Coastal Measurements Compared to Numerical Weather Prediction during a Foggy Sub-Refractive Environment

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Sub-refractive conditions are generally rare and usually occur when a thermally stable internal boundary layer (SIBL) forms in the atmosphere (Marshall and Haack 2007) while water vapor increases with height. On December 8 2012, a low pressure system was located offshore the Virginia coast with its associated cold front. Foggy conditions were observed over Wallops Island, VA, USA for more than 24 hours. Multiple and simultaneous balloon sonde measurements of the atmospheric boundary layer were taken along a radial from the shore to a distance of approximately 7 km offshore. Sub-refractive conditions were observed and as the day progressed, the atmospheric boundary layer became better mixed while an elevated duct developed.

The Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS®) and the Advanced Refractive Effects Prediction System (AREPS) were employed to provide a numerical weather prediction and radio frequency analysis for the day of interest. The Naval Surface Warfare Center Dahlgren Division (NSWCDD) Surface Layer Blending Technique (SLBT) was applied to the measured and COAMPS® profiles. Preliminary results show that COAMPS®/AREPS predicted sub-refractive conditions, generally agreeing with the sub-refractive conditions.

This paper will describe the results of this study by showing a comparison of observed meteorological data to the COAMPS® modeled data along a radial. It will also include the modified refractivity profiles with their corresponding evaporation ducting calculated using the NSWCDD SLBT. The radio frequency propagation impact on a notional S-band radar will also be shown for blended profiles.