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# Dam – break shock waves with floating debris: A two – phase model for hazard assessment

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To predict flood and debris flow dynamics a numerical model, based on 1D De Saint Venant (SV) equations, modified for including erosion / deposition processes along the path, was developed. The McCormack – Jameson shock capturing scheme was employed for the solution of the equations, written in a conservative law form. This technique was applied to determine both the propagation and the profile of a two – phase debris flow resulting from the instantaneous and complete collapse of a storage dam.

To validate the model, comparisons have been made between its predictions and laboratory tests concerning flows of water and homogeneous granular mixtures in a uniform geometry flume reproducing dam – break waves. Agreements between computational and experimental results are considered very satisfactory for mature (non – stratified) debris flows, which embrace most real cases.

To better predict immature (stratified) flows, the model was improved in order to feature, in a more realistic way, the distribution of the particles of different size within the mixture. The level of maturity of the flow is assessed by an empirical, yet experimental based, criterion.

The model, at this stage, should be able to predict the whole debris flow phenomenon, i.e. the triggering , mobilising and stopping processes of both mature and immature debris flows in different dam-break conditions.

On the whole, the model proposed can easily be extended to channels with arbitrary

cross sections for debris flow routing, as well as for solving problems of unsteady flow in open channels by incorporating the appropriate initial and boundary conditions. The model could also be improved to predict and assess the propagation and stoppage processes of debris and hyper-concentrated flows in mountainous catchments and river basins, triggered by extreme hydrological events, once validated on the basis of field data.