A 12-day field exercise, coined The Tropical Air-sea Propagation Study (TAPS), took place in the coastal town of Lucinda, Australia extended seaward ~90km over the Great Barrier Reef (Nov/Dec 2013). This combined measurement and modeling campaign included a consortium of international defense organizations with the aim of quantifying predictive capability for radio frequency (RF) propagation. Atmospheric variability in the warm tropical environment was measured by an instrumented jetty, research vessel, and aircraft, and was modeled by several high-resolution Numerical Weather Prediction (NWP) systems. Conditions evolved from a benign weather pattern dominated by diurnal sea/land breezes for the majority of the first week followed by passage of an upper level disturbance that brought in drier and colder air with stronger winds and steady easterlies until diurnal forcing resumed at the end of TAPS.

Environmental factors can produce significant temporal and spatial changes in the prediction of propagation path loss and expected radar detection ranges, owing to variations in atmospheric ducting. While evaporative ducting, found immediately above the ocean surface, is largely dependent on low level wind speed, relative humidity and air-sea temperature difference, marine atmospheric boundary layer (MABL) ducting is influenced by a combination of local, mesoscale and synoptic scale meteorology, in particular by variations in moisture advection confined near the sea surface by the MABL temperature inversion. Although the tropical environment of TAPS Campaign typically had a deep MABL in which upper air ducting was too high to impact surface sensors, in some cases a shallow inversion-capped land-breeze developed over night and spread seaward creating a surface-based MABL duct that encompassed the depth of the TAPS sensors. In those circumstances over-the-horizon detection was observed despite very low evaporation duct heights. Signals transmitted from the Lucinda shore for multiple frequencies (X, Ka, Ku, and W-band) were recorded aboard the research vessel as it transited toward the GBR, permitting comparison with coincident model derived predictions of RF propagation.