
Impact of superobbing high resolution marine glider and HF radar data in regional marine JEDI data assimilation system

Ling Liu^{*†1} and Avichal Mehra²

¹I.M. Systems Groups – 3206 Tower Oaks Blvd 300, Rockville, MD 20852, United States

²NOAA – 5830 University Research Court, College Park, MD, United States

Abstract

Ocean data assimilation is important to improve coupled numerical weather and climate prediction. Joint Effort for Data Assimilation Integration (JEDI) infrastructure has been developed and is being testing for coupled (ocean and atmospheric) forecast systems by NOAA.

Use of ocean observations for initialization is critical for coupled Hurricane forecasts using Marine JEDI. High-resolution ocean glider data are useful for providing details of vertical mixing process during Hurricanes at sub-surface levels due to their continuous high vertical resolution; High-frequency radar surface radial velocity data provide broader spatial coverage over Hurricane passage comparing to ocean glider data. The assimilation of both will help us advance our understanding of data assimilation systems especially during Hurricane season. Experiments set up during Hurricane Isaias show that when glider data were superobbed to a similar vertical resolution to that of regional model background, data assimilation produces optimal analysis and forecast skill. Our results also indicate superobbing oceanglider data provides fuller details of vertical mixing than thinning because of rapid hydraulic changes in the surface mixed layer, whereas thinning might skip or miss these details. HF Radar radial velocity obtained over deployment at US Virgin Island with 6 km resolution are also assimilated into 10 km resolution regional marine JEDI during Hurricane Isaias. The forward operator $H(x)$ and observation minus background, observation minus analysis are analyzed for HF radar data. Details on superobbing and observation error correction is also discussed to compensate for the observation errors caused by optimal interpolation of the radar data.

Keywords: data assimilation, marine glider, HF radar, superobbing, thinning, hurricane Isaias, analysis skill, forecast skill, statistics, open boundary condition, regional MOM6, JEDI

*Speaker

†Corresponding author: ling.liu@noaa.gov