



## **Ionospheric storms monitored by ground and space based GPS techniques**

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Ionospheric storms affect accuracy, reliability and availability of global navigation satellite systems (GNSS). On the other hand, ground and space based GNSS techniques enable the capability to explore different temporal and spatial aspects of ionospheric perturbations. We discuss ionospheric perturbation features of several severe storms by combining ground and space based GPS measurements to get a more detailed view on the perturbation mechanism. Deduced is the temporal and horizontal structure of the ionosphere at both hemispheres based on 30 s sampled high latitude TEC data from the ground tracking network of the International GPS Service (IGS). Whereas the ground based measurements show strong horizontal perturbation induced convection of plasma crossing the pole from day- to night-side, the space-borne measurements on CHAMP indicate a severe vertical redistribution of the ionospheric plasma during the selected events. Presented are also some average features of ionospheric storms as observed over the European region since 10 years.