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Estimation of the effects of uncertainties in the determination of a water-sediment flow rheology

M. Arattano (1) and L. Franzi (2)

(1) CNR-IRPI, Torino, Italy (massimo.arattano@irpi.cnr.it / Fax: +39 011 343574), (2) Regione Piemonte, Torino, Italy

In a mountain basin the water flowing in the torrent can carry sediments according to different mechanisms and generate different types of flows, ranging from water flows with suspended load and bed load transport to hyper-concentrated flows, from mud-flows to debris flows. The rheology of the mixture of water and sediments may vary for these different types of flow and this variation may strongly affect the dynamic behavior of the mixture: flow velocities, flow depths, peak-discharges and consequently impact forces depend in fact on the value of the rheological parameters. For this reason the uncertainties in determining the water-sediment flow rheology can play an important role as far as the assessment of endangered areas and the design of countermeasures is concerned. Administrators, decision makers and practitioners who have to protect the life and property of people and the economical activities in a mountain area have therefore to take into account the uncertainties in determining the possible rheology of future water-sediment flows, either by means of practical experience, by comparison with other similar cases or by carrying out mathematical simulations of past events. In the paper a simple formula is proposed to directly estimate the uncertainties in determining the dynamical behavior of a water-sediment flow due to the rheology and an application to a real case is shown.