

Interaction of Bending Angle Assimilation from GNSS Sensors in the U.S. Navy's Assimilation System

Benjamin Ruston, Steve Swadley, Nancy Baker, Rolf Langland, and Tim Hogan

Naval Research Laboratory, Monterey, CA

The Navy's 4-Dimensional Variational (4D-Var) assimilation system NAVDAS-AR has added the capability to assimilate bending angle from GNSS Sensors. The core of the Navy's global forecast system is the NOGAPS model which uses 42 levels with a model top of 0.01 hPa along with the 4D-Var system NAVDAS-AR. The system currently assimilates radiances from microwave and infrared satellite sounders in addition to the bending angle from GNSS sensors. The interaction of the bending angle assimilation on the overall system has been strongly positive with a large reduction in the radiance biases for upper-tropospheric and stratospheric sounding channels. In addition, model biases with respect to radiosondes has also been affected with improved global statistics. The current NAVDAS-AR system can compute bias correction for satellite radiances from either an offline Harris-Kelley type approach, or using variational bias correction. The differences in the GPS and radiosonde statistics show a much better fit of the first-guess and analyzed innovations (observation – background) when the variational bias correction is used. The study will include monitoring plots of GPS, radiosonde and satellite sounders from the two bias correction schemes, as well as an examination of impact on the medium-range, 1-5 day, forecasts.