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The fate and impact of internal waves induced by strong shear current over a marginal ridge

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Internal waves with strong vertical mixing could be induced by stratified flow over seafloor obstacles. Noted that the stratified flow not only trigger internal tides, but also highly nonlinear internal waves like internal lee waves and internal solitary waves over steep topography features, and the highly nonlinear internal waves are suggested to play an important role in turbulence and mixing. As a typical seafloor obstacle, ridge could significantly modified the propagation of internal tide, internal lee wave and internal solitary wave. We focused on I-Lan ridge with asymmetrical topography feature in Kuroshio region. To the north of the I-Lan ridge, the depth of Philippine basin reached 4000m compared with the depth of 1500m in the south of the ridge, leading to different characteristics of internal wave energy field and ecological characteristics between two sides. Based on numerical simulations, we revealed the generation and propagation of internal waves over marginal ridge, causing by the shear current induced by Kuroshio. We also discussed the turbulence kinetic energy contributed by linear internal waves and nonlinear internal waves, providing the strength of vertical turbulent mixing around the I-Lan ridge. Then we demonstrated the characteristics of complex internal wave field in the strong background shear current over I-Lan ridge.

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