

Variability of Evaporation Duct Properties Observed in a Coastal Environment during CASPER

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Electromagnetic ducting is a type of anomalous propagation in which the radio and microwaves from a surface based source become trapped within shallow and near horizontal layer known as ducting layer or simply duct. This lead to enhanced propagation range and weak propagation loss of electromagnetic energy within the ducting layer. A corresponding reduction in the electromagnetic signal strength also occurs above or below the duct. Evaporation ducts are produced due to the near surface humidity gradient and therefore nearly always present over the oceans. These duct layers are of the order of few meters to a few tens of meters deep. This study dealt with the evaporation duct observed during Coupled Air-Sea Processes and EM ducting Research (CASPER) conducted offshore Duck, North Carolina. The measurements were made during October-November 2015.

Shipborne measurements of standard meteorological parameters such as pressure, temperature, humidity, wind and sea surface temperature were made during the CASPER experiment. Observations were limited within ~100 km from the shore. This region, particularly in the first 20 km from shore was characterized by significant horizontal gradient in sea surface temperature, resulting in large variability in atmospheric boundary layers. The meteorological measurements on the bow mast are used to generate the surface layer profiles required to estimate the evaporation duct properties using the flux profile relations ships in the COARE 3.0 bulk flux algorithm. We will present the variability of evaporation duct height and strength as a function of distance from the shore. Relationship of evaporation duct properties with surface layer stability and moisture gradient will also be discussed. Finally, we will examine influence of synoptic depressions on duct properties.