



Relations of HF Doppler Ionospheric Monitoring with GNSS Positioning Errors

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The HF Doppler ionospheric measurements can along with identification of medium scale wave activity provide also estimation of the level of the related GNSS positioning errors.

The paper demonstrates the rise of GNSS positioning error with increasing wave activity at ionospheric heights and with changing parameters representing ionospheric waves as measured by Continuous Doppler Sounding Systems (CDSS) [1, 2, 3].

Results using state-of-the-art Septentrio GNSS receivers applying various combinations of GNSS frequencies (L1&L2&L5+SBAS as its accuracy depends on the allocated signal bandwidth and modulation schemes) confirmed in all those scenarios correlation of positioning precision with the Medium-scale Traveling Ionospheric Disturbance (MSTID) activity-related ionospheric disturbances as monitored by the CDSS.

The most significant relation was found between the CDSS Doppler frequency-shift measurements (dF), even stronger than one naturally occurring during indications of ionospheric SpreadF. In few cases of significant MSTID activity, the positioning errors reached over 10 meters for solutions without SBAS (EGNOS).

References

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