

Opportunities for Polar Cap Science Using Coordinated RISR-C and RISR-N Experiments

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The Resolute Bay Observatory (RBO) includes two Advanced Modular Incoherent Scatter Radar (AMISR) faces: the southward pointing Resolute Bay ISR Canadian face (RISR-C) and the northward pointing RISR-N. RISR-N has been operational since 2009, and RISR-C is fully operational as of August 2015. Coordinated science experiments using both faces began in 2016. This presentation will describe the combined capabilities of the two faces and discuss the opportunities they present for future polar cap ionospheric research. Resolute Bay is located at 83 degrees magnetic latitude, and the union of the fields of view of the two AMISRs cover nearly 15 degrees of geomagnetic latitude from approximately 75 degrees magnetic latitude up almost to the geomagnetic pole. The radars can also probe a common volume in the vertical direction. RISR-C and RISR-N are both electronically steerable phased array radars. The facility furthermore has a 4.0 MHz wide frequency allocation centered at 442.9 MHz, which allows for experiments requiring extensive frequency diversity. The radar pulses are synchronized to transmit simultaneously, typically on frequencies separated by 0.4 MHz, such that the radars are probing two different directions at once on every pulse. Most of the coordinated experiments so far have either utilized a “world day” or “imaging” mode. The world day mode uses 11 beams per radar (22 total), and a combination of an alternating code experiment on one frequency channel and two long pulse experiments on two independent frequency channels. This mode is particularly good for studying polar cap convection. Line-of-sight velocity measurements from both radars can be combined into vector velocity estimates over a large area. The imaging mode uses 51 beams per radar (102 total) and three long pulse experiments on three independent frequency channels. This mode is good for imaging polar cap patches and other density structures. The full scientific potential of this facility has only begun to be explored, and we are soliciting requests for new experiments from the broad geospace community.