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Turbulence and Mixing Near a Sloping Boundary of a Lake[1]
CHRIS REHMANN, ZHIMIN LI, HUI HU, Iowa State University — Fluxes in stratified water bodies such as lakes and oceans are often controlled by turbulence and mixing at sloping boundaries, and determining how the mixed fluid moves from the boundary to the interior is important for estimating basin-wide transport of heat and other scalars. A field experiment in one lake showed that fluid mixed at the boundary can be transported by intrusions that form as the mixed fluid collapses while an experiment in another lake suggested that the transport is caused by advection and dispersion by internal waves. Further work on this problem involves two parallel approaches. An analytical model, based on rapid distortion theory, is used to determine the effect of straining by vertical mode-2 waves on the turbulence and to compute the efficiency of the mixing. This approach is complemented with laboratory measurements of velocity and scalar fields with molecular tagging velocimetry. These measurements allow the scalar fluxes to be quantified as a function of the ratio of the wave frequency and the critical wave frequency.

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