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Spatial-temporal variability of M2 internal tides modulated by the Kuroshio currents and mesoscale eddies northeast of Taiwan

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The spatial-temporal variability and energetics of M2 internal tides during their generation and propagation through the Kuroshio flows and robust eddies northeast of Taiwan are investigated using a high-resolution numerical model. The corrugated continental slopes, particularly the I-Lan Ridge and Mien-Hua Canyon, are identified as the energetic sources of M2 internal tides. The M2 internal tide generation is influenced by the horizontally varying and zonally tilting stratification associated with the Kuroshio currents and mesoscale eddies. In this situation, the magnitude of conversion rate and energy beam exhibit highly temporal variability. An energetic along-slope tidal beam from the I-Lan Ridge radiates southward against the northward Kuroshio flows, causing strong vertical displacement. Complex background currents lead to the time-varying inhomogeneous diapycnal mixing induced by internal tide dissipation.

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