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Three dimensional simulation on the generation and propagation of internal tides and solitary waves northeast of Taiwan Island

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The slope area northeast of Taiwan was known as a hotspot for internal tides and internal solitary waves (ISWs), while their specific sources and generation mechanism of ISWs remain unclear. We investigate the generation and evolution processes of internal tides and ISWs with realistic configuration based on the high resolution non-hydrostatic numerical simulations. The ISWs northeastern Taiwan show a complex pattern according to the satellite image and our numerical results. ISWs propagate to various direction, and both shoreward and seaward propagating ISWs are generated on the continental slope. The ISWs observed on the continental slope-shelf region northeastern Taiwan can be generated by two ways. One is the local tide-topography interaction, and the other is the disintegration of remote internal tides generated over the I-Lan Ridge. The generated internal tides propagate northward to the Okinawa Trough, and can reach the continental slope-shelf region. During the propagation of the internal tides, the internal tides start to steepen and internal solitary waves are formed about 80 km north of I-Lan Ridge. The amplitude of the generated internal solitary waves is about 30 m. Furthermore, the Kuroshio is important to modulate the propagation and evolution of internal tides and ISWs, especially to the complexity of the ISW spatial pattern. We revealed most of the generated internal wave energy is dissipated locally over the double-canyon region, and strong mixing occur over the canyons.