A STATISTICAL STUDY OF THE COMPARISON OF WATER VAPOR AND POTENTIAL TEMPERATURE TERMS FOR THE MODIFIED REFRACTIVITY GRADIENT EQUATION IN ADVECTION DUCTS

Burgess, E. H.[1], Marshall, R. E. [1], Rottier, J. R.[2]
[1]NSWCDD, Dahlgren, VA
[2]Johns Hopkins University/Applied Physics Laboratory, Laurel, MD

Abstract Submission Form

2004 National Radio Science Meeting

Abstract: burgess3469

Date Received: September 24, 2004

Efforts to study the effects of pressure, temperature, and relative humidity on the refractive nature of the marine atmospheric boundary layer has led to a derivation of the modified refractivity (M) gradient equation in terms of the gradients of potential temperature (q) and water vapor mixing ratio (w).

The mean structure of stably stratified internal boundary layers (IBL) resulting when air heated over a land surface advects over a colder ocean has mostly been described in terms of the gradient of q (Rotheram, 1983, Smedman et al, 1997, Skyllingstad, 2004). In IBLs where thermal stability suppresses turbulence and the vertical mixing of water vapor, the gradient of M has the potential to be less than zero. It has also been demonstrated that the height of the IBL and the degree of mixing of q and w increase with offshore distance

This paper will present statistical results showing the relative influence of the mixing ratio gradient term to the potential temperature gradient term for three days of advection duct activity during the Wallops 2000 Microwave Propagation Measurement Experiment (MPME). During the multi-agency Wallops 2000 MPME, a wealth of sea surface and upper air meteorological observations were collected by helicopter, rocketsonde, and boat in order to document the spatial and temporal structure of the coastal atmospheric boundary layer near the Virginia Eastern Shore.

Preliminary results indicate that the mixing ratio term can be as much as three times as influential as the potential temperature term. Statistics of the ratio of the two terms will be binned by temporal location in the diurnal heating and synoptic meteorological cycles. Statistics will also be binned by spatial location in the offshore flow.

1. (a)
   Edward Burgess
   17320 Dahlgren Rd
   Dahlgren, VA
   22448-5100 USA
   burgesseh@nswc.navy.mil

   (b) 540 653 2871

   (c) 540 653 5234

2. F - Wave Propagation and Remote Sensing

3. (a)

4. C - Contributed Paper

5. No special instructions