Analysis of SSH variability in the Tropical Pacific based on ocean model and Topex altimeter data during the Topex-Poseidon mission

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Using numerical output from the high resolution Regional Ocean Model System (ROMS) with atmospheric forcing from the NCEP data coincident in time and a full series of Topex/Poseidon observations, we compare basic statistical characteristics of SSH variability in the equatorial Pacific region between 20 N and 20 S as predicted by the model and observed by the altimeter. The focus is on the zonal and meridional distributions of low-frequency variability for timescales from semi-annual to interannual. The ocean variability is analyzed seprately for four frequency bands with scales 0.5 year, 1 year, 1.5 year and 2.3-4.5 years. Meridional profiles of SSH variance on these timescales are analyzed and individual dynamical components of the variability quantified using the wavenumber-frequency spectra of SSH spatial-temporal variations. The four frequency bands are shown to account for about 63 percent of the total SSH variance. We find in particular that wave-related variations on annual timescales account for about 33wave-type oscillations contribute only about 4 percent. In agreement with the previous findings, the variability is dominated by steric-type oscillations whose spatial scales are comparable with the zonal extent of the area. However, we also find that intermittently occuring very large-scale equatorial eddies

yield an appreciable fraction of the total energy. The meridional structure of oscillations is of particular interest, and we have managed to obtain an unprecedently detailed distribution of the energy across and along the equator for each type of oceanic motions. Both the agreements and the descrepancies between the model output and the observed variability are highly instructive and pose serious questions regarding the ability of the numerical model to reproduce the actual physical phenomena.