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Modelling tidal mixing in sill regions

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A non-hydrostatic model in cross sectional form with idealized topography representing a sill and forced by a barotropic tidal flow is used to examine the role of a hydraulic transition and lee waves in determining mixing in the sill region. The effect of bottom friction , horizontal and vertical eddy viscosity upon the intensity of lee waves and hence mixing is also investigated. Calculations using smooth topography show that unsteady lee waves are generated on the sill slope during flood tide. These waves propagate towards the sill when the tide reverses leading to enhanced mixing in the sill region. The addition of small scale topography on the leeside of the sill changes the lee wave distribution with an associated change in mixing. Calculations show the importance of the hydraulic transition, lee waves , and friction , together with small scale topography in determining mixing in sill regions. Consequently mixing based on coarse topography will not represent the role of small scale topography in determining the mixing in a sill region , that may therefore be underestimated.