Western Equatorial Indian Ocean

Overview

The Western Equatorial Indian Ocean is that part of the Indian Ocean bounded by the Equator (to the north), Africa (to the west) and the Mid-Indian Ridge (to the east). Its is an area primarily of deep water (greater than 3000 meters) broken up by the Mauritius Ridge and the Seychelles Islands.



Figure 1. Bathymetry of the Western Equatorial Indian Ocean. [Smith and Sandwell, 1997]

Observations

There has been some research done in the Western Equatorial Indian Ocean both though in situ and remote sensing observations. Konyaev et al. [1995] reports on data collected in March 1987 and November/December 1990 over the shallowest part of the Mascarene Ridge (centered around 13°S, 61.25°E). Internal waves were measured both east and west of this sill. The eastward propagating waves obtained peak-to-trough amplitudes of up to 90-meter amplitude and phase speed of 3 m/s. To the west, strong (up to 40 meter) elevations of the upper part of the thermocline were measured with groups of short waves (height of 20 meters) above the sill. The western and sill observed waves each had significant sea surface manifestations.

Zheng et al. [1995] performed an analysis of astronaut photographs acquired North of Madagascar (near 7°S, 45°E). He noted a several wave packets with intersoliton separations of 1.1 to 2.6 km, along crest lengths of 100 km and packet separation of 66 km. These data were used to derive a phase speed of 1.7 m/s and a mean amplitude of 25 meters.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
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 Table 1 - Months when internal waves have been observed in the Western Equatorial Indian Ocean.

 (Numbers indicate unique dates in that month when waves have been noted)

References

Konyaev, K.V., K.D. Sabinin, and A.N. Serebryany, 1995: Large-amplitude internal waves near Mascarene Ridge in the Indian Ocean. *Deep-Sea Res.* **I**, **42** (11/12), 2075-2091.

Smith, W. H. F., and D. T. Sandwell, 1997; Global seafloor topography from satellite altimetry and ship depth soundings, *Science*, v. **277**, 1957-1962

http://topex.ucsd.edu/marine_topo/mar_topo.html

Zheng, Q., V. Klemas, and X.-H. Yan, 1995: Dynamic interpretation of space shuttle photographs: deep-water internal waves in the western equatorial Indian Ocean. *J. Geophys. Res.*, **100 (C2)**, 2579-2589.

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Figure 2. MODIS (Bands 1,3,4) 250-m resolution visible image near the Seychelles in the Western Equatorial Indian Ocean acquired on 16 October 2003 at 0935 UTC. The image shows internal waves propagating to the northwest. Imaged area is approximately 253 km x 312 km



3°S

6⁰S



Figure 3. MODIS (Bands 1,3,4) 250-m resolution visible image near the Seychelles in the Western Equatorial Indian Ocean acquired on 16 October 2003 at 0640 UTC. The image shows internal waves propagating both to the north and northeast. Imaged area is approximately 200 km x 193 km







Figure 5. Astronaut photograph (ISS006-E-7795) acquired on 13 December 2002 at 0612 UTC over the Western Equatorial Indian Ocean. The image shows internal wave signatures near the Seychelles Islands. Imaged area and orientation are unknown. Position estimated from the location of the sun specular point.





Figure 6. MODIS (Bands 1,3,4) 250-m resolution visible image in the Western Equatorial Indian Ocean acquired on 15 October 2003 at 0650 UTC. The image shows internal waves propagating west toward Africa. Imaged area is 85 km x 175 km



Figure 7. Astronaut photograph (STS044-93-101) over the Western Equatorial Indian Ocean acquired on 28 November 1991 at 0653 UTC. The image shows two internal wave packets and soliton interaction. Image orientation is unknown. Imaged area approximately 100 km x 100 km. Position estimated from the location of the sun specular point. [Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center (http://eol.jsc.nasa.gov)]





Figure 8. Astronaut photograph (STS044-93-103) over the Western Equatorial Indian Ocean acquired on 28 November 1991 at 0653 UTC. The image shows two internal wave packets crossing at near right angles in the open ocean. Image orientation is unknown. Imaged area approximately 100 km x 100 km. Position estimated from the location of the sun specular point. [After *Zheng et al.* 1995]. Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center (http://eol.jsc.nasa.gov).



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