Unstable modes of a sheared pycnocline above a stratified layer
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— Internal waves
incident on a sheared ocean pycnocline are studied using analytic and numerical
methods. Linear analysis of the unstable modes of a sheared ocean pycnocline is used
to demonstrate interactions between internal waves and shear instabilities. A new
analytic solution for an asymmetric shear layer over a stratified layer is presented,
illustrating modes which couple to internal waves, in addition to the well-known
Holmboe modes. The robustness of these solutions is demonstrated using numerical
methods for realistic shear profiles. Fully nonlinear numerical simulations illustrate
the growth of these modes and demonstrate the excitation of shear instabilities
by incident internal waves. The results may have implications for internal wave
interactions with the ocean pycnocline and the local generation of internal solitary
waves.

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