Signature of main ionospheric trough diagnosed by in situ waves measurements and GPS diagnostic during strong geomagnetic disturbances.

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The region of the main ionospheric trough is an unique region of the ionosphere, where different type of wave and instabilities can be generated and the main ionospheric trough acts like a lens focusing a variety instabilities and disturbances from a different region of the Earth’s environment. The mid-latitude electron density trough can provide useful information about dynamics and morphology of magnetosphere-ionosphere system. The satellites in situ measurements can provide comprehensive coverage in both the time and geomagnetic place effects. The aim of this presentation is to show typical main ionospheric trough signatures during extreme geomagnetic disturbances. The global time varying picture of the ionospheric trough it is possible to reconstructed using the sequence of waves spectra registered and plasma measurements in the top-side ionosphere. Different approaches in describing of this activity produce desired results. However the very high, extreme activity demands very special characterization of the conditions. For these purposes the data gathered on board of current operated satellite DEMETER and past diagnostics located on MAGION-3 spacecraft as well as TEC measurements seems to be excellent tools for analyse the signature of mid-latitude ionospheric trough phenomena during chosen extreme geomagnetic disturbances.