



New Observations of the Gulf of Aden Intermediate Water Intrusion into the Red Sea.

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The three-layer exchange flow between the Red Sea and the Indian Ocean during summer is characterized by a thick, northward intrusion of relatively cold, low-salinity and low in dissolved oxygen (< 0.5 ml/l); Gulf of Aden Intermediate Water (GAIW), sandwiched between two thin layers of outflow water. The flux of GAIW into the Red Sea is important in the heat, freshwater and nutrient budgets of the Red Sea, but the structure and pathways of the intrusion are not well-known due to a paucity of hydrographic and direct velocity observations. A research cruise was executed at the eastern side of the Red Sea during September-October 2011 to conduct the first large-scale survey of the intrusion. This mission is part of a series of expeditions in the Red Sea designed to investigate the seasonal Red Sea circulation. Surprisingly, the GAIW intrusion was observed to stretch nearly the entire length of the Red Sea (~1500 km) as a narrow eastern boundary current with subsurface velocity maximum of 0.1-0.3 m/s in the depth range 50-100 m. The intruding layer is weakly stratified compared to the background, possibly an indication of strong vertical mixing as it flows through the strait. Some GAIW was observed to enter deep channels in a coral reef bank (Farasan Banks) located in the southeastern Red Sea, and to enter the Red Sea interior, the latter possibly due to interactions between the boundary current and mesoscale eddies. The pathways and erosion of the GAIW intrusion will likely have major implications for the spatial distribution of biological productivity.