# Geomorphic response to floods: from process understanding to hazard assessment

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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. Motivations and key points of this project are: (i) geomorphic response to flood events has not been widely investigated; (ii) flood hazard assessment needs to include the effects of channel dynamics which are the dominant processes in several portions of river networks (e.g. in mountain rivers or in very dynamic fluvial systems). The proposed project has two main goals: (i) to investigate channel response to floods of different magnitude, including extreme floods; (ii) to improve hazard assessment, that is our capability of predicting geomorphic effects of floods.

For hazard assessment it is crucial to document the type and magnitude of channel response, to identify controlling factors of such response, and to develop tools enabling channel dynamics predictions. Buraas et al. (2014) pointed out that there is still a general lack in the capability to predict where major geomorphic changes take place during an extreme flood event. In this respect, the integrated approach developed by Rinaldi et al. (2016) and results from Surian et al. (2016) and Righini et al. (2017) represent promising contributions for the analysis of channel response to extreme floods and identification of controlling factors. Notwithstanding this, there is a need for (i) building a larger dataset, including a wide range of flood magnitude, channel morphologies, environmental conditions; (ii) testing and developing geomorphic tools (e.g. identification of "river morphodynamic corridors") that should improve our capability in forecasting channel response to floods. Although such forecasting is very challenging, this is crucial because ongoing climate changes are increasing flood frequency, specifically occurrence of extreme floods.

Methods used in this project include: field survey (topographic survey using GPS, grain size analysis, geomorphological survey); GIS analysis using aerial photographs, satellite images, DTMs. Numerical modeling could be eventually used according to the skills and interests of the PhD student.

Collaborations: CNR-IRPI (Padova); University of Bolzano; ISPRA.

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

References:

Buraas E.M. et al. (2014), Earth Surf. Process. Landf., 39, 1778-1789.

Righini M. et al. (2017), Geomorphology, 290, 184-199.

Rinaldi M. et al. (2016), Earth Surf. Process. Landf., 41, 835-846.

Surian N. et al. (2016), Geomorphology, 272, 78-91.