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Thermocline Regulated Seasonal Evolution of Surface Chlorophyll in the Gulf of Aden

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The Gulf of Aden, although subject to seasonally reversing monsoonal winds, has been previously reported as an oligotrophic basin during summer, with elevated chlorophyll concentrations only occurring during winter due to convective mixing. However, the Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) ocean color data reveal that the Gulf of Aden also exhibits a prominent summer chlorophyll bloom and sustains elevated chlorophyll concentrations throughout the fall, and is a biophysical province distinct from the adjacent Arabian Sea. Climatological hydrographic data suggest that the thermocline, hence the nutricline, in the entire gulf is markedly shoaled by the southwest monsoon during summer and fall. Under this condition, cyclonic eddies in the gulf can effectively pump deep nutrients to the surface layer and lead to the chlorophyll bloom in late summer, and, after the transition to the northeast monsoon in fall, coastal upwelling driven by the northeasterly winds produces a pronounced increase in surface chlorophyll concentrations along the Somali coast.