



Eddy dynamics and filaments inject oxygenated, high-salinity Persian Gulf Water into the Bay of Bengal

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Persian Gulf Water (PGW) is an oxygenated, high-salinity water mass that originates in the Persian Gulf. Injection of PGW into the Bay of Bengal (BoB) could act to ventilate the BoB oxygen minimum zone, but little is known about when, where and how PGW is transported to the BoB. Using a combination of models and observations, we show that eddy-like features inject PGW into the BoB throughout the year, and we identify the pathways and time scales for transport of PGW from the Arabian Sea. Temperature, salinity and oxygen observations from an autonomous ocean glider deployed at 85.5°E as part of the Bay of Bengal Boundary Layer Experiment (BoBBLE) demonstrate the presence of PGW in the southwestern Bay of Bengal (BoB); the glider observes an increase in salinity and oxygen at the potential density of PGW (1026.5 kg m^{-3} , approximately 250 m deep). Output from a NEMO 1/12th degree ocean reanalysis product show that this PGW signal is associated with a northward-flowing filament of high-salinity water, and backward particle tracking experiments confirm that the origin of this water is in the northern Arabian Sea. The particle tracking experiments identify two pathways along which PGW travels from its outflow in the northern Arabian Sea to the southwestern BoB. One pathway follows the coast of India southward in the eastern Arabian Sea; the second follows the Omani and Somali coasts southward in the western Arabian Sea and connects to the BoB via the equatorial currents. The shorter, eastern pathway takes approximately 3.5 years; the longer, western pathway takes approximately 4.5 years. We calculate the transient salinity flux, $v'S'$, into the BoB across 8°N from 11 years of NEMO reanalysis to investigate the interannual and longitudinal variability of the PGW flux into the BoB. The greatest influx of PGW into the BoB is to the east of Sri Lanka, in which region the time-mean salinity flux is directed northwards. The PGW filament observed by the glider, however, is anomalous: it occurs in a region of limited salt flux and the filament does not occur as part of an eddy-like feature, which the majority of flux events appear to be. There is no apparent annual cycle in the salinity flux: events occur throughout the year.