

Characterization of the Environment along an X-Band Propagation Path Using the Controlled Towed Vehicle (CTV) during CASPER-East

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We deployed the Controlled Towed Vehicle (CTV) on all 11 flights of the CIRPAS Twin Otter (tow) aircraft during the Coupled Air Sea Processes and EM ducting Research (CASPER) experiment off Duck, NC in the Fall of 2015. This presentation will focus on the environmental characterization of the propagation path between and X-band (11-Gz) transmitting beacon mounted on the low flying CTV and receiving antennas mounted on the stern of the R/V Atlantic Explorer. We will explore the modification of the propagation characteristics as a function of meteorological (mean and turbulence statistics) and thermodynamics conditions along the propagation path as measured by the instrumented CTV. We will compare results from flights along the East-West path off Duck, NC to those obtained from flights that were dedicated to a three-consecutive-day survey over the Gulf Stream (GS). In particular, we will investigate the role of the vigorous enhancement across the GS boundary in turbulence intensity and fluxes over the warmer water on signal propagation.

The CTV uses improved towed drone technology to actively maintain via a radar altimeter and controllable wing a user-set height that can be as low as the canonical reference height of 10 m above the sea surface. After take-off, the drone is released from the tow aircraft on a ~700-m stainless steel cable. We have instrumented the 0.23 m diameter and 2.13 m long drone with high fidelity instruments to measure the means and turbulent fluctuations of 3-D wind vector, temperature, humidity, pressure, CO₂ and IR sea surface temperature enabling direct calculation of eddy correlation air-sea fluxes. Data are recorded internally at 40 Hz and simultaneously transmitted to the tow aircraft via dedicated wireless Ethernet link. The CTV accommodates 40 kg of instrument payload and provides it with 250 W of continuous power through a ram air propeller-driven generator.