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GPS phase scintillation at high latitudes following near-earth interplanetary coronal mass ejections

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Interplanetary coronal mass ejections (ICMEs) are among the most geoeffective solar wind disturbances. ICMEs can cause major geomagnetic and ionospheric storms depending on their speed, magnetic field orientation and solar energetic particle flux. One of the important ionospheric consequences is an enhanced E- and F-region irregularity, causing rapid fluctuations of the amplitude and phase of transionospheric radio waves, which can impair performance of radio communication and navigation systems including the Global Positioning System (GPS). The Canadian High Arctic Ionospheric Network (CHAIN) consists of ten GPS ionospheric scintillation and total electron content (TEC) monitors and six ionosondes. CHAIN has been operating through the latest minimum of solar activity, which is now gradually increasing and ICMEs have become more frequent. ICMEs observed in the near-Earth solar wind have been cataloged and magnetic clouds (MCs), a subset of ICMEs, have been identified (Richardson and Cane, 2010). GPS phase scintillation following the arrival of ICMEs is compared in the auroral oval, cusp and polar cap. Characteristics of scintillation occurrence in these regions differ, pointing to different irregularity production mechanisms and/or altitude.

Richardson, I. G. and Cane, H. V., Solar Phys., 264(1), 189-237, 2010.