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Experimental Evaluation of Simplified Theoretical Models for Fluid Mud Gravity Current Propagation[1] FIRAT TESTIK, MIJANUR CHOWDHURY, Civil Engineering Department, Clemson University — The propagation dynamics of fluid mud gravity currents were studied experimentally and theoretically. The experimental currents propagate under slumping, self-similar and viscous phases. The transition times from slumping to self-similar and from self-similar to viscous phases are parameterized. Predictive capabilities of the three existing theoretical modeling approaches (force-balance, box and shallow water) were evaluated based on our experimental observations. For the slumping and self-similar phases, both the force-balance and box model solutions showed a better predictive capability than the one-layer shallow water model solution. Having non-Newtonian rheology, the propagation dynamics of fluid mud gravity currents in the viscous phase vastly differ from the Newtonian currents. A force-balance expression for the viscous spreading of non-Newtonian power-law gravity current was derived. The predictions of this force-balance expression and a recent viscous shallow water model solution are observed to be in good agreement with the experimental data. The results of this study are expected to be useful in predicting the spreading of fluid mud gravity flows that occur in different natural and industrial situations.

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