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Progress towards a polar-cap patch detection algorithm using SuperDARN data

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A polar cap patch is defined operationally as an enhancement in plasma density within the high-latitude Fregion of the ionosphere, having spatial scale of the order of 100 km and featuring a density that exceeds twice that of the surrounding ionosphere. The occurrence of patches at high latitudes is important for two main reasons. First, they arise from complex interactions in the magnetosphere-ionosphere-thermosphere (M-I-T) system. Second, patches are suspected to act as a strong High Frequency (HF; 3 - 30 MHz) scintillation source in the high-latitude ionosphere. This scintillation appears in the form of ionospheric backscatter due to field-aligned-irregularities seeded by the patch, and also deviations from great-circle path trajectories due to the strong horizontal plasma density gradients inherent to patches. Despite the clear need to monitor polar cap patches actively, an automated method for detecting them using HF instruments has not yet been developed. In this study, we present the progress made towards understanding the patches' signature within HF backscatter signal obtained by the Super Dual Auroral Radar Network (SuperDARN), a radar system that provides real-time observations across northern and southern high- and mid-latitudes.

Keyword-1

SuperDARN

Keyword-2

Polar

Keyword-3

Polar-cap patch

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