Impact of glider data assimilation on the Global Ocean Forecasting System during the 2018 hurricane season

Maria Aristizabal | Rutgers University

Co-Authors

Scott Glen | Rutgers University and Travis Miles | Rutgers University

Abstract (Oral Presentation)

During the last decades hurricane track forecast has been refined significantly but the hurricane intensity forecast has seen only limited improvement. Operational coupled atmosphere-ocean hurricane models, such as the Hurricane Weather Research and Forecasting model (HWRF) and the Coupled Ocean/Atmosphere Mesoscale Prediction System for Tropical Cyclones (COAMPS-TC), require accurate ocean initial conditions in order to better forecast storm intensity. The ocean initial conditions for these models are provided by the Navy's Global Ocean Forecasting System (GOFS 3.1) which implement the Navy Coupled Ocean Data Assimilation (NCODA) System. NCODA assimilates satellite altimeter, satellite and in-situ surface temperature, in-situ vertical temperature and salinity from XBTs, Argo floats, moored buoys and gliders.

We conducted a qualitative assessment of the impact of glider data assimilation on the performance of GOFS 3.1 during the 2018 hurricane season in five regions of high hurricane activity: Gulf of Mexico, Caribbean, Middle Atlantic Bight, South Atlantic Bight and the Yellow Sea. For this assessment we used a wealth of temperature and salinity data from a fleet of sentinel gliders deployed in the five geographic areas of interest. The data was accessed through the IOOS Glider Data Assembly Center (DAC), with a total of 62 deployments during the 2018 hurricane season.

Our model/data comparisons show that the assimilation of glider data is having a substantial effect on the temperature and salinity fields that GOFS 3.1 estimates. For example, in the Gulf of Mexico during the passage of hurricane Michael, glider temperature rapidly decreases around the time of the eye passage. However, the model temperature abruptly warms up after the data assimilation cycle has been completed. This suggests that the data assimilation scheme used did not adjust the model fast enough to match this rapid cooling event. On the other hand, in the Yellow Sea there was a significant improvement in the salinity field ahead of Typhoon Soulik before and after glider data assimilation.

Our next step will be to quantify the impact of glider observations on the performance of two coupled atmosphere-ocean hurricane forecasting models: COAMPS-TC and HWRF. This work will be done in close collaboration with the Naval Research Laboratory (NRL) Monterrey and National Centers for Environmental Prediction (NCEP).