Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Particle-driven gravity currents in non-rectangular cross-section channels TAMAR ZEMACH, Tel-Hai College — Particle-driven gravity currents are suspensions of dense particles that spread into an ambient fluid due to the difference between the density of the suspension and that of the ambient fluid. During the evolution of the current, particles continually sediment and are deposited from the flow. Particle-driven gravity currents are important in many environmental situations (volcanic ash flows, turbidity currents). In the present work we consider the propagation of a high-Reynolds-number gravity current generated by suspension of heavier particles in fluid of density ρ_i propagating along a channel into an ambient fluid of the density ρ_a . The bottom and top of the channel are at $z = 0, H$, and the cross-section is given by the quite general $-f_1(z) \leq y \leq f_2(z)$ for $0 \leq z \leq H$. The flow is modeled by the one-layer shallow-water equation. We solve the problem by the finite-difference numerical code to present typical height $h(x,t)$, velocity $u(x,t)$ and volume fraction of particles $\phi(x,t)$ profiles. The methodology is illustrated for flow in typical geometries: power-law, trapezoidal and circle. The presence of the particles reduces the speed of propagation, however the details are depend on the geometry of the cross-section.

Marius Ungarish
Technion

Date submitted: 27 Jul 2015 Electronic form version 1.4