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Quantification of vulnerability for elements at risk exposed to torrent processes in Mediterranean regions

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Due to the EU Flood Directive there is a need for the establishment of flood risk maps in European countries until 2013. In order to achieve this goal, risk analyses have to be undertaken on a catchment scale. In risk analysis, risk is expressed as a function of the probability of occurrence of a hazardous process, the exposed elements at risk and their vulnerability. With respect to torrent hazards in Mediterranean countries, the assessment of processes has been subject to extensive research during the last decades. The focus was mainly on flash floods which represent a major threat due to periods of intense rainfall events. However, studies on the vulnerability of elements at risk evolved only recently, and related quantitative information is hardly available so far due to an overall lack of systematic data collection.

The objective of this study is to close this gap by establishing a spatially explicit vulnerability model for flood processes including fluvial sediment transport which is applicable in Mediterranean regions of Greece. This model is based on a method combining spatially explicit loss data, data on the value of exposed elements at risk, and data on flood intensities in order to develop vulnerability functions. Vulnerability is defined as the expected degree of loss for an element at risk as a consequence of a certain event. It is shown that such relationships for defined object categories are dependent on site-specific and process-specific characteristics, but there is a correlation between process types that have similar characteristics; (2) existing semi-quantitative approaches of vulnerability assessment for elements at risk can be improved based on the proposed quantitative method; and (3) the concept of risk can be enhanced with respect to a standardised and comprehensive implementation by applying the vulnerability functions to be developed within the proposed research. The overarching aim is to show possible implementations of flood risk management emerging from the requirements laid down in the European Flood Directive.