

Recent achievements in use of scintillation technique to study ionospheric irregularities (Invited)

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Plasma instabilities and other processes that occur in the earth's ionosphere produce fluctuations in ionospheric electron density with spatial scales that may span several orders of magnitude extending from sub-meter to hundreds of kilometers. Of these irregularities, those with intermediate spatial scales ( $\sim 100$  m to few km) scatter transionospheric VHF, UHF and L-band radio waves transmitted from a satellite, to produce a pattern of varying intensity and phase on the ground. Relative motion between the irregularities and signal path result in temporal fluctuations or scintillations in the phase and amplitude of the signal recorded by a ground receiver. As such, scintillation data contain information about the irregularities that give rise to the observed scintillations. In the weak scintillation regime, certain characteristics of the irregularities such as their strength and spatial structure may be derived from the  $S_4$  index, which is a measure of the strength of amplitude scintillations, and scintillation power spectra, respectively. The challenge lies in deriving information about irregularity characteristics from strong scintillation data. In this situation, it is necessary to take recourse to theoretical models. However, comparison of theoretical results with those derived from data becomes problematic due to (a) variations in the drift of ionospheric irregularities across the signal path during the course of a scintillation event and (b) evolution of the irregularities. Derivation of the spatial correlation function of intensity variations in the ground scintillation pattern produced by the irregularities at any instant of time, from scintillation data, allows direct comparison with the spatial correlation function obtained from theory. A recently developed method to achieve this using spaced receiver scintillation data is described. This has proved to be a useful tool for studying the evolution of spatial structure in ionospheric irregularities.