Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)
©2012. Japan Geoscience Union. All Rights Reserved.

AAS01-15 Room:101A Time:May 24 14:35-14:50

The dynamics of wind-driven intraseasonal variability in the equatorial Indian Ocean

NAGURA, Motoki[1*], Michael J. McPhaden[2]

[1]Japan Agency for Marine-Earth Science and Technology, [2]National Ocean and Atmospheric Administration/Pacific Marine Environmental Laboratory

Variability in the equatorial Indian Ocean on intraseasonal time scales (defined as periods of 30-110 days) is investigated using satellite and in situ observations and a simple analytical linear long-wave equatorial beta-plane model. Despite the extreme simplicity of the model, which includes just the two gravest baroclinic mode Kelvin waves and first meridional mode Rossby waves, simulated surface zonal velocity and sea surface height compare very well with observations. Both observations and model are characterized by a red shift in the velocity spectrum relative to the wind forcing spectrum, which is attributable to a combination of factors, including (1) the near resonant excitation of Kelvin waves by eastward propagating winds, (2) constructive interference between wind-forced waves and Rossby waves reflected from the eastern boundary, and (3) the favored excitation of low-frequency waves whose zonal wavelengths are long compared to the zonal fetch of the wind. We decomposed variability in two broad period bands, namely, 30-70 days and 70-110 days, for detailed analysis. At periods of 30-70 days, zonal velocity tends to be stationary in the directly forced region along the equator owing to the competing contributions of Kelvin and Rossby waves. In contrast, at 70-110 day periods, zonal velocity propagates westward despite eastward propagation of zonal wind stress because of the combined influence of eastern boundary generated and wind-forced Rossby waves. Kelvin waves reflected from the western boundary are negligibly small, indicating that basin mode resonances are not prominent as has been previously suggested.

Keywords: Equatorial Indian Ocean, Intraseasonal Variability, Wave Dynamics, Resonance