Supporting Information for
“The railroad switch effect of seasonally reversing currents on the Bay of Bengal high salinity core”

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Introduction

Supporting information includes a comparison of the Southwest Monsoon Current velocity and the salinity from the model data along 7°N in the Bay of Bengal; composites of model depth and velocity for high and low salinity years on the 1024 kg m\textsuperscript{-3} isopycnal across the tropical Indian Ocean; composites of the model backwards trajectory particle experiment for a range of density classes between 1023 and 1025 kg m\textsuperscript{-3}; a forward trajectory particle experiment on the 1024 kg m\textsuperscript{-3} isopycnal; monthly climatology of eastward velocity at 65°E, and an alternate schematic for the ‘Railroad Switch’ effect for the winter monsoon only.

The forward trajectory particle experiment used model velocity interpolated to the 1024 kg m\textsuperscript{-3} isopycnal surface. Particles were tracked forwards along this surface, similar to methods described in section 4. The particles were initiated from a section between 50-55°E along 10°N in the western Arabian Sea every 5 days from 1 December the previous year until 30 January the current year, and then run forwards until 30 August.

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Figure 1. NEMO northward velocity of the Southwest Monsoon Current (a) and salinity (b) in the Bay of Bengal at 7° N. Data has 61-day smoothing applied from 2007 to 2016 and is interpolated to the 1024 kg m$^{-3}$ isopycnal.
Figure 2. Composites of NEMO velocity (vectors) and the 1024 kg m$^{-3}$ isopycnal depth (shaded) for Feb-May on (a) high salinity years: 2007, 2014 and 2016 and (b) low salinity years: 2008, 2010 and 2015.
Figure 3. Composite of NEMO salinity particles released at 82-90°E, 7°N at 5-day intervals from 1 June to 30 August and tracked backward to 1 January for high salinity years (2007, 2014 and 2016; left column) and low salinity years (2008, 2010 and 2015; right column) on the 1023 kg m$^{-3}$ (top panels), 1024 kg m$^{-3}$ (middle panels) and 1025 kg m$^{-3}$ (bottom panels) isopycnals. The particle tracks are coloured by their initial salinity at the 7°N release location.
Figure 4. Composite of NEMO salinity particles released at 50-55°E, 10°N at 5-day intervals from 1 December to 30 January and tracked forward until 30 August for high salinity years (2007, 2014 and 2016) and low salinity years (2008, 2010 and 2015) on the 1024 kg m$^{-3}$ isopycnal. The particle tracks are coloured by their initial salinity at the 10°N release location. Magenta lines indicate regions where the Equatorial Undercurrent and the Bay of Bengal high salinity core were measured. SC = Somali Current, EACC = East African Coastal Current, EUC = Equatorial Undercurrent, SMC = Summer Monsoon Current.
Figure 5. Monthly climatology from 2007 to 2016 of NEMO eastward velocity (m s\(^{-1}\)). Green lines depict salinity contours for 35.2 and 35.4 g kg\(^{-1}\). Blue line indicates the location of the 1024 kg m\(^{-3}\) isopycnal.
Figure 6. Schematic of surface salinity climatology (shaded) from the Argo OI product, showing the seasonal reversal of major current systems and the formation of the spring Equatorial Undercurrent (EUC), where there is a convergence of high salinity particles in the western Indian Ocean via the East African Costal Current (EACC) and the Somali Current (SC) that flows south in the (a) Winter Monsoon. Followed by the formation of a strong and weak EUC during the inter-monsoon season (b,c), and the formation of the Southwest Monsoon Current during the Summer Monsoon (d,e). Magenta lines indicate regions where the EUC and the Bay of Bengal high salinity core were measured. SMC = Southwest Monsoon Current, NMC = Northeast Monsoon Current, BoB = Bay of Bengal, HSC = High Salinity Core.