



Ionospheric Turbulence and the Equatorial Plasma Density Irregularities: Scaling Features and RODI

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In the framework of space weather, the understanding of the physical mechanisms responsible for the generation of ionospheric irregularities is particularly relevant for their effects on global positioning and communication systems. Ionospheric equatorial plasma bubbles are one of the possible irregularities. Using data from the ESA's Swarm mission, we investigate the scaling features of electron density fluctuations characterizing equatorial plasma bubbles. Results strongly support the turbulent character of these structures and suggest the existence of a clear link between the observed scaling properties and the value of the Rate Of change of electron Density Index (RODI).

In addition, considering that important features of plasma bubbles such as their dependence on latitude, longitude, solar and geomagnetic activities have been inferred indirectly using their magnetic signatures, we study also the scaling properties of the magnetic field inside them. We show that the spectral features of plasma irregularities cannot be directly inferred from their magnetic signatures. A relation more complex than the linear one is necessary to properly describe the role played by the evolution of plasma bubbles with local time and by the development of turbulent phenomena. A better comprehension of the plasma bubbles dynamics and of the turbulence processes that characterize their time evolution may benefit from the use of very high-resolution vector magnetic field and plasma density measurements such as those available from the future NanoMagSat mission.