Enhanced mixing in the equatorial thermocline induced by inertia-gravity waves

*Kelvin John Richards[1], Andrei Natarov[1]

1.University of Hawaii

Observations show turbulence activity is enhanced in and above the equatorial thermocline. This enhancement is brought about in part by the generation, propagation and dissipation of wind-driven inertia-gravity waves (IGWs). Numerical experiments show that in a zonally symmetric model of a tropical ocean forced by a transient wind stress both IGW activity and the energy dissipation have a pronounced maximum in the thermocline close to the equator regardless of the latitudinal distribution of the energy input into the ocean's mixed layer by the wind. We show that this equatorial enhancement is caused by a combination of three factors: a stronger superinertial component of the wind forcing close to the equator, wave action convergence at turning latitudes for various equatorially trapped waves, and nonlinear wave-wave interactions between equatorially trapped waves. Amplification of IGWs also occurs due to refraction at the top of the thermocline. We show that the latter mechanism can operate at any latitude, but is limited in its capacity to amplify the Froude number associated with propagating IGW packets and requires short (shorter than the local inertial period) energetic wind bursts to produce enhanced mixing.

Keywords: Turbulence, Inertia-gravity waves, Equatorial

