

Thermodynamic coupled modes in the tropical atmosphere-ocean

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A set of thermodynamic coupled modes is derived from a simple linear atmosphere model coupled to a slab ocean model through the wind-evaporation-SST (WES) feedback. For pure easterly mean winds, the zeroth mode is a series of meridional SST dipoles in the tropics, antisymmetric about the equator and moving westward; the first mode is a series of zonal SST dipoles in the subtropics, symmetric about the equator and moving eastward. The meridional component of the mean winds will break such an equatorial symmetry and enable the coupled modes to intensify in the Southern Hemisphere for southerlies and the Northern Hemisphere for northerlies. Despite the existence of positive WES feedbacks, these thermodynamic coupled modes are largely damped oscillation with periods in years. These findings are further tested with an aqua-planet model and assessed with the reanalysis data.

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