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Estimating energy dissipation in internal solitary waves breaking on slopes

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The shoaling mechanisms of internal solitary waves that propagate horizontally are an important source of mixing and transport in the coastal zones. Numerical modelling, laboratory experiments and observations are needed for understanding wave energetics, especially energy transformation during waves interaction with the slopes. Two shoaling mechanisms are important during interaction with the slope: (i) wave breaking that results in mixing and dissipation, (ii) changing of the polarity of the initial wave of depression on the slope. Classification based on regimes of interaction with the slope was presented in [1]. Four zones were separated in $\alpha\beta\gamma$ (γ - is slope angle, α - is the non-dimensional wave amplitude (wave amplitude normalized on the thermocline thickness) and β - is the blocking parameter that is the ratio of the height of the bottom layer on the shelf to the incident wave amplitude) classification diagram: (I) without changing polarity and wave breaking, (II) changing polarity without breaking; (III) wave breaking without changing polarity; (IV) wave breaking with changing polarity. It was shown that results of field, laboratory and numerical experiments are in good agreement with proposed classification. In the present study we estimate energy dissipation for all the types of interaction and present the algorithm for building a zone map with a 'hot spot' of energy dissipation for real slopes in the ocean.

[1] K Terletska, BH Choi, V Maderich, T Talipova Classification of internal waves shoaling over slope-shelf topography RUSSIAN JOURNAL OF EARTH SCIENCES vol. 20, 4, 2020, doi: 10.2205/2020ES000730