Abstract View

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Generation and Propagation of 30-Day Waves in a Numerical Model of the Pacific

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ABSTRACT

A multilevel numerical model is applied to the equatorial Pacific Ocean, driven by long-term averaged, monthly varying winds. In agreement with satellite-observed sea surface temperatures, the solution is unstable at certain times of year and gives rise to waves of 1.1 month period and 1000 km wavelength just north of the equator in the central and eastern longitudes. A stability analysis of the flow indicates that the initial eddy energy is drawn from the mean flow via horizontal shearing instability between the South Equatorial Current and the North Equatorial Countercurrent. However, as the waves reach larger amplitude, significant conversion from potential to eddy kinetic energy takes place as well. The growth rate is found to increase strongly as vertical stratification is decreased. There are various planetary waves which are available to carry the wave energy away from the generation area. Internal Rossby-gravity and Rossby waves can carry energy downward and eastward, while external Rossby waves can carry energy poleward and eastward. Evidence for these mechanisms is investigated in the model solution. Vertical radiation by the internal waves is found to provide a significant sink of energy from the surface layers. The existence of wave energy of approximately 1 month period in the real ocean at locations remote from the generation area may be explained by one or more of these propagating modes.