Turbulence and Plasma Inhomogeneity Observed by Swarm Constellation

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The ionospheric environment is a complex system where dynamic phenomena, such as turbulence (fluid and magnetohydrodynamics) and plasma instabilities generally occur as a consequence of the coupling processes among solar wind, magnetosphere and ionosphere. It has been suggested that the turbulent character of the ionospheric plasma density also enters into the formation and dynamics of ionospheric inhomogeneities and irregularities, which essentially characterize the active equatorial, mid-latitude and polar regions. The ionospheric turbulence indirectly plays an important role also in the framework of space weather when due to the arrival of solar perturbations the plasma, the energetic particle distributions, the electric and magnetic fields within the magnetosphere and ionosphere are deeply modified thus paving the way for an increase in the ionospheric turbulence. Recent findings within the ESA funded project “Characterization of IoNospheric TurbulENce level by Swarm constellation (INTENS)” permitted us to investigate the role played by the turbulence on scales from hundreds of kilometers to a few kilometers in generating multi-scale plasma structures and inhomogeneities in the ionospheric environment at different latitudes. This presentation reports on the most promising results of the INTENS project regarding the investigation of turbulence and plasma conditions in the topside ionosphere using Swarm data.

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