

Variations in polar Doppler spread characteristics

Angeline G. Burrell^{*(1)}, Clayton E. Coker⁽¹⁾, and David Siskind⁽¹⁾

(1) Space Science Division, U.S. Naval Research Laboratory, Wash., DC, 20375

Doppler spread, a measure of broadening of the Doppler spectrum, can be caused by hardware considerations such as the radar resolution and length of the integration time, as well as geophysical conditions such as velocity gradients, vertical ionospheric motion, and the turbulent motion induced by plasma instability mechanisms. Previous statistical studies have found a strong dependence of Doppler spread from ionospheric backscatter (or its frequency-independent equivalent spectral width) on location and time. This study examines the variations in Doppler spread of 1/2-F ionospheric backscatter observed in the polar cap in 2017, a year of moderate solar activity at the end of the descending phase of the 24th solar cycle.

This study uses observations from two high frequency (HF) radars located at Inuvik and Clyde River. These radars are a part of the Canadian portion of the Super Dual Auroral Radar Network (SuperDARN), a network of HF radars whose combined coverage encompasses northern and southern high-latitudes, and much of the northern mid-latitudes. The HF radars at Inuvik (INV) and Clyde River (CLY) have fields of view that look East and West, respectively, and overlap along the 255°E geographic meridian. In 2017 these radars regularly operated in an observational mode that swept through their entire field of view at a 2 min cadence using frequency bands at 10 and 12 MHz. This study uses observations along the geographic meridian shown in Figure 1 to examine the local time, seasonal, and latitudinal variations in spectral width. Preliminary results demonstrate strong local time variations in Doppler spread that are affected by both season and latitude.

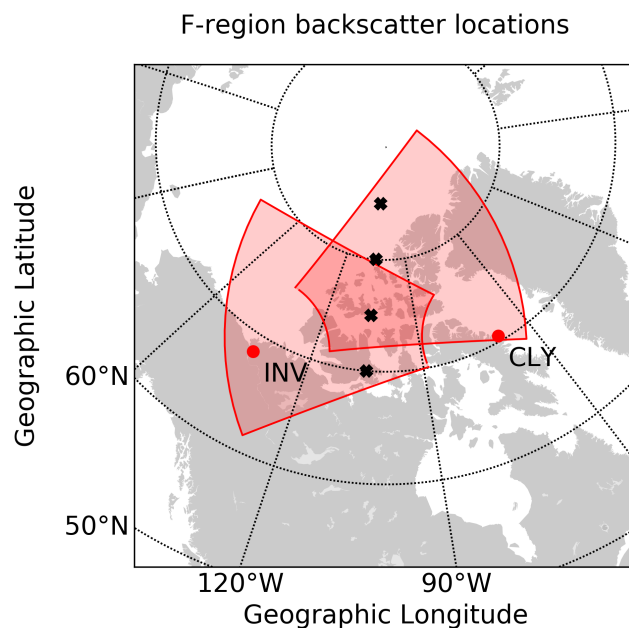


Figure 1. SuperDARN radar locations (red circles) and $\frac{1}{2}$ F fields of view (red fans) for Inuvik and Clyde River with locations along the geographic meridian of interest marked by black crosses.