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The railroad switch effect of seasonally reversing currents on the Bay of Bengal High Salinity Core

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The Southwest Monsoon Current (SMC) flows eastward from the Arabian Sea into the Bay of Bengal (BoB) during the summer. During the southwest monsoon, the SMC advects a core of high salinity water into the southern BoB. This highly saline water has previously been linked with Arabian Sea High Salinity Water that forms in the northern Arabian Sea and is presumed to enter the BoB directly from the Arabian Sea via the SMC. Here we show that the high salinity core originates, instead, predominantly from the western equatorial Indian Ocean and reaches the BoB via the Somali Current, the Wyrki Jet and the SMC. Years with an anomalously saline high salinity core are linked with the winter convergence of the East Africa Coastal Current and the Somali Current, and an anomalously strong spring Wyrtki Jet. The seasonal reversals that occurs at the Somali Current and SMC junctions act as 'railroad switches' diverting water masses to different basins in the northern Indian Ocean. Mechanisms driving the interannual fluctuations of the Wyrtki Jet are linked to equatorial zonal wind stress, the Indian Ocean Dipole and the El Nino Southern Oscillation (ENSO). As a result, these modes of variability will influence the subsurface salinity in the BoB and thus modulate the variability of sea surface temperature and the strength of air-sea coupling in this region. This represents a hitherto unknown mechanism through which the Indian Ocean Dipole and the ENSO can influence rainfall in the South Asian monsoon.