In-Situ Observation of Surface Layer Scalar Profiles for Characterizing Evaporative Duct Properties.

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Marine atmospheric surface layer (MASL) is the lowest few tens of meters of the atmosphere immediately adjacent to the ocean surface. Because of surface evaporation, the MASL often consists of a surface trapping layer and hence a ducting layer for the propagation of electromagnetic Wave (EM) propagation often referred to as Evaporative Duct (ED). Such ducting conditions in the MASL are characterized through the temperature and humidity profiles and are affected by the surface layer wind profiles as well. These profiles are normally obtained by a MASL model based on the Monin-Obukhov Similarity theory (MOST) and input of measured quantities at a fixed level. However, MOST is based on the empirical dimensionless functions obtained over the land surfaces, the fidelity of bulk parameterization derived surface layer profiles are often debatable. Direct measurements of the MASL profiles of temperature and humidity are needed at high vertical resolution so that the gradients near the surface can be resolved. Such measurements should be done away from the immediate ship environment to avoid contamination by the ship structure.

During the Coupled Air Sea Processes and Electromagnetic ducting Research (CASPER) pilot experiment, conducted offshore Moss Landing, CA, we made repeated soundings of the lowest 50 m of marine atmospheric surface layer from a Rigid Hull Inflatable Boat (RHIB) using self-recording radiosonde attached to a tethered balloon to quantify the near surface vertical profiles of pressure, temperature and humidity. The RHIB was used for its small size to avoid flow distortion resulted of the platform. For each sounding set at a given location, about 10-15 sounding profiles were made to obtain good statistics of the profiles given its natural variability. Apart from this, single level measurements of temperature, humidity, wind speed and direction, and sea surface temperature were also made from an instrumented mast installed on the RHIB. Along the CASPER track, RHIB-based measurements are made generally at three locations at different distance from the shore. A total of 7 up and down profiling were done at each location.

We will present the characteristics and behavior of surface layer profiles of pressure, temperature and humidity under various surface layer stability and conditions. A comparison of these profiles with the profiles generated from single level measurements using the COARE bulk parameterization scheme is also provided. Finally, evaporation duct height and strength estimated from the *in-situ* profiles and COARE algorithm are also presented. This research represents some

of the early efforts in quantifying evaporative directly from in situ measured temperature and humidity profiles.