Dual frequency wind-driven mixed Rossby gravity waves in the equatorial Indian Ocean

*名倉 元樹[1]、McPhaden Michael[2]
*Motoki Nagura[1], Michael J McPhaden[2]

1. (独) 海洋研究開発機構、2. 米国大気海洋庁/太平洋海洋環境研究所
1. Japan Agency for Marine-Earth Science and Technology, 2. National Oceanic Atmospheric Administration/Pacific Marine Environmental Laboratory

Frequency spectra of in-situ meridional velocity measurements in the central equatorial Indian Ocean show two distinct peaks at “quasi-biweekly” periods of 10-30 days. One is near the surface at frequencies of 0.06-0.1 cpd (periods of 10-17 days) and the other is in the pycnocline (~100 m depth) at lower frequencies of 0.04-0.06 cpd (periods 17-25 days). Analysis of a wind-forced ocean general circulation model shows that variability in the two frequency bands represents wind-driven mixed Rossby gravity waves. The waves share a similar horizontal structure, but the meridional scale of lower frequency variability is about half compared to that of higher frequency variations. Higher frequency variability has its largest amplitude in the eastern basin while the lower frequency variability has its largest amplitude in the central basin. The vertical wavelength of lower frequency variability is three times smaller than that of higher frequency variability. These results are consistent with expectations from linear mixed Rossby gravity wave theory. The results obtained from numerical simulations show that the primary driver of these waves is surface wind forcing in the central and eastern Indian Oceans and dynamical instability does not play a major role in the generation of the waves.

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