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Analytical study on breaking location of Internal Solitary Waves over a sloping bottom

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We present an analytical model to predict both location and time of breaking of Internal Solitary Waves (ISWs). Since direct observations cannot detect the exact breaking location, we compare our analytic results with indirect field observations.
We take advantage of some laboratory experiments, performed in a wave tank with a sloping boundary. We set up the experiments to reproduce the plunging and plunging-collapsing breakers mechanisms, since they are the most relevant breaking mechanisms expected in the continental shelf region. In particular, the experiment is set up to reproduce ISWs generated in the Messina Strait (Tyrrhenian Sea, Italy).
The experiments show a steepening of the rear wave edge during the shoaling process, leading to the verticalization of the wave profile. We consider the breaking location as the wave verticalization point. Through the eKdV equation and some geometrical approximations we model the wave profile and we derive the location and the time of the ISWs breaking.
We apply our model to the case of the ISWs generated in the Messina Strait, where tidally forced ISWs propagate northward, towards a frontal slope where the breaking is expected to occur.