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Title: High-Order Equaotrial Kelvin Waves in Air-Ocean Coupled System (Fo Land-Ocean-Atmosphere Interaction)

Abstract:

On the base of nonlinear equatorial wave dynamics, a two-stage air-interaction mechanism is proposed to explain the central equatorial P warming and its effect on the onset of El Nino and Southern Oscillatio (ENSO) event. The first-stage westerly wind bursts occur in boreal wi over the western equatorial Pacific and generate the 'first-stage' Kelvi waves, propagating in stratified ocean with vertically sheared mean c U (e.g., zonal jet such as the equatorial undercurrent). Wave-current interaction significantly modifies the structures and dispersion charac of the baroclinic Kelvin waves, depending on the speed and the spatia of the jet relative to those of waves. The first baroclinic mode has the speed (c) much larger than U (ranging between 0-1.5 m/s), and it is modified least structurally by the Doppler shift, and causes eastward propagation of weak warm SST anomaly. Conversely, the high (espec second) baroclinic modes have the phase speed comparable to the m speed, and they are modified structurally or even ceased propagation Doppler shift. When the second baroclinic mode ceases its propagatio central Pacific, positive SST anomaly appears that shifts the atmosph convection zone from the western to central equatorial Pacific and in t causes the second-stage westerly wind bursts over a broad area cove western and central Pacific. The second-stage westerly wind bursts ge the 'second-stage' Kelvin waves with the first baroclinic mode carryin sufficient warm SST anomaly and causing the ENSO onset. This theor verified using TOGA-TAO data and numerical model simulation.

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