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Interannual variability of tropical Pacific sea level from 1993 to 2014

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A multimode, linear reduced-gravity model, driven by ERA-Interim monthly mean wind stress anomalies, is used to investigate interannual variability in tropical Pacific sea level as seen in satellite altimeter data. The model output is fitted to the altimeter data along the equator, in order to derive the vertical profile for the model forcing, showing that a signature from modes higher than mode 6 cannot be extracted from the altimeter data. It is shown that the model has considerable skill at capturing interannual sea level variability both on and off the equator. The correlation between modeled and satellite-derived sea level data exceeds 0.8 over a wide range of longitudes along the equator and readily captures the observed ENSO events. Overall, the combination of the first, second, third, and fifth modes can provide a robust estimate of the interannual sea level variability, the second mode being dominant. A remarkable feature of both the model and the altimeter data is the presence of a pivot point in the western Pacific on the equator. We show that the westward displacement of the pivot point from the center of the basin is strongly influenced by the fact that most of the wind stress variance is found in the western part of the basin. We also show that the Sverdrup transport is not fundamental to the dynamics of the recharge/discharge mechanism in our model, although the spatial structure of the wind forcing does play a role in setting the amplitude of the "warm water volume."