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Gravity currents in non-rectangular cross-area channels with stratified ambient MARIUS UNGARISH, Israel Inst of Tech — The propagation of a high-Reynolds-number gravity current (GC) in a horizontal channel along the horizontal coordinate x is considered. The current is of constant density, ρ_c, and the ambient has a linear stable stratification, from ρ_b at the bottom $z = 0$ to ρ_o at $z = H$. The cross-section of the channel is given by the general $-f_1(z) \le y \le f_2(z)$ for $0 \le z \le H$. A shallow-water model is developed for the solution of a GC of fixed volume released from a lock on the bottom ($\rho_c \ge \rho_b$). The dependent variables are the position of the interface, $h(x,t)$, and the speed (area-averaged), $u(x,t)$, where t is time. The cross-section geometry enters the formulation via the width of the channel $f(z) = f_1(z)+f_2(z)$. For a given $f(z)$, the free input parameters of are the height ratio H/h_0 of ambient to lock and the stratification parameter $S = (\rho_b - \rho_o)/(\rho_c - \rho_o)$. The equations of motion are a hyperbolic PDE system. The initial motion displays a "slumping" stage with constant speed, calculated analytically. An analytical solution for the long-time self-similar propagation is also available for special cases. The model is a significant generalization of the rectangular-channel analysis.

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