Configuration Space Ionospheric Models

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Ionospheric structure models are characterized by statistical measures, which include probability distribution functions (PDFs), point averages, and spectral density functions (SDFs). Ionospheric measurements include in situ probes and remote diagnostics. Diagnostic measurements may be collected as time series or spatial maps, typically presented as images. A structure model should allow generation of *physical realizations* of definitive ionospheric observables, for example electron density. Stochastic structure evolves from quasi-deterministic structure defined by global ionospheric models. However, the transition is ill defined, whereby the statistical component is inhomogeneous. The structure itself is characterized by a range of representative structure scales. Large-to-small in the spatial domain correspond to small-to-large spatial wavelengths.

A standard stochastic structure model imposes an SDF onto uncorrelated spatial Fourier components. However, the associated structure is zero mean and symmetric. While there is statistical equivalence to real structure, the textural details are very different. A configuration space model comprised of a distribution of physically realizable striations is described in [1]. In the original development it was shown that a configuration of randomly located striations could be configured to generate two-component inverse power-law structures. Figure 1 shows a physics based model realization together with the configuration model defining relations. The connections between the analytic, physics-based, and configuration-space models will be demonstrated.





References

 C. Rino, C. Carrano, K. Groves, and T. Yokoyama, "A Configuration Space Model for Intermediate-Scale Ionospheric Structure," *Radio Science*, 53,2018, doi: 10.1029/2018RS006678,