Geophysical Research Abstracts
Vol. 17, EGU2015-8852-1, 2015
EGU General Assembly 2015

The Influence of Wind and Basin Eddies in Controlling Sea Level Variations in the Coastal Red Sea

Yasser O. Abualnaja (1), James H. Churchill (2), Mohammedali Nellayaputhenpeedika (1), and Richard Limeburner (2)

(1) King Abdullah University of Science and Technology (KAUST), Red Sea Research Center (RSRC), Thuwal, Saudi Arabia, (2) Woods Hole Oceanographic Institution, Physical Oceanography, MA 02543-1050, U.S.A.

Sea level variations in the central Red Sea coastal zone span a range of roughly 1.2 m. Though relatively small, these water level changes can significantly impact the environment over the shallow reef tops prevalent in the central Red Sea, altering the water depth by a factor or two or more. Roughly half of the coastal sea level variance in central Red Sea is due to elevation changes in an 'intermediate' frequency band, with periods between 2 days and 1 month. We examined the sea level signal in this band using the data from pressure sensors maintained for more than five years at a number of locations in Saudi Arabian coastal waters between 20.1 and 23.5 oN. We find that the intermediate-band sea level variations are strongly correlated with the local wind stress measured at a meteorological buoy. The maximum pressure-wind correlation occurs at wind direction closely aligned with the alongshore orientation and at a lag (wind leading) of 45 hr, which is consistent with the expected response of the coastal sea level to local wind forcing. However, less than half of the sea level variance in the intermediate band is related, through linear correlation, with local wind forcing. Our analysis indicates that the residual coastal sea level signal, not associated with wind forcing, is largely driven remotely by the passage of mesoscale eddies, revealed by satellite altimeter-derived sea level anomaly fields of the central Red Sea. These eddy-driven coastal sea level changes occur on time scales of 10-30 days. They span a range of 0.5 m, and thus constitute an import component of the sea level signal in the coastal Red Sea.