Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Effects of particle inertia on gravity current flows MARIANO CANTERO, S. BALACHANDAR, MARCELO GARCIA, University of Illinois at Urbana-Champaign — Gravity currents are buoyancy-driven flows well known to be one of the main sediment transport mechanism into deep sea. A new mathematical model for particulate gravity currents based on the well-accepted formalism of two-phase flow is introduced. The model includes settling and particle inertia effects to $O(\tau V_s + \tau^2 + V_s^2)$ (tau represents the dimensionless particle inertia and V_s the dimensionless settling rate). By means of highly resolved simulations the effect of particle inertia on front velocity, ambient fluid entrainment, flow structure and deposition patterns is addressed. The simulations are performed with a de-aliased pseudo-spectral code which allows accurate representation of length and time scales present in the flow. The results show a strong variation of the flow structure caused by particles migration from regions with strong vorticity and accumulation into regions of high shear. These effects contribute to the variation of the current front velocity with varying particle size, even in the case of same net buoyancy. The analysis of the effect of particle inertia on deposition patterns and ambient fluid entrainment is under way.

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Date submitted: 10 Aug 2005 Electronic form version 1.4