**Validation of the Navy Atmospheric Vertical Surface Layer Model (NAVSLaM) Using LATPROP-UWB 2-40 GHz Data from CASPER East**

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The Navy Atmospheric Vertical Surface Layer Model (NAVSLaM) has been developed by the Naval Postgraduate School to characterize near-surface refractivity conditions over the ocean surface, including the ubiquitous and critical evaporation duct. NAVSLaM is currently in use within many electromagnetic (EM) propagation prediction systems to provide refractivity information based on standard meteorological data from either in situ measurements or numerical weather prediction (NWP) model forecasts. NAVSLaM is based on Monin-Obukhov similarity theory (MOST), which has proved to be a powerful tool for modeling near-surface vertical profiles of mean quantities, including temperature and humidity, from which the refractivity is computed. MOST depends upon empirically determined dimensionless functions for describing the vertical gradients of temperature, humidity and wind speed. The forms of the functions used within the model can have a very significant impact on the performance of NAVSLaM. This presentation will focus on examining the impact of using different gradient functions within NAVSLaM and selecting those functions which perform best.

During the CASPER East field campaign conducted off Duck, North Carolina, in 2015, the Ohio State University's ElectroScience Laboratory obtained concurrent meteorological and radio-frequency propagation data, which are ideal for evaluating the relative performance of different versions of NAVSLaM and other near-surface refractivity models. OSU used its LATPROP Ultra-Wide Band (UWB) system to measure horizontal near-surface propagation loss as a function of range for frequencies from 2 to 40 GHz. Concurrently, the meteorological data needed as inputs to NAVSLaM, including wind speed, air and sea temperatures, humidity and pressure, were collected from a pier and an offshore vessel. These meteorological data are input to different versions of NAVSLaM, which use various forms of the dimensionless gradient functions, to produce near-surface modified refractivity profiles, which are then input to the Advanced Propagation Model (APM) to predict the propagation loss as a function of range. These NAVSLaM-APM propagation loss predictions are then compared to the actual UWB propagation measurements to determine the relative performance of NAVSLaM when using different dimensionless gradient functions. Special focus will be placed on evaluating data obtained during stable conditions (the air warmer than the underlying sea surface), due to the challenges of characterizing the evaporation duct using MOST under such conditions.