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Real Heights of SuperDARN Echoes Estimated From Electron Density Data

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The actual heights of the SuperDARN echoes have never been systematically estimated. The main difficulty is that the HF signals experience a strong ionospheric refraction, so that even accurate angle-of-arrival measurements provide information only on their virtual height. In this study, we use elevation angle data at 10- and 12-MHz frequency bands from Rankin Inlet (RKN) SuperDARN radar to estimate electron density values at the scatter locations. Matching these densities with those from collocated altitudinal profiles measured by the Resolute Bay incoherent scatter radar (RISR) allowed for estimation of the actual height of the HF radar echoes. Our analysis show that typical heights of RKN echoes are at 220-250 km above the ground. The echoes are, on average, 40-50 km below the F region peak, with larger differences occurring at larger maximum F-layer densities. Echoes in the 12-MHz frequency band are typically 5 km higher than those at 10 MHz. Some minor tendencies in the diurnal variations of echo heights and seasonal differences are identified and discussed.

Keyword-1

ionosphere

Keyword-2

SuperDARN

Keyword-3

echo height

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