Sediment transport during extreme flood events

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Floods are one of the major natural hazard that affect highly populated countries. Besides hydraulic hazard (i.e. probability of inundation of a given area), geomorphological hazard due to channel dynamics should be taken into account. Channel dynamics (i.e. channel lateral mobility, changes in bed elevation, intense sediment and wood transport) can cause severe damages to human properties and infrastructures. Research on channel response to floods, and specifically to extreme flood events, has increased over the last few years (e.g. Stoffel et al., 2016; Naylor et al., 2017; Davis et al., 2018) focusing in particular on morphological changes and controlling factors (e.g. Thompson and Croke, 2013; Magilligan et al., 2015; Surian et al., 2016). Sediment and wood transport have been investigated in detail in very few studies (e.g. Lucia et al., 2015), although they represent key processes for understanding channel dynamics and assessment of flood hazard.

The project aims to improve our understanding on sediment transport processes during extreme floods. The specific goals are: (i) to develop a sound approach to recognize different flow types (i.e. water, hyperconcentrated and debris flows) from field evidences; (ii) to investigate relations between flow types, that is different transport conditions, and geomorphic/hydraulic factors; (iii) to improve hazard assessment, that is our capability of predicting how sediments move (i.e. type of flow) during large flood events.

The project may have direct implications on mitigation of flooding-related risks, by implementation of the Floods (2007/60/CE) European Directive which does not take into account morphological changes and related sediment processes.

Collaborations: CNR-IRPI (Padova); University of Bolzano; Pontificia Universidad Católica de Chile.

Available funds: DOR funds will cover field work and workshop/conference attendance, while several data (e.g. remotely sensed images, DTMs, hydrological data) are already available for two case studies.

References:

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