



GNSS Phase Scintillation and Cycle Slips Occurrence at High Latitudes: Climatology and Forecasting

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Space weather impacts the operation of modern technology that relies on Global Navigation Satellite Systems (GNSS). Ionospheric scintillation (rapid fluctuation of radio wave amplitude and phase) degrades GPS positional accuracy and causes cycle slips leading to loss of lock that affects performance of radio communication and navigation systems. At high latitudes, GPS scintillation and total electron content has been monitored by the Canadian High Arctic Ionospheric Network (CHAIN). GPS phase scintillation and cycle slips, as a function of magnetic latitude and local time, occur on the dayside in the ionospheric cusp, in the nightside auroral oval, and in the polar cap. Interplanetary coronal mass ejections and corotating interaction regions on the leading edge of high-speed streams are closely correlated with the occurrence of scintillation at high latitudes. Results of a superposed epoch analysis of time series of phase scintillation and cycle slips occurrence keyed by arrival times of high speed solar wind streams and interplanetary coronal mass ejections are presented. Based on these results, a method of probabilistic forecasting of high-latitude phase scintillation occurrence is proposed.