NRC AIRBORNE W AND X-BAND (NAWX) RADAR CAPABILITIES AND PERFORMANCE

Mengistu Wolde[1] and Andrew L. Pazmany[2]

[1]*Flight Research Laboratory, National Research Council (NRC), Ottawa, Canada*
[2]*ProSensing, Inc., 107 Sunderland Road, Amherst, MA 01002, USA*

ABSTRACT

The National Research Council of Canada (NRC), in cooperation with ProSensing Inc., developed a state-of-the-art dual frequency airborne radar system for atmospheric and flight safety research for its Convair-580 research aircraft. The NRC Airborne W and X-band (NAWX) radar system has polarimetric and Doppler capabilities at both wavelengths and can switch electronically between zenith, nadir and side looking antennas. Using a motorized reflector plate, the zenith W-band antenna is also able to scan -5° aft to +45° forward in horizontal and vertical directions, to provide dual-Doppler capability in the side and nadir directions at W-band. Using 0.7 degree beamwidth antennas, NAWX W-band radar is designed to collect high resolution polarimetric and Doppler measurements in various cloud conditions. Unique features of the W-band radar include:

- Space qualified EIK tube with 3% duty cycle
- Dual-Doppler capabilities in the Nadir and Starboard side plane along the flight line
- Digital chirp and pulse compression – improved sensitivity
- Pulse-to-pulse Frequency Hopping – ensure sample independence in high PRF operations

Since the completion of the NAWX radar integrations on the NRC-Convair 580 in January 2007, the NAWX radar system has been successfully used in three major cloud study projects.

This paper provides details of the NAWX radar capabilities and performance in various environmental conditions. The specific topics that will be addressed in the paper include:

- Validation of Least Mean Squared (LMS) pulse compression filters/algorithms in minimizing the range sidelobes outside a specified main lobe region.
- Near-coincident measurements with CloudSat W-band radar: Comparison and interference issues
- Dual-frequency measurements in various cloud conditions allowing retrievals of cloud microphysical properties and inferences of cloud processes
- Calibration and radar stability – challenges and success