Minima of Interannual Sea-level Variability in the Indian Ocean

D. SHANKAR[1], M. APARNA[1], J.P. MCCREARY[2], I. SURESH[1], S. NEETU[1], F. DURAND[3], S.S.C. SHENOI[4], and M.A. AL SAAFANI[5]

[1]*National Institute of Oceanography, Dona Paula, Goa 403004, India (shankar@nio.org)*
[2]*SOEST, University of Hawaii, Honolulu, Hawaii, USA.*
[3]*IRD, LEGOS, UMR5566 CNRS-CNES-IRD-UPS, 14 Avenue Edouard Belin, 31400 Toulouse,France.*
[4]*INCOIS, Ocean Valley, Post Bag 21, IDA Jeedimetla PO, Hyderabad 500055, India*
[5]*Department of Earth and Environmental Sciences, Faculty of Science, Sana'a University, Yemen.*

Shankar et al. [1] performed wavelet analysis of altimeter sea level in the Indian Ocean to show that regions of high variability (maxima) and low variability (minima) exist at all time scales. At interannual time scales, i.e., at periods of 17 months or more, minima are seen at several places: in the central equatorial Indian Ocean; in the Arabian Sea along the south and west coasts of India and Sri Lanka, along the northern boundary, in the Gulf of Aden, and in patches along the coast of Oman; and in the Bay of Bengal along the east coasts of Sri Lanka and India south of ~10°N, and in the southern bay east of the Sri Lanka thermal dome. The cause of these interannual minima is investigated using a linear, continuously stratified numerical model, which is able to simulate the observed minima. The forcing is separated into a set of processes: direct forcing by winds in the interior ocean,forcing by winds blowing along continental boundaries, and forcing by Rossby waves generated by the reflection of equatorial Kelvin waves at the eastern boundary. At interannual periods, minima (maxima) of interannual variability occur where the direct wind forcing and reflected Rossby waves interfere destructively (constructively). At interannual periods within the tropics, the adjustment time scale of the system is less than that of the forcing, leading to a quasi-steady balance, a property that distinguishes the interannual minima from those at annual and semiannual time scales. Idealized solutions show that the presence of India causes the minimum along the Indian west coast, and that it extends around the perimeter of the Arabian Sea into the Gulf of Aden.

Keywords: Climate and interannual variability; Equatorial oceanography; Sea level variations; Rossby waves.

References

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