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Gabor analysis of the intraseasonal oceanic variability simulated in the tropical Pacific Ocean by a regional coupled model

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Intraseasonal oceanic variability simulated by an ocean-atmosphere general circulation model restricted to the tropical Pacific is studied using both the classical Hayashi's space-time spectral analysis and a newly-developed method combining a Gabor analysis together with Hayashi method. This analysis, applied to both the thermocline depth and zonal surface current, reveals strong equatorial Kelvin wave activity dominated by the first and second baroclinic modes. A strong interannual variability of this wave activity is also detected, in relation with the ENSO cycle, underlying the implication of such equatorial oceanic waves in the triggering, development and termination of El Niño and La Niña events.

Thanks to this new statistical technique, which is particularly effective when applied to time and amplitude modulated signals, two main periods emerge in the equatorial Kelvin wave activity. The first one is near 70 days and is associated with zonal wave number 1; it corresponds to the classical intraseasonal oceanic Kelvin wave activity, and indicates the predominance of the second baroclinic mode. The other one is near 25 days with zonal wave number 2, and reveals pulse of strong activity of the first baroclinic mode.