The Impact of UAV Data Assimilation on Radio Frequency Propagation Predictions during the 2009 New Zealand Sea Breeze Trial

Katherine L. Horgan*[(1)], Tracy Haack [(2)], and Sally Garrett[(3)]
(1) Naval Surface Warfare Center Dahlgren Division, Dahlgren, VA USA
(2) Naval Research Laboratory, Monterey, CA USA
(3) Defence Technology Agency, Auckland, New Zealand

From 23 February to 6 March 2009, an experiment called the New Zealand Sea Breeze Trial (NZSBT) was conducted on the Bay of Plenty in New Zealand with a focus on sea breezes and the associated impacts on radio frequency propagation. The NZSBT was funded by the Defense Technology Agency (DTA) who supplied all of the assets and measurement equipment with participation from the United States' Naval Surface Warfare Center Dahlgren Division and Naval Research Laboratory Monterey (providing on-site test support and real-time numerical weather prediction). During the experiment, numerous profiles from radiosondes and kitesondes were taken in addition to bulk meteorological parameters on an offshore buoy. To complement the environmental measurements, 9.4 GHz (X-band) radio frequency measurements were also taken. The radio frequency measurements included multiple transmitters onboard the Research Vessel (R/V) Macy Grey and multiple receivers on shore to measure the signal as the R/V Macy Grey transited on the 320 degree bearing out to 65 km offshore.

A UAV called the Kahu, owned by DTA, was also flown during the trial collecting meteorological quantities. Its flight profiles were guided by daily numerical weather prediction (NWP) forecasts allowing its profiles to be focused on interesting and influential mesoscale features. The meteorological UAV data was assimilated into the Coupled Ocean / Atmosphere Mesoscale Prediction System (COAMPS), a mesoscale NWP model, to determine if radio frequency propagation predictions driven by NWP results with UAV data assimilation improved the forecast as a similar study on UAV data assimilation during Trident Warrior 2013 has shown. Preliminary results show improvements at some measurement locations and degradation at others. Comparisons with both the meteorological and radio frequency measurements will be presented. Impact of the assimilation in both time and space will also be shown.