



Glider Team Observations and Assimilative Modeling of Gulf Stream Intrusions and Fresh Water Lenses North of Cape Hatteras

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In May/June of 2017, six gliders were used together in team configurations to observe submesoscale features on the North Carolina shelf north of Cape Hatteras as part of a collaboration between the U.S. Naval Research Laboratory's (NRL) "Smart Glider Teams for Rapid Update of Local Analysis" project and the U.S. National Science Foundation funded multi-institution project titled, "Processes Driving Exchange at Cape Hatteras" (PEACH). During the experiment, the NRL gliders were typically divided into a station-keeping team of gliders to provide less ambiguous temporal and spatial data interpretation, and a moving team of gliders to provide greater spatial coverage of the area. Over 13,000 CTD profiles were collected and transmitted by the gliders for assimilation into a local area domain forecast model using several versions of a four-dimensional variational (4DVAR) data assimilation system. A number of striking features were observed by the glider teams, including warm/salty (23°C / 36 psu) subsurface intrusions of Gulf Stream water and very fresh (< 30 psu) surface lenses of coastal origins. Both of these features were observed near the shelf break in close proximity to each other indicating both offshore and onshore transfer of water masses and complex advection processes. The assimilation of these data proved successful in reproducing some, but not all, of these small scale features.