Connectivity of Pulley Ridge and the South Florida Coral Reef Ecosystem

Ryan Smith and George Halliwell

Scientists from AOML's Physical Oceanography Division (PhOD), in conjunction with more than 30 researchers from multiple universities and two NOAA Cooperative Institutes, are studying the connectivity between Pulley Ridge and the larger south Florida coral reef ecosystem. West of the Dry Tortugas in the Florida Keys, Pulley Ridge is a mesophotic reef on the southwest Florida shelf (Fig. 1). Until recently, the physical and biological connections of deeper reefs, such as Pulley Ridge, with the shallower reefs of the Dry Tortugas and Florida Keys National Marine Sanctuary (FKNMS) have not been considered when planning management strategies for the region. PhOD collaboration in this multi-year project is supported by AOML and NOAA's Center for Sponsored Coastal Ocean Research (CSCOR).

This interdisciplinary research program is led by the University of Miami and focused on three principal themes: *population connectivity*, *community structure*, and *ecosystem value*. The population connectivity theme is comprised of four subgroups: the regional physical oceanography (model and observations), a biophysical model, population genetics, and a population dynamics model. PhOD scientists are involved with the physical oceanography subgroup. This arm of the project is tasked with the management and subsequent data processing and analysis of a moored current meter array deployed at Pulley Ridge and the Dry Tortugas between August 2012 and June 2015 (34 months). The subgroup is also responsible for the development of a new 900-meter resolution HYCOM-based model for the project (*extended Florida Keys*, eFKEYS-HYCOM). The in situ mooring data are being used for model validation. In turn, many of the products obtained from the eFKEYS-HYCOM, which include real-time 7-day forecasts of circulation, sea surface height (SSH), and sea surface temperature (SST), are supporting the other program subgroups (including the biophysical model) with the data needed to further examine the biological connections between Pulley Ridge and the FKNMS.

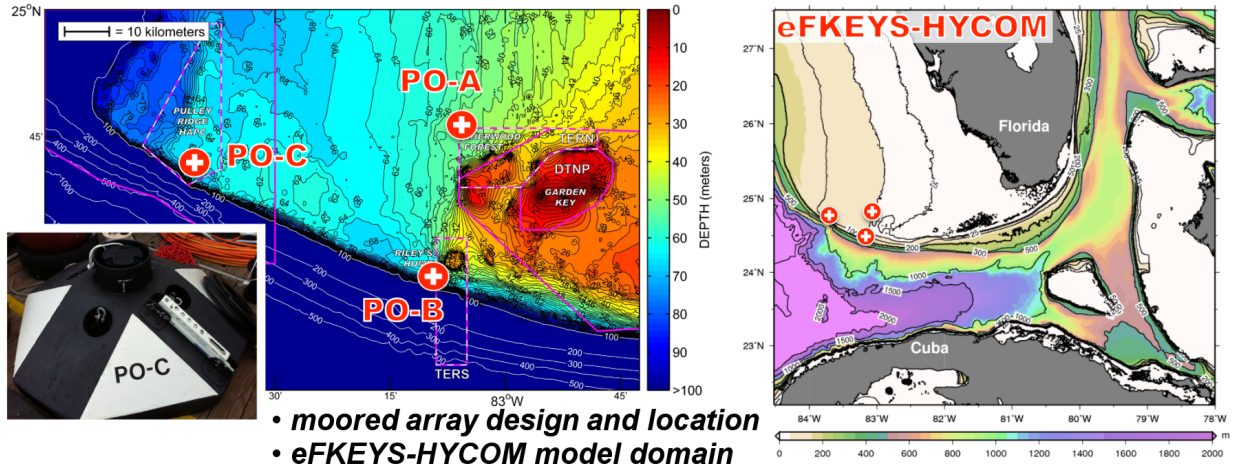

Figure 1. Left panel: a project acoustic Doppler current profiler (ADCP) mooring and mooring site locations at PO-A (northern Dry Tortugas), PO-B (southern Dry Tortugas), and PO-C (Pulley Ridge). Right panel: the eFKEYS-HYCOM model domain with markers indicating project mooring site locations. The model, nested within a larger Gulf of Mexico (GOM) HYCOM, has 26 layers and a resolution of 900-meters.