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Nonreflecting wave propagation and runup in U-shaped bays

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The problem of tsunami wave shoaling and runup in U–shaped bays (such as fjords) and underwater canyons is studied in the framework of shallow water theory. The wave shoaling in bays, when the depth varies smoothly along the channel axis, is studied with the use of asymptotic approach. In this case a weak reflection provides significant shoaling effects. The existence of traveling (progressive) waves, propagating in bays, when the water depth changes significantly along the channel axis, is studied. It is shown that traveling waves do exist for certain bay bathymetry configurations and may propagate over large distances without reflection. The tsunami runup in such bays is significantly larger than for a plane beach.