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Nutrient transport induced by internal gravity waves interacting with topography

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Two-dimensional numerical simulations are performed to investigate the nutrient transport by internal waves interacting with a sloping topography. The numerical model is non-hydrostatic and solves the fully nonlinear Boussinesq equations.
Numerous field studies have shown that internal waves and their interaction with topography can lead to a high nutrient input into near-shore waters which often exceeds the input by terrestrial runoff. The aim of this study is to investigate the dependence of this transport on different physical parameters such as slope, pycnocline depth, pycnocline width, internal wave type and internal wave parameters.
The focus is on interfacial waves occurring in a strongly stratified ocean with a relatively sharp pycnocline. In this situation, often occurring in shallow water during the summer, the nutrient input into the euphotic zone can yield a strong ecological impact. One specific situation studied is the run-up of a single soliton in coastal waters. Solitons, which can for example be generated by the interaction of tidal flow with topography, are quite ubiquitous in the ocean due to their form-preserving nature. In addition to the pure nutrient transport, we investigate the different timescales involved in these phenomena and their dependence on the former mentioned physical parameters. Times such as the residence time of nutrient rich water in the euphotic zone or the period of internal wave events are highly relevant for the ecology of coastal waters.