Atmospheric Radar Performance Surfaces

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U.S. Naval operators have relied upon the versatility and ease of AREPS (Advanced Refractive Effects Prediction System) for evaluating propagation conditions in and around the Fleet during planning/execution of at-sea exercises and military operations. AREPS has the capability to ingest NWP model fields for specifying the environment, which provides bearing dependence from a heterogeneous environment and expands AREPS applications into the forecasting realm. However, propagation information displayed in AREPS coverage diagrams is for a single location, which limits its ability to convey spatial variability. With existing massively parallel, multi-processor computing architectures, the computational demands of running the propagation core of AREPS (The Advanced Propagation Model (APM)) over the entire theater of military operations using high-resolution NWP model fields as input are now attainable in real-time. To meet this challenge, a new system called ATPS 'Atmospheric Radar Performance Surfaces', was designed in a joint effort between NRL, NPS and SSC to be efficient, flexible and globally re-locatable.

For a given radar specification, the performance is depicted by domain-wide distributions of the maximum detection range for a 90% probability of detection of any number of targets. During ATPS development and testing, a variety of ship-board and air-borne radar performance surfaces were generated for a host of geographical regions, time periods and seasons. These surfaces contain remarkable spatial variability in detection stemming from environmental effects on propagation associated with changes in SST, sea-land breeze flows, and island wake dynamics, for example. Currently, ATPS uses COAMPS®[1] analysis/forecast fields from the Navy's mesoscale model to represent the environment within a particular operating area. As a demonstration of the real-time operational capability of the system, ATPS seamlessly produced aircraft radar performance surfaces at three flight levels for exercises in and around the Hawaiian Islands during the month of July. The ATPS products are intended to be an extension of AREPS, offering broader guidance about propagation conditions to gain a strategic advantage in placement and positioning of military assets.

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[1] COAMPS is a registered trademark of the Naval Research Laboratory

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