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Signature of main ionospheric trough diagnosed by in situ waves measurements and GPS diagnostic.

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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 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 the magnetosphere-ionosphere dynamics and can be applied for applications in Space Weather program. The satellites in situ measurements as well as the ground based complex diagnostics, 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 geomagneticcs disturbances. The global time varying picture of the ionospheric trough it is possible to reconstructed using the sequence of HF waves spectra registered in the top-side ionosphere as well as TEC measurements. 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 diagnostics tools of the turbulent plasma layers and global descriptions of near Earth plasma density seems to be excellent tools for analyse the signature of mid-latitude ionospheric trough phenomena during chosen extreme geomagnetic disturbances.