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Comparison of ionospheric plasma irregularities measured by Swarm with the ground-based GPS scintillation data

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Ionospheric irregularities are often the cause of GNSS precise positioning errors, as well as disruption of radio communications in the HF range. The reason for the occurrence of these irregularities can be various non-stationary processes in the near-Earth space plasma that depend on the response of the ionosphere to the variations in the near Earth space. Therefore, the study of ionospheric irregularities is an urgent scientific and applied problem. In this study we use a global product based on the Swarm satellite measurements that characterizes ionospheric irregularities and fluctuations. The IPIR (Ionospheric Plasma Irregularities product) provides characteristics of plasma density structures in the ionosphere, of plasma irregularities in terms of their amplitudes, gradients and spatial scales and assigns them to geomagnetic regions and consequently to predominant plasma processes. It also provides indication, in the form of a numerical value index, on their severity for the integrity of trans-ionospheric radio signals and hence the accuracy of GNSS precise positioning. In this work we made validations of the IPIR product against the ground-based measurements, focusing on GPS TEC and scintillation data in low latitudes regions.