# Further Improvements and Validation for the Navy Atmospheric Vertical Surface Layer Model (NAVSLaM)

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The Navy Atmospheric Vertical Surface Layer Model (NAVSLaM) has been developed within the Department of Meteorology at the Naval Postgraduate School (NPS) for describing near-surface atmospheric conditions and features which impact radio frequency propagation over the ocean, including the important evaporation duct. NAVSLaM is currently widely used within the U.S. Department of Defense for both research purposes and as a component of operational propagation modeling and performance prediction systems. This model can be run with inputs from either in situ meteorological measurements or numerical weather prediction (NWP) model forecasted data. In addition to describing near-surface refractivity conditions, the latest version of NAVSLaM also predicts the near-surface vertical profile of the refractive index structure parameter (Cn2), which can have a significant impact on radio-wave propagation at higher frequencies.

In this study, new improvements to the NAVSLaM model and validation results using measured data from recent at-sea experiments will be presented. NAVSLaM's performance and behavior is highly dependent upon certain empirically-determined functions that are used within the model, especially the Monin-Obukhov similarity theory (MOST) dimensionless profile functions for humidity, temperature and wind speed. Different forms of these dimensionless profile functions will be examined for both unstable (the air cooler than the underlying sea surface) and stable (the air warmer than the underlying sea surface) conditions. Special focus will be placed on validations with data collected under stable conditions, however, due to the greater uncertainty in NAVSLaM predictions in such conditions and the very limited amount of suitable stable data in previous experimental data sets. New model capabilities and performance enhancements introduced in NAVSLaM Version 2.0 will also be described.