the CAPE2015 field project, ice particles were observed between an altitude of 29,000 ft and 40,000 ft on 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 United States Navy's Mid-Course Radar (MCR) using both a 37 m resolution (narrowband) and a 0.546 m resolution (wideband) beam. The wideband beam was set such that it tracked just ahead of the aircraft as flights over the MCR were conducted, which provided concurrent in-situ and remote measurements. Analysis includes a direct comparison between derived radar reflectivity from in-situ data and measured narrowband MCR reflectivity. Radar reflectivity is derived using particle concentration from the 2D-S and particle mass from the Nevzorov when the aircraft is within 10 nautical miles from the radar. An average ice density during flight legs with constant temperature is also evaluated to determine the relationship between ice crystal density and temperature. Results show that a direct comparison between the derived aircraft and measured narrowband reflectivity is ineffective due to the large spatial variability, and a statistical comparison between these data sets is required.