Numerical Modeling of Turbidity Currents in Various Environments

*Svetlana Kostic[1]

1. Computational Science Research Center, San Diego State University

Numerical modeling is frequently combined with physical experiments and/or field observations to improve our understanding of the formation, propagation, and depositional patterns of turbidity currents in different environments. This talk addresses the main challenges associated with numerical modeling of turbidity currents. My numerical model of progradational fan-deltas is used to illustrate the importance and complexity of boundary conditions. My numerical model of ponding turbidity currents in salt withdrawal minibasins is compared to numerical models of turbidity currents cascading over a series of depression to demonstrate that a) numerical modeling entails in-depth understanding of underlying physics (e.g. turbulence in minibasins is dead or dying, which has to be accounted for via water detrainment); and b) the common practice to calibrate and verify numerical models based solely on bed elevation profiles can be very misleading. My model of internal hydraulic jumps is used to illustrate that models validated against experimental studies often cannot be directly applied to field-scale problems. Numerical experiments with my model of upper-flow regime bedforms pertain to the morphodynamic interaction between turbidity currents and upstream marching bedforms in channels on the active Squamish prodelta. They are used to demonstrate that even date from extensive monitoring programs can often lack some crucial information for numerical modeling. This talk also explores problems associated with using “black box” commercial software, and the discrepancy between available data and expected results from numerical simulations, in particular with 3-D and other complex models.

Keywords: turbidity currents, numerical modeling, calibration and verification, boundary conditions, 3-D models , commercial software

