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Accelerating dense-water flow down a slope

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Where water is denser on a shallow shelf than in the adjacent deep ocean, it tends to flow down the slope from shelf to ocean. The flow can be in a steady bottom boundary layer for moderate combinations of horizontal density gradient ρ' and bottom slope (angle θ to horizontal):

$|\rho'|g\sin\theta \quad < \quad \rho_0 \, f^2 \, / \cos\theta$

where g is acceleration due to gravity, ρ_0 is a mean density and f is the Coriolis parameter. For stronger combinations of horizontal density gradient and bottom slope, the flow accelerates. Analysis of an idealised initial-value problem shows that when the threshold is exceeded, there is exponential intensification of a bottom boundary layer with down-slope flow.