SYNOPTIC, MESOSCALE AND DIURNAL IMPACTS ON EM TRAPPING CONDITIONS

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Ducting of electromagnetic (EM) energy is often associated with abrupt gradients that tend to occur in temperature and moisture at the top of the marine atmospheric boundary layer (MABL). We utilize the Navys globally re-locatable mesoscale model $COAMPS^{TM}{}_1$ to obtain the atmospheric forecasts necessary to analyze trends in EM ducting parameters for a variety of forcing regimes. In this study, the model has been setup over Wallops Island, Virginia and run for a continuous 6 weeks beginning 1 April 2000. High horizontal (δx = 3 km inner grid) and vertical (δz = $\tilde{4}$3 m in the MABL) resolutions are implemented to adequately represent details within a complex coastal environment. The forecasts encompass the time frame that data was collected for the Wallops 2000 MPME (Microwave Propagation Measurement Experiment) by fixed buoy, boat, radiosonde, rocketsonde and helicopter profiles. The buoy observations provide time series of the environmental variables used in the NPS Operational Evaporation Duct Model to give estimates of the evaporation duct height (EDH) based upon TOGA-COARE surface flux scaling parameters. These values are compared with the EDH predicted by COAMPS on a high-resolution (δz = 1 m) vertical grid using Monin-Obukhov similarity theory.

Statistics showing model-observed EDH bias and RMS error provide confidence in the model forecasts. At the buoy site, we examine time periods when the EDH reached the lower limit of 0 m or upper limit threshold of 40 m. Values within this range occurs 70% of the time and lie between 2-13 m in agreement with estimates given by Paulus (1984) for the thermally unstable regime (R.A. Paulus, Tech. Rep 966, NOSC prepared for NASC, Code 330). Eight periods (10%) are identified where the EDH reaches 40 m, which typically results from thermally stable conditions and low relative humidity. EDH values near 0 m occur the remaining 20% of the time as southeasterly flow advects warm, moist air into the area, tending to eliminate surface ducting and create subrefractive conditions. The 2D model-computed EDH fields are temporally averaged for the duration of the 6-week study period to elucidate regions of preferred ducting and subrefraction. These results will be shown at the conference.

[1] COAMPS is a trademark of the Naval Research Laboratory

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