



The structure and stability of mode-2 internal solitary-like waves

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Recent observational examples of Mode-2 internal solitary-like waves (ISWs) in the ocean (e.g. Yang et al., 2009; Schroyer et al., 2010) have motivated modelling studies. The present laboratory study investigates the structure and stability of mode-2 ISWs. A rank-ordered train of mode-2 ISWs is generated using a lock release configuration. The pycnocline is centred either on the mid-depth of the water column (the 0% offset case) or it is offset in the positive vertical direction by a fraction of 5%, 10% or 20% of the total fluid depth. It is found that offsetting the pycnocline has little effect on the basic wave properties but it does significantly affect wave stability. Instability takes the form of small K-H-like billows in the rear of the wave and small scale overturning in the core of the wave. In the 0% offset case, instability occurs on both the upper and lower interfaces of the pycnocline and is similar in extent and vigour over the two interfaces. As the offset percentage is increased, however, instability is more pronounced on the lower interface with little or no evidence of instability being observed on the upper interface. In the 20% offset case a mode-1 tail is associated with the wave and the wave characteristics resemble qualitatively the recent field observations of Shroyer et al., (2010).