Spaced receiver measurements of the high-latitude ionospheric drifts

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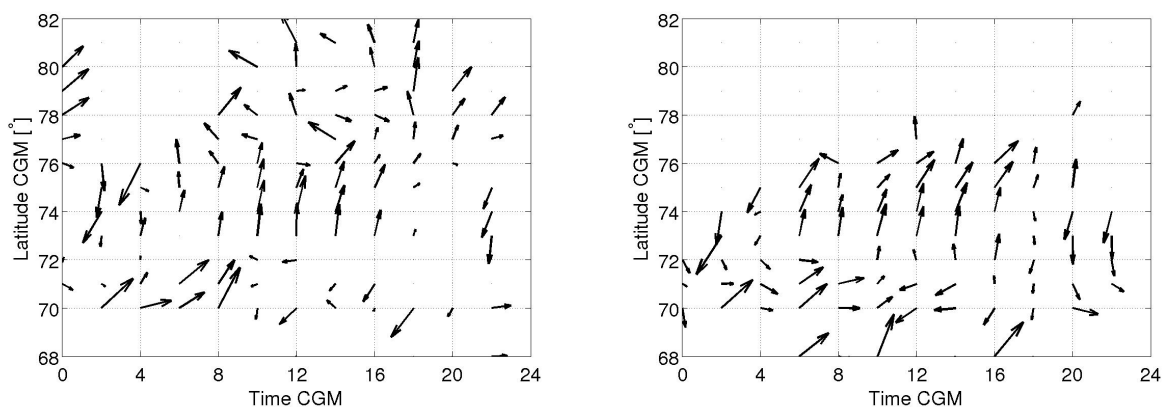
In September 2007 at the Polish Polar Station (74 N degree CGM) we started ionospheric scintillation measurements using three spaced receivers. This is a part of the project MISTECS (Monitoring Ionospheric Scintillation and Total Electron Content) (Wernik et.al. 2008). The GSV 4004B scintillation and TEC monitors (Dierendonck et al. 1993) are used. Antennae and receivers are located in the corners of geographically oriented triangle. Separation in north-south direction is 97 meters and 93 meters in east-west direction. Localization of the measurements station allows to study drift an irregularities anisotropy in both auroral oval and polar cup regions.

In present study was used measurements raw amplitude of GPS signal recorded at 50 samples per second. The time sequence was filtered with the band pass filter (0.2 -2Hz). Filter range has been estimated on the basis of spectra computed from data. The lower frequency is limited by the Fresnel frequency. The upper is determined by receiver signal to noise ratio and is the frequency where the noise level is comparable to the signal amplitude. To determine drift velocity and anisotropy parameter of scintillation was used the cross correlation method described in Briggs, 1968. Correlation and cross correlation function were calculated over 30 seconds long data segment. One hour of observation contains 220 set of correlation and cross correlation function shifted by 15 second. The drift and anisotropy were calculated only for those cases when the maximum cross correlation functions was greater than 0.5.

Plot below show drift velocity in south-north and east-west direction. Computed characteristics is a median value. The bins dimension is 2 hour in time by 1 degree in latitude The measurements were carried out during low solar activity. The data were divided into a period of low (Kp $<$ 3.5) and high magnetic activity.



(a) Kp<3.5 (b) Kp≥3.5

The obtained results shows the existence of global drift structure compatible with the ionospheric convection pattern. Around local magnetic noon the prevailing drift direction is northward, while around midnight it is northward. Maximum drift velocity reaches 500 m/s.

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1 References

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