Modeling and Simulation of Hazardous Geophysical Mass Flows Using the TITAN toolset

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April 15, 2004

High quality computational tools are indispensable for hazard assessment and planning from rapid flow of geophysical masses. The complexity of the physics involved in such events has often led to highly simplistic or empirical/heuristic models being used. In recent years, first principles based modeling of such flows has been enabled by the use of high performance computing and new techniques for constructing accurate numerical solutions to nonlinear hyperbolic partial differential equations. We will describe in this talk the TITAN toolset developed over the last few years for modeling rapid flows of geophysical masses over natural terrain. Highlights of the TITAN toolset are the use of depth averaged models of the conservation laws and parallel adaptive grid solvers using classical finite volume adaptive grid Godunov solvers and the more recently developed discontinuous Galerkin methodologies. The code is integrated with geographical information systems to obtain terrain/cultural data for simulating flows on natural terrain and displaying their hazard potential. We will discuss in this paper a number issues relating the ability of the simulation in accurately predicting flow paths and runouts for a number of typical flows of interest. In particular, we will explore the model’s ability to correctly predict a number of laboratory scale and real flows.