Ionospheric drifts estimated using GPS scintillation data during magnetic storm on 5-6'th of April 2010

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ABSTRACT

We have analysed the ionospheric drift pattern during disturbed geomagnetic conditions on 5-6’th of April 2010 at high geomagnetic latitudes (Hornsund). The stress in the analysis is put on drift dependence on scale size of underlying electron concentration irregularities.

High-latitude ionosphere are often remarkably irregular and dynamic. For that reason, monitoring of the high-latitude scintillation is of utmost importance. With this in mind, we got involved in the MISTECS (Monitoring of Ionospheric Scintillation and Total Electron Content on Spitsbergen) project. Monitoring equipment has been installed in the Polish Polar Station in Hornsund on Spitsbergen.

In a paper (Grzesiak & Wernik, 2009) we proposed a new method of analysis of spaced receivers data, which uses the windowed Fourier transform (WFT) to take care of possible nonstationarity of data, and Radon transform (RT) that can capture characteristic linear dependence of the cross-spectrum phase on frequency, provided the scintillation pattern on the ground is drifting. The advantage of the method is that it allows to obtain frequency variations of the drift velocity even for non-stationary data.

In Figure 3 we presented the results of the dispersion analysis of ionospheric drifts of during magnetic storm on 5-6.10.2010 - the strongest in 2010. Each of the drawings illustrates the distribution of mutual phase spectrum of GPS signal phase for a couple of receivers and its Radon transform below. Portions of the data analyzed (a, b, c, d) come from various phases of the storm.

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Bibliography