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Internal Solitary Wave Generation by Tidal Flow over Topography KARL HELFRICH, Woods Hole Oceanographic Institution, USA, ROGER GRIMSHAW, University College London, UK — Oceanic internal solitary waves are typically generated by barotropic tidal flow over localized topography. Wave generation is characterized by the Froude number $F = U/c_0$, where U is the tidal amplitude and c_0 is the long wave phase speed. For steady flow in the resonant regime, $\Delta_m < F - 1 < \Delta_M$, forced-KdV (fKdV) theory shows that an upstream propagating undular bore is produced. The response further depends on whether the forcing is an equivalent hole or sill. Here wave generation is studied numerically using a fKdV model with time-dependent forcing, $F(t)$, representative of realistic tidal flow. The response depends on $\Delta_{max} = F_{max} - 1$, where F_{max} is the maximum of $F(t)$. When $\Delta_{max} < \Delta_m$ the flow is always subcritical and solitary waves appear after release of the downstream disturbance. When $\Delta_m < \Delta_{max} < \Delta_M$ the flow reaches criticality at its peak, producing upstream and downstream undular bores that are released as the tide recedes. When $\Delta_{max} > \Delta_M$ the tidal flow goes through the resonant regime twice, producing undular bores with each passage. Solutions representative of Stellwagen Bank and Knight Inlet illustrate the effect of asymmetric topography.

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