Dissipation and transport due to internal tides generated by multiple submarine canyons

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Rough seafloor is a major source to generate internal waves in the ocean. High-resolution multibeam survey reveals detailed seafloor with complicated features, however, some are not shown in commonly used topography datasets, such as Smith and Sandwell (1997). A group of canyons on the continental shelf of the northern South China Sea were recently discovered during a geographic survey. Interaction between barotropic tides and concave-shape canyons generates internal tides, showing complex interference patterns. A linear model, based on normal-mode decomposition, reveals complex beam generation and interaction inside and between the canyons. Then, a very high resolution and three dimensional numerical model is employed to validate the linear model result and estimate local energy dissipation for internal wave generation by a group of canyons. Instead of complicated turbulence models, constant viscosity coefficients are used. Nonlinear interaction or shear instability during internal tide generation and propagation causes local diapycnal mixing, which is one of the key processes to drive material transport in continental shelf. Transport due to internal tides in the canyon region is also calculated and its relationship with local internal tide generation and propagation is discussed.

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