Difficulty and partial success in diagnosing cross-equatorial surface currents from satellite: Yanai-mode tropical instability waves

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Introduction:

Large-scale to mesoscale surface currents can be estimated from satellite observations with diagnostic models (Bonjean and Lagerloef 2002). The Ocean Surface Current Analysis Realtime (OSCAR) dataset, one of the most advanced current datasets, has been able to accurately produce Pacific equatorial zonal currents, but not Pacific **equatorial meridional currents** (Johnson et al. 2007, heir Fig. 3). The equatorial meridional currents contain quasi-geostrophic high-frequency perturbations amplified near the surface (Lyman et al. 2007) and wind-driven shallow meridional overturning cells (Philander and Pacanowski 1981; Philips 1987); neither can be estimated by steady, 2-D surface diagnostic models. In this study, we use satellite SSH to identify **two modes of tropical instability waves** (TIWs) in the equatorial Pacific and develop a **non-steady diagnostic model** for their currents, especially for equatorial meridional currents of **Yanai instability waves**.

