A 2D numerical model to estimate flood inundation due to dam break.

In the XXI century around 200 notable dam and reservoir failures happened worldwide causing massive fatalities and economic costs. One of the main phases of the dam break risk management is constituted by the flood hazard delineation. Normally in the engineering practice this step is conducted with hydrodynamic models and then the results are imported within a GIS to perform risk assessment analysis. This two step procedure is time expensive and error prone, due to export/import requirements, and not user friendly.
For this reason with a recent work [Cannata & Marzocchi 2012], an existing numerical model for the solution of the two-dimensional dam break problem has been implemented in the open source GRASS GIS as a GIS embedded module. The model solves the conservative form of the 2D Shallow Water Equations (SWE) using a Finite Volume Method (FVM); the inter-cell flux is computed by one-side upwind conservative scheme extended to a two-dimensional problem [Ying et al., 2004]. The new developed GIS module, among others outputs, allows to derive maximum intensity maps that can be directly used in the risk assessment.
Aim of this work is to verify the model implemented in GRASS and auto-calibration procedures added to the model in order to guarantee the numerical stability of the solution.
During the talk, the problem formulation, the new GRASS module and its first validations are presented. Moreover further possible developments will be considered and discussed.

References

Cannata M., Marzocchi R. (2012) Two-dimensional dam break flooding simulation: a GIS embedded approach . Natural Hazards 61(3):1143-1159
Ying X, Khan A, Wang SSY (2004) Upwind conservative scheme for the Saint Venant Equations Journal of hydraulic engineering 10:977-987