



Equatorial plasma irregularities, their effects on geomagnetic field and GPS signal — Swarm observations

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Equatorial plasma irregularities (EPIs) are formed by the generalized Rayleigh-Taylor instability over the geomagnetic equator, and characterized by plasma density depletions along magnetic flux tubes. Previous studies based on CHAMP observations shows that EPIs cause magnetic fluctuations in both the parallel and perpendicular components, driven by diamagnetic currents and field-aligned currents, respectively. With ESA's Swarm mission, which comprises three satellites, we investigated the scale sizes of EPIs by correlating the measurements between Swarm satellites. We found that EPIs are more fragmented at the South Atlantic Anomaly region where the ambient magnetic field is low. Our results also shows that GPS observations onboard Swarm usually drop-out when satellites encountered EPIs with large density depletions. For those EPIs with absolute density depletions larger than $1 \times 10^{12} \text{ m}^{-3}$, we found that with 95% probability, the signal from at least one GPS satellite was lost, and in up to 45% of the events only less than four GPS satellites were tracked; then precise orbit determination impossible.