**Title:** An expanding role for coastal ocean observing systems in tropical cyclone forecasting and research

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Regional coastal ocean observing systems are increasingly utilized under hurricanes, typhoons, and cyclones to validate ocean initial conditions in coupled atmosphere-ocean models, map the spatial and time variability of essential ocean features, and study ocean processes that feedback on storm intensification and weakening. Core technologies of these systems include coastal High Frequency (HF) radar systems and autonomous underwater gliders, which have been well established as part of the US Integrated Ocean Observing System (IOOS) and Global Ocean Observing System (GOOS) community over the past two decades. These technologies fill a critical data gap in coastal regions for tropical cyclone ocean observing. Networked HF Radar stations provide high spatial and temporal resolution observations of surface currents from near-shore out past the shelf-break (~200 km). Ocean gliders rapidly sample the coastal oceans collecting hundreds to thousands of profiles of temperature, salinity, and other hydrographic data ahead of, during, and after storm events. Both systems send data in real-time to national data repositories and are available for ocean data assimilation in operational and research models. They also provide post deployment validation of these same systems.

This presentation will focus on key examples of how these ocean observing networks have been used for hurricane research and forecasting, and the current state of and future needs for further integrating coastal ocean observations to improve the tropical cyclone intensity forecasting. Recent studies with these technologies have established that the thermal structure of the coastal ocean can evolve rapidly ahead of landfalling storms. Examples in the US Mid Atlantic Bight and the Yellow Sea have shown drops in sea surface temperature of more than 10oC in less than 12 hours ahead of eye-passage, and linked these substantial cooling to rapid storm weakening before landfall. Additionally, freshwater barrier layers in regions of river influence, such as the Amazon/Orinoco River plume entering in the Caribbean Sea, have been demonstrated to inhibit vertical mixing ahead of storms and retain warm water in the surface, potentially contributing to the rapid intensification of hurricanes.

As regional ocean observing systems have matured significantly in the past decade, new assets are continually being added to these networks with the express purpose of sampling our coastal oceans during these storm events. In 2018 alone, 62 gliders were sampling in US and international waters and providing realtime data to national data centers throughout the Atlantic Hurricane season. Supported by NOAA, Navy, NSF, State, academic, private, and public partnerships, roughly ¼ were specifically tasked for use to understand the oceans role in hurricane intensity and provide data to operational coupled ocean and atmosphere modeling systems. As these ocean observing systems continue to be deployed, new studies need to be undertaken to evaluate existing hurricane forecast models with coupled oceans, and to develop the forecast models of the future.