



The role of adverse current gradients in the formation of freak waves

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Laboratory experiments in a wave flume and a narrow directional wave basin have been carried out to investigate the nonlinear dynamics of mechanically generated water-wave trains when propagating on adverse current gradients. Observations substantiate that the increase of wave steepness induced by the wave-current interaction excites nonlinear mechanisms such as modulational wave instability. This facilitates the formation of freak waves also under those circumstances when they are less likely. Experimental results support recent theoretical achievements based on a current-modified Nonlinear Schrodinger equation, which demonstrate that rogue waves are triggered by current with negative gradient of horizontal velocity.