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Irregular behavior of the low-latitude ionospheric irregularities probed with the multi-scale properties of L-band signals

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In the low latitude ionosphere, the formation of plasma density irregularities presents a regular behavior when conditions of the geospace are quiet. In fact, the morphology of the magnetic field and the ionosphere electrodynamics of the Earth allow the formation of plasma bubbles after the local post-sunset. Plasma bubbles form in a region of about $\pm 15°/20°$ in magnetic latitude off the magnetic equator, i.e. in correspondence with the expected position of crests of the Equatorial Ionospheric Anomaly (EIA). The ionospheric irregularities embedded in the plasma bubbles may lead to random fluctuation of the amplitude of trans-ionospheric signals, such as those emitted by Global Navigation Satellite Systems. Solar events disturb the regular behavior of the magnetosphere-ionosphere system, leading to an intensification or a suppression of the ionospheric irregularities producing scintillations. During the same storm, inhibition and intensification of the ionospheric scintillations can simultaneously occur, depending on the local time of the storm arrival. Electric fields penetrating from the auroral latitudes and disturbing the ionospheric electrodynamics are commonly highlighted as the principal responsible for the inhibited/enhanced scintillations. In the present work, we analyzed the radio scintillation over San Miguel de Tucumán (Argentina) under the EIA southern crest focusing on the time multi-scale variability and on the causal relationship between forcing factors from the geospace and the ionospheric response. We highlight here the conditions leading to the exacerbation or the inhibition of the GPS L-band scintillation.