# Triple-Frequency Airborne Radar Observations of Mid and High Latitude Clouds

*Cuong Nguyen[1], Mengistu Wolde[1], Samuel Haimov[2], Alexei Korolev[3], Leonid Nichman[1], Matthew Bastian[1], Natalia Bliankinshtein[1], Ivan Heckman[3]

1. Flight Research Laboratory, National Research Council Canada, Ottawa, Canada, 2. Department of Atmospheric Sciences, University of Wyoming, Wyoming, USA, 3. Environment and Climate Change Canada, Toronto, Canada

The two existing space-borne atmospheric radars in operation, namely GPM DPR and CloudSat, have been providing valuable data sets for characterizing cloud and precipitation systems and their evolving processes globally. However, it is also well recognized that GPM radars do not have adequate sensitivity (14.5 dBZ at Ku and 16.5 dBZ at Ka) to detect shallow precipitation that is dominant in mid and high latitudes. Moreover, the GPM DPR only provides dual-frequency measurements between 65˚ N-S. The CloudSat is more sensitive to those systems than the GPM but the interpretation of single frequency radar observations is challenging; especially in mixed phase conditions where microphysical properties of the medium (e.g. density, size and shape) vary largely. In this study, we present preliminary analysis of near-coincident triple-frequency (X, Ka and W-band) airborne radar and in-situ cloud microphysics data of cloud and precipitation systems from airborne campaigns collected in mid-latitude and Arctic regions, using the NRC Convair-580 research aircraft. The research flights were conducted during the fall of 2018 and winter of 2019 covering a wide geographical region and microphysical conditions, at temperature ranges between -45˚ to 5˚C. This presentation will focus on triple frequency radar signatures of different particle types and mixed phase conditions as compared to modeling studies.

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