Abstract View

Volume 10, Issue 12 (December 1980)

Journal of Physical Oceanography
Article: pp. 1929–1951 | Abstract | PDF (1.84M)

The Seasonal Variability in a Model of the Tropical Pacific

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(Manuscript received March 19, 1980, in final form September 25, 1980)

DOI: 10.1175/1520-0485(1980)010<1929:TSVIAM>2.0.CO;2

ABSTRACT

A simple linear model of the tropical Pacific Ocean is used to simulate the oceanic response to time-dependent wind stress forcing. A linear, one-layer, reduced-gravity transport model on an equatorial beta-plane is incorporated. The non-rectangular model basin extends from 18°N to 12°S. Bottom topography, thermohaline and thermodynamic effects are neglected.

The equatorial response, particularly at the eastern boundary, is studied along the same lines as Kindle. Annual and semiannual harmonics of the zonal equatorial wind stress calculated by Meyers are used to force the model. The east-west slope of the model pycnocline is compared with depth observations of the 14°C isotherm. The linear model generates a semiannual eastern boundary response remote from any region with strong second harmonies of the zonal wind stress. This response supports Meyers' hypothesis that at the eastern boundary the semiannual displacement of the thermocline is due to remote forcing.

The major application of the model is forced by mean monthly wind stresses based on 10 years of observations over the tropical Pacific. The resulting meridional profile of the pycnocline depth is similar to Wyrtki's profile of dynamic height. The equatorial system of troughs and ridges is evident in the pycnocline profile. The seasonal variation of the major equatorial surface currents is compared with the observations. An annual Rossby wave emanating from the eastern boundary is found to modify the location and variability of the Countercurrent Trough. The presence of an anomalous eastward flow centered south of the equator in the eastern equatorial Pacific is supported by Tsuchiya's maps of the dynamic topography of this region.

The results of the two model applications indicate that the dynamics inherent in linear theory are capable of simulating some of the major features of the equatorial response and those of the equatorial surface current system.

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