APPLYING REFRACTIVITY FROM RADIO (RFR) INVERSIONS TO ENHANCE LOCAL NWP SIMULATIONS DURING THE CASPER EAST MEASUREMENT CAMPAIGN

Hank Owen[(1)], Edward Bertot* [(2)], and Ted Rogers[(2)]
(1) HS Owen LLC, Medford NJ
(2) SSC Pacific, San Diego, CA

Numerous radio signals of opportunity were recorded off the coast of North Carolina for approximately one month, aboard the R/V Atlantic Explorer as part of the CASPER East campaign. The primary purpose of this particular data collection is to test atmospheric refractivity inversion methods for use in passive environment sensing, as part of a system called Refractivity From Radio (RFR). These inversion results are then integrated into NWP simulation output to create a more refined snapshot of the current refractivity situation.

Signals monitored included entities such as FM radio broadcast, Digital Television (DTV) broadcast, Automatic Identification System (AIS) for ship navigation and tracking, and some terrestrial radars. The opportunity to monitor these signals is global and consistent, and the integration of their propagation characteristics is a crucial component to maintaining an accurate picture of the local refractive environment. One of the main outputs of RFR is a vertical refractivity profile prediction in the direction of signal reception.

To implant these local observations into the larger-scale numerically-predicted environment, RFR feeds its predictions to a separate module, Refractivity Data Fusion (RDF). The purpose of this module is to coherently merge various measurement and prediction sources into the current mesoscale NWP simulation, resulting in an updated model. Here, the Cartesian representation of refractivity calculated from the NWP output is mapped into a set of 2-dimensional diagnostic variables, which are surfaces over the NWP domain. RDF produces an analysis of refractivity in the diagnostic space, which is then mapped back into Cartesian coordinates, and returned in the same format as an NWP simulation output.

We discuss the application of RFR and RDF in the context of the CASPER experiment, including collection procedures, processing techniques, system integration, and some preliminary results.