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A nonlinear Schrodinger Equation for capillary-gravity water waves with vorticity on finite water depth

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Generally, gravity-capillary waves are produced by wind which generates firstly a shear flow in the uppermost layer of the water and then waves. These short waves play an important role in the initial development of wind waves, contribute to some extent to the sea surface stress and consequently participate in air-sea momentum transfer. Furthermore, the knowledge of their dynamics at the sea surface is crucial for satellite remote sensing. The knowledge of gravity-capillary waves is important in remote sensing applications.
In this paper we consider the effect of surface tension and vorticity due to a vertically sheared current on the modulational instability of a weakly nonlinear periodic short wave trains. Recently, Thomas et al (2012) have derived a nonlinear Schrödinger equation for pure gravity water waves on finite depth with constant vorticity. Their main results were (i) a restabilisation of the modulational instability for waves propagating against the current whatever the depth and (ii) the importance of the nonlinear coupling between the mean flow induced by the modulation and the vorticity. Our aim is to extend Thomas' investigation to the case of gravity-capillary waves propagating on a vertically sheared current.