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Equatorial waves and warm water volume changes in the equatorial Pacific

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Observational and modelling studies showed that variations of Warm Water Volume (WWV) in the tropical Pacific mainly consist of a zonal seesaw pattern in the equatorial band at the ENSO time scale, and a meridional seesaw pattern between the equatorial and off-equatorial regions at the ENSO and decadal (PDO) time scales. The meridional seesaw pattern is reminiscent of the ENSO recharge / discharge oscillator theory, and WWV changes in the equatorial band can be used to improve ENSO prediction.

This presentation aims at analyzing the mechanisms responsible for the WWV changes in the 5˚N-5˚S equatorial region during the period 1992-2006. This is done relying on sea level data derived from the TOPEX/Poseidon and Jason missions and wind stress measurements from the ERS and Quiksat satellite missions.

The WWV changes in the 5˚N-5˚S equatorial box are derived from sea level changes, assuming the ocean behaves like a 1.5-layer ocean. Changes in this WWV are analyzed in terms of geostrophic and Ekman transports filling up or draining the 5˚N-5˚S equatorial box. The geostrophic transports in the upper layer are computed from surface geostrophic currents (derived from sea level gradients) and statistical current pro-

files obtained from TAO/TRITON moorings and cruise measurements. The satellite-derived geostrophic transports in the upper layer are validated against in situ hydrographic measurements. The Ekman transports are computed from the wind stress data alone.

The relative roles of geostrophic and Ekman transports in changing the equatorial WWV are discussed, focussing in particular on the effects of propagating equatorial Kelvin and Rossby waves as they affect the basin-scale sea level gradients and related geostrophic currents. It will be shown, in particular, that first baroclinic, first and third meridional mode equatorial Rossby waves, play a key role in changing WWV at the ENSO time scale.