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# Modelling the Variation of OTHR Performance

Luke D Nugent[1], Paul S. Cannon* [1], and Sean Elvidge[2]
(1) SERENE, University of Birmingham, Birmingham, B15 2TT, UK, e-mail: p.cannon@bham.ac.uk

Over the Horizon Radar Modelling (OTHR) performance modelling is generally based on ray tracing through median models of the ionosphere to estimate the received signal power in combination with the median radio frequency noise power which is usually considered to be spatially uniform. The question then arises as to how estimates of the radar performance vary at a specific hour from day-to-day and also within the hour. The former variations are due to day-to-day changes in both the ionosphere and the noise sources, and the latter are due to fading, largely due to interference between the propagation modes, polarisation changes and travelling ionospheric disturbances.

In this paper we describe a technique which models the day-to-day variation about the median using ensemble techniques. Ray tracing is performed through a sample of 20 years of output from a physics-based ionospheric model. The model is driven by F10.7 solar flux and Kp (indicators of solar and geomagnetic activity). The Jensen-Shannon distance is used to determine the minimum sample size (i.e. number of days) required for samples of F10.7 and Kp values to have similar distributions to the 20-year F10.7 and Kp populations. Ionospheric model outputs representative of this sample of days are used for ray tracing to determine the variability in skywave propagation path losses for each hour of day. This provides an estimate of the variability of received power for various transmitter-receiver ground ranges as a function of seasonal ionospheric changes and variability in solar and geomagnetic activity.