Geophysical Research Abstracts
Vol. 21, EGU2019-8399, 2019
EGU General Assembly 2019

Freshwater transport in the Bay of Bengal and its modulation by mesoscale variability and the Indian Ocean Dipole

Akurathi V S Chaitanya (1,5), Jerome Vialard (2), Matthieu Lengaigne (2,1), Francesco D'Ovidio (2), Jean Riotte (4), Fabrice Papa (3), and R. Arthur James (5)

(1) Indo-French Cell for Water Sciences, IISc-NIO-IITM–IRD Joint International Laboratory, NIO, Goa, India, (2) LOCEAN-IPSL, Sorbonne Universités (UPMC, Univ Paris 06)-CNRS-IRD-MNHN, Paris, France, (3) IRD/Laboratoire d'études en Géophysique et Océanographie Spatiales (LEGOS), Toulouse, France, (4) Géosciences Environnement Toulouse (Université de Toulouse, CNRS, IRD), 14 avenue Edouard Belin, Toulouse, France , (5) Bharathidasan University, Marine Science, Tiruchirapalli India (chaitu.ocean1@gmail.com)

The large freshwater input from rivers and rain and the energetic monsoon circulation conspire to create strong horizontal and vertical salinity gradients in the Bay of Bengal (BoB). Since salinity acts as a barrier to the vertical mixing of heat and nutrients in this basin, its distribution strongly influences air-sea interactions below tropical cyclones and primary productivity. The BoB receives most of its freshwater in its northeastern portion, with 2/3rd originating from rainfall and 1/3rd from two major rivers: the Ganges-Brahmaputra (GB) and Irrawaddy (IRR). In this work, we use a Lagrangian method together with satellite-derived surface currents to investigate how horizontal circulation spreads riverine and rain inputs horizontally in the BoB during and after the monsoon. Comparing the computed Lagrangian trajectories with drifting buoys indicates that the satellite-derived currents are reasonably accurate in the BoB, including close to the coast. Our results reveal that the rain dominates the freshwater thickness distribution over most of the southern and eastern BoB. Horizontal advection brings 1/6th of the total rainfall input through the southern boundary and represents an important freshwater source in the southern BoB. GB waters dominate the freshwater balance near the estuary, but are also transported southward along the coast by the East India Coastal Current (EICC) after the monsoon. This current, nicknamed the "river in the sea", largely contributes to a low-salinity water tongue hugging the coast, with also a large contribution from rain in the northeastern BoB transported along the same path. Mesoscale variability is the main contributor to the freshwater export from the "river in the sea" toward the basin interior. Ekman transport significantly contributes to shifting the rain freshwater southeast into the Andaman sea during the summer monsoon, followed by a weaker and opposite transport during the winter monsoon. The westward Ekman drift during winter also contributes to maintain the "river in the sea", by pushing rain and GB freshwater towards the Indian coast. In the eastern part of the BoB, the weaker mean circulation and eddies limit the effect of the IRR-induced freshening to the vicinity of its estuary. We further investigate interannual anomalies associated with Indian Ocean Dipole (IOD) events. During positive IOD events, the anomalous anticyclonic circulation yields a reduced EICC that carries less GB and rainfall southward, yielding salty anomalies in the western BoB and fresh anomalies in the Northern BoB. This anticyclonic circulation also reduces the input of rainfall by advection through the southern boundary into the Andaman Sea.