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# Variability of Intraseasonal Kelvin Waves in the Equatorial Pacific Ocean

**Toshiaki Shinoda**

*NOAA/Earth System Research Laboratory, and CIRES Climate Diagnostics Center, Boulder, Colorado*

**Paul E. Roundy**

*Department of Earth and Atmospheric Sciences, University at Albany, State University of New York, Albany, New York*

**George N. Kiladis**

*NOAA/Earth System Research Laboratory, and CIRES Climate Diagnostics Center, Boulder, Colorado*

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ABSTRACT

Previous observational work has demonstrated that the phase speed of oceanic equatorial Kelvin waves forced by the Madden–Julian oscillation (MJO) appears to vary substantially. Processes that are responsible for systematic changes in the phase speed of these waves are examined using an ocean general circulation model. The model was integrated for 26 yr with daily wind stress derived from the NCEP–NCAR reanalysis. The model is able to reproduce observed systematic changes of Kelvin wave phase speed reasonably well, providing a tool for the analysis of their dynamics.

The relative importance of the upper ocean background state and atmospheric forcing for phase speed changes is determined based on a series of model experiments with various surface forcings. Systematic changes in phase speed are evident in all model experiments that have different slowly varying basic states, showing that variations of the upper ocean background state are not the primary cause of the changes. The model experiments that include and exclude intraseasonal components of wind stress in the eastern Pacific

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demonstrate that wind stress changes to the east of the date line can significantly alter the speed of Kelvin waves initially generated over the western Pacific, which often results in a phase propagation faster than the free wave speed. These faster waves contribute to the systematic changes of phase speed evident in observations. Similar results are also obtained using a linear stratified model, eliminating nonlinearity as a possible cause of the phase speed changes.


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