



Ionospheric Scintillation Observed with the Canadian High-Arctic Ionospheric Network

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The Canadian High-Arctic Ionospheric Network (CHAIN) is an array of ground-based optical and radio instruments in the polar cap to study the dynamics of the solar wind–magnetosphere–ionosphere interaction causing ionospheric effects including radio scintillation. Dual frequency receivers, configured to measure amplitude and phase scintillation from the L1 frequency GPS signals and ionospheric total electron content (TEC) from the L1 and L2 frequency GPS signals, are used. These receivers are capable of obtaining scintillation and TEC measurements from up to 10 GPS satellites in view. Phase and amplitude data are sampled at a rate of 50 Hz and the amplitude scintillation S4 index and phase scintillation index are computed over 60 s. The focus of the study is on the ionospheric structure at high temporal resolution and spatial scales from 1000 km down to 1 m affecting radio propagation of satellite signals that can have detrimental impact on operation of navigation and communication systems. The study also uses data from Polar Dual Auroral Radar Network (PolarDARN), Canadian Advanced Digital Ionosondes (CADIs) and the 250-MHz satellite beacon receiver in Thule, Greenland. Results based on the 250-MHz scintillation S4 index, HF radar and ionosonde data show that polar cap patches of enhanced ionospheric plasma density are a primary source of HF radar backscatter and scintillation-causing irregularities in the polar ionosphere. The seasonal and universal time dependencies of the occurrence frequency of the fixed-frequency ionosonde F-region echoes, the HF radar backscatter and the scintillation S4 index exceeding given thresholds are all very similar, and in general agreement with the model dependencies of the patch-to-background NmF2 ratio (Sojka et al., 1994). When the Enhanced Polar Outflow Probe (ePOP) is launched, we will have additional in-situ measurements to further our studies of the high-latitude ionosphere.

Sojka et al., *J. Geophys. Res.*, 99(A8), 14959-14970, 1994.