

Comparison of Propagation Coverage Diagrams from Refractivity From Clutter (RFC) Profiles or other Refractivity profiles to Measured Propagation in Surface Based Ducting Environments

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During the spring of 2000, the ONR351 Air and Surface Weaponry Technology Program conducted a Ship Based Defense Demonstration at Wallops Island, VA. A series of experiments designed to show how environmental knowledge could be used to improve shipboard radar performance against cruise missile threats were conducted. A variety of sensors were simultaneously used to collect pertinent data. These included multiple refractivity sounding systems, several bulk meteorological measurement systems including boats and buoys, a direct propagation measurement system operated at three radar frequencies of interest, and sea surface backscatter measurements from both the SPANDAR atmospheric research radar and the AN/SPY-1A radar. The simultaneous measurement of all of these data allowed for a number of studies to be conducted.

This work presents a statistical comparison of Refractivity From Clutter (RFC) propagation predictions with directly measured propagation loss in surface based ducting environments. Statistical summaries were calculated for the on time observations for the RFC, a helicopter based, range dependent sounding system, a rocketsonde system, and single profiles extracted from the helicopter soundings. A Liu-Katsaros-Businger (LKB) evaporation duct, calculated using meteorological measurements from a buoy, was appended to all helicopter and rocket measured refractivity profiles. Analyses of the on-time error statistics for each method showed that the error distributions were not normally distributed, thus indicating the use of robust statistics in the analysis. The analysis also indicated that the helicopter measurements produced more accurate estimates of the propagation than either the RFC or the rocketsondes, which had comparable error magnitudes.

Time lagged results were also analyzed. These statistics show the loss of accuracy of the propagation predictions as a function of time, via a comparison of RFC, helicopter and rocketsonde results to the propagation measurements.