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GNSS Probing of Local Ionospheric Disturbances in High Latitude

Abstract:

We present studies of regional ionospheric perturbations in high latitude by monitoring dual frequency signals transmitted by Global Navigation Satellite Systems (GNSS). The variations in Total Electron Content (TEC) are identified from high rate GNSS receivers placed in Ramfjordmoen and in Tromsø, Norway. The separation of the two receiver locations is approximately 14 km. This experimental setup is designed to monitor the local ionosphere simultaneously with European Incoherent Scatter (EISCAT) radars.

It has been reported that perturbations of GNSS signals can be observed in ionospheric plasma irregularities caused by High Frequency (HF) heating. During the experiments in winter 2010, HF electromagnetic pumping waves from EISCAT heating facility in Ramfjordmoen were transmitted along the geomagnetic field lines. The modification of ionosphere was observed by EISCAT UHF radar. We analyze TEC measurements from GLONASS satellites with regard to the distance between the ionospheric piercing points and estimated heated center at 200km. TEC data shows background increases over the heating cycles as well as some localized variations which may be associated with heating on/off intervals. The largest variations from the background TEC are seen during the longer heating intervals. We will also discuss other localized signal variations that seem to be related to natural origin.