



Complex Dynamics of Equatorial Scintillation

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Radio power scintillation, namely highly irregular fluctuations of the power of trans-ionospheric GNSS signals, is the effect of ionospheric plasma turbulence. The scintillation patterns on radio signals crossing the medium inherit the ionospheric turbulence characteristics of inter-scale coupling, local randomness and large time variability. On this basis, the remote sensing of local features of the turbulent plasma is feasible by studying radio scintillation induced by the ionosphere. The distinctive character of intermittent turbulent media depends on the fluctuations on the space- and time-scale statistical properties of the medium. Hence, assessing how the signal fluctuation properties vary under different Helio-Geophysical conditions will help to understand the corresponding dynamics of the turbulent medium crossed by the signal.

Data analysis tools, provided by complex system science, appear to be best fitting to study the response of a turbulent medium, as the Earth's equatorial ionosphere, to the non-linear forcing exerted by the Solar Wind (SW). In particular we used the Adaptive Local Iterative Filtering, the Wavelet analysis and the Information theory data analysis tool. We have analysed the radio scintillation and ionospheric fluctuation data at low latitude focusing on the time and space multi-scale variability and on the causal relationship between forcing factors from the SW environment and the ionospheric response.