

Scale interactions in the tropical Pacific Ocean

*Kelvin John Richards¹

1. University of Hawaii at Manoa

We examine the way various temporal and spatial scales of motion interact to impact the evolving ocean/atmosphere system in the tropical Pacific. A major focus is the link between wind variability, the production and propagation of internal wave activity, and changes to the thermocline that impact the cold tongue, which in turn affects ocean/atmosphere interactions. A key element is the fine-scale shear associated with small vertical scale inertia-gravity waves. An equatorial enhancement of wave activity is brought about by a combination of factors: a stronger superinertial component of the wind forcing close to the equator, wave action convergence at turning latitudes for equatorially trapped waves, and nonlinear wave-wave interactions between equatorially trapped waves. This equatorial enhancement leads to an enhancement of mixing in the equatorial thermocline. The small vertical scale nature of the waves means that they are often overlooked in observations and are not resolved in models, and thus we are missing a crucial element of interactions in the ocean. The good news is that with enough resolution the relevant scales can be captured in both observations and models. Future observational studies and the design of the next generation climate models need to take this into account.

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