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Investigation of long-term, basin-scale thermohaline trends in Qatar's marine region in response to environmental and climatic change

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ABSTRACT

The Arabian Gulf, an economically and geopolitically important marine area, is a semi-enclosed and shallow basin with an average depth 36 m. The Gulf is one of the seasonally warmest (i.e., in summer) and most saline marine regions, which naturally experiences extreme seasonal heating, cooling, and evaporation cycles. Recent economic development and industrialization along with climate change also have introduced significant anthropogenic pressures on this naturally-stressed marine environment. Due to its semi-enclosed, shallow morphology and unique climatic setting, the impacts of environmental pressures are increasingly manifested in the hydrography and biogeochemistry of the Gulf. Oceanographic data collected within the exclusive economic zone (EEZ) of Qatar, although limited in space and time, indicate that physical and biogeochemical properties exhibit high spatial and temporal variability. Previous observational and numerical studies of the region conclude that increased field observation activity is required to better investigate the physical and biogeochemical dynamics of the Gulf. Long-term, continuous, and integrated monitoring of the marine environment, therefore, is essential to understand the status and seasonal/interannual variability of marine physical and biogeochemical dynamics as well as to predict any significant future changes in water column and ecological properties in response to environmental pressures and climatic changes. In this study, basin-scale oceanographic data collected in Qatar's marine region in the recent years are comparatively analyzed with available historical observations to assess thermohaline trends in water column structure and continental shelf circulation, to identify spatial and temporal data gaps, and to provide recommendations regarding optimal time and space coverage for future observational studies.

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