



A process flood typology along an Alpine transect: analysis based on observations and modelling approaches

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Understanding the effects of climate changes on river floods requires a better understanding of the control of climate variability on flood regimes. The aim of this work is to identify the process types of causative mechanisms of floods along a longitudinal Alpine transect spanning 200 km from Verona in Italy to lower Germany. The investigation is focused on the analysis of the statistical properties of the various flood typologies, their spatial organization and their relation with the topography of the transect. Along the transect, 34 basins were selected following criteria of basin size (between 50 and 500 km²), amount of hydrometeorological data available and impact of hydraulic structures on runoff regime. Around 20 years of hourly data of discharge, precipitation and temperature were collected for each basin. The three most intense floods occurred each year are considered in the work. Precipitation and temperature follow a sharp gradient across the transect, with both precipitation and temperature low around the main alpine ridge. Four flood types are considered: long-rain floods, flash floods, rain-on-snow floods, and snowmelt floods. For the classification we use a combination of a number of process indicators, including the timing of the floods, storm duration, rainfall depths, snowmelt contribution to runoff, initial catchment state and runoff response dynamics, using a procedure similar to what described in Merz and Blöschl (2003). The indicators for flood classification are derived based on either observed discharge data and model results. Comparison between the two derived flood classifications allows one to analyse the viability of using a model approach to build flood typologies in basins characterized by varying data availability. Finally, a sensitivity analysis is carried out by imposing step changes to the precipitation and temperature pattern. The resulting distribution of flood types gives an insight on the possible change in floods distribution as a result to a change in climate properties.

Merz, R. and G. Bloschl (2003). A process typology of regional floods. *Water Resources Research* 39(12): 1340.