In Cloud Observations of Supercooled Rain and Its Freezing

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Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX) is a field campaign conceived and conducted by Indian Institute of Tropical Meteorology during the period 2009-2012. Phase-I of CAIPEEX program has been carried out during May-September 2009 over different parts of India. An aircraft equipped with scientific instruments to measure aerosol properties, cloud microphysical properties and all the meteorological parameters have been utilized during the experiment. About 220 flight hours of data has been collected during CAIPEEX Phase-I.

Preliminary analysis of the data collected showed all liquid hydrometeors present at temperatures -12° C to 15° C. Most of the presence of rain drops is in the liquid water content range from 0.5 to 2 g/m^3. In general, rain drops were initiated when the cloud drop effective radius exceeded 12 micron. Supercooled rain dominated at the tops of young growing convective clouds even at temperatures colder than -10°C. Mixed phase hydrometeors were present at temperatures from -2° C to -18° C. The cases where mixed phase precipitation occurred at temperatures warmer than about -7°C were suspected to be associated with desert dust. Hysplit back trajectory analysis indicated presence of desert dust originated aerosols which could have acted as ice nuclei over west coast regions, where mixed phase hydrometeors were found at warmer temperatures. Ice hydrometeors only were found at temperatures extending from -10° C to -22° C. More insights into the above results will be discussed.

Keywords : supercooled rain, freezing, ice nuclei