Refinement of Helicopter-Based Evaporation Duct Calculations

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For the past 20 years, the Johns Hopkins University Applied Physics Laboratory (JHU/APL) has been continually developing a set of helicopter instrumentation that is used to collect environmental data needed to calculate refractivity profiles that vary in range and height. These refractivity profiles are important inputs to propagation models, as the mechanism to include the effects of ducting and other non-standard conditions on electromagnetic propagation. More recently, the system was given additional capability by including sensors that are appropriate for measuring the parameters needed for evaporation duct calculations. This new system is currently being built to replace the older JHU/APL-built system that has been used for more than ten years by the Naval Air Warfare Center (NAWC) at Pt. Mugu, CA, to support US Navy radar system testing at several sites around the country. As this new system is transferred to the Navy for regular use, an assessment of its capabilities for estimating evaporation duct is warranted.

Building on the work in this area that was presented at the 2002 USNC/URSI Winter Meeting, this presentation will describe the sensor and data collection systems, along with the procedures used to collect data for the evaporation duct and vertical profile applications. In addition, the algorithms necessary to reduce these data to the bulk parameters needed by evaporation duct models will be described. The JHU/APL project boat *Chessie* recently collected data specifically for this purpose during planned helicopter operations, and these data will be used to compute benchmark evaporation duct heights against which the helicopter-derived estimates will be compared. The Liu-Katsaros-Businger (LKB), Constant Virtual Temperature (CVT) and Paulus-Jeske (PJ) models will be used for these comparisons. Finally, a brief discussion will be given on how these helicopter-derived evaporation duct parameters are used in the processing of this system's traditional vertical profile data.