10.4 AIRBORNE IMPLEMENTATION OF PDPP TECHNIQUE ON THE NRC W-BAND RADAR

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As part of an ESA Doppler Wind Radar Demonstrator Project, the NRC Airborne W-band (NAW) radar was recently upgraded with a new power supply modulator and a radar control card that allow operating the NAW radar in Polarization Diversity Pulse Pair (PDPP) mode. Although the PDPP technique was demonstrated successfully in ground based systems, the NAW radar is the first airborne system with successful implementation of the PDPP mode. The NAW radar antennae sub-system consists of three fixed Gaussian Optics Lens antennae and a two-axis reflector housed in an external radome. For the PDPP demonstration, the NAW dual-polarization side-looking antenna and combination of the dual-polarization aft-looking antenna and a reflector are used. With a careful selection of aircraft maneuvers, extensive PDPP dataset was collected in 2016-2017 over a diverse weather and surface conditions.

For the NAW PDPP upgrade, a hybrid PDPP and conventional pulse-pair operating mode was implemented using the previously available NAW PP10 pulsing mode. In this new PDPP mode, sequence of H/V and V/H polarization diversity pulse-pairs are transmitted interleaved with conventional staggered PRT H/H and V/V pulse-pairs. The radar control board (RCB) does not trigger the data system at the second PDPP pulses, so the data system real-time processes the measured data using the currently available PP8 algorithm. The main NAW upgraded features include, the ability to transmit double pulsing with short spacing as low as 5 μs and recording of the raw IQ radar data in PDPP mode. The PDPP mode is also tested at 6, 12, 20 and 40 μs separations.

In this paper, we present summaries of our fight data that provides unique observations of radar cross-section of various surfaces up to 80 degrees incidence angle and measured Doppler velocity exceeding 100 m/s from a moving platform for the first time.