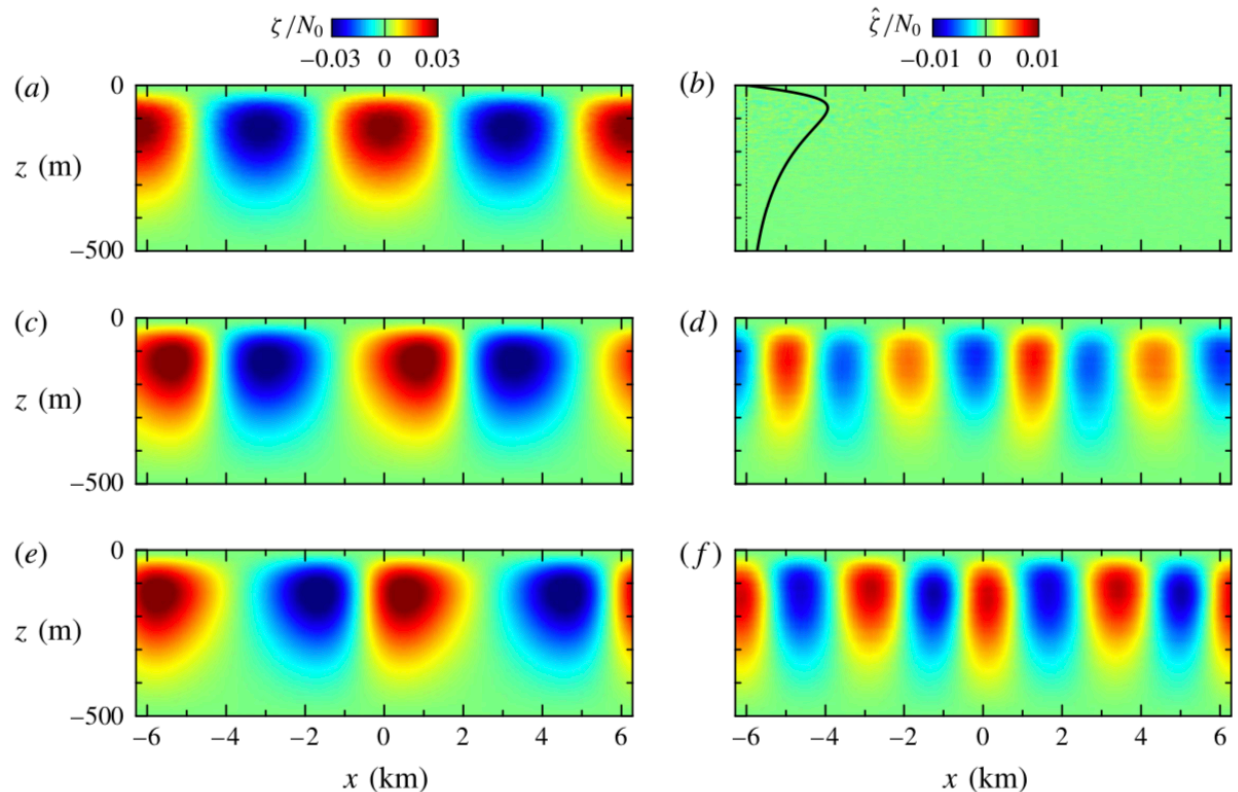


Interaction between internal modes and their superharmonics

Bruce Sutherland



Snapshots from simulation at $Nt=0$ (top), 200 (middle) and 400 (bottom) with the total horizontal velocity field (left) and the horizontal velocity having subtracted that of the primary wave (right)

A vertical mode in non-uniform stratification immediately excites superharmonics with twice the horizontal wavenumber and frequency but with vertical structure that does not necessarily correspond to any one mode. The project aims to examine the weakly nonlinear interactions between the superharmonics and the primary wave. Numerical simulations of internal modes in exponential stratification suggest the superharmonics periodically grow and decay in amplitude. Theory will be developed to predict the amplitude and periodicity of this oscillation as it depends upon amplitude and frequency of the primary wave. Extensions to stratification more representative of the ocean will be explored.

Further reading

- Sutherland, "Excitation of Superharmonics by Internal Modes in Non-uniformly Stratified Fluid", J. Fluid Mech., 793, 335-352 (2016)