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Power spectral analysis of plasma density fluctuations during total loss of lock of GPS signal events

, Ionospheric irregularities are fluctuations or structures of plasma density that affect the propagation of radio signals. In this work, we study the importance of plasma density irregularity intensity and scale size on satellite-based GPS signals, using plasma density and GPS measurements from the Swarm mission. We compare the probability distribution function (PDF) of the integrated power of plasma density in different frequency bands with the PDF of the integrated power of plasma density during total loss of lock events. Total loss of lock of GPS signal is a physical proxy for severe degradation of GPS signals. We show that all such events on Swarm occur in conjunction with the highest levels of density fluctuation at Swarm altitudes encountered during the entire mission. In addition to the integrated power in different frequency bands, we study the power spectra of plasma density of total loss of lock events to investigate any possible correlation.

Ionospheric irregularities; Power spectra; Total loss of lock