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Hazard assessment for small torrent catchments – lessons learned

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The documentation of extreme events as a part of the integral risk management cycle is an important basis for the analysis and assessment of natural hazards. In July 2011 a flood event occurred in the Wölzer-valley in the province of Styria, Austria. For this event at the "Wölzerbach" a detailed event documentation was carried out, gathering data about rainfall, runoff and sediment transport as well as information on damaged objects, infrastructure or crops using various sources. The flood was triggered by heavy rainfalls in two tributaries of the Wölzer-river. Though a rain as well as a discharge gaging station exists for the Wölzer-river, the torrents affected by the high intensity rainfalls are ungaged. For these ungaged torrent catchments the common methods for hazard assessment were evaluated.
The back-calculation of the rainfall event was done using a new approach for precipitation analysis. In torrent catchments especially small-scale and high-intensity rainfall events are mainly responsible for extreme events. Austria's weather surveillance radar is operated by the air traffic service "AustroControl". The usually available dataset is interpreted and shows divergences especially when it comes to high intensity rainfalls. For this study the raw data of the radar were requested and analysed.
Further on the event was back-calculated with different rainfall-runoff models, hydraulic models and sediment transport models to obtain calibration parameters for future use in hazard assessment for this region. Since there are often problems with woody debris different scenarios were simulated. The calibrated and plausible results from the runoff models were used for the comparison with empirical approaches used in the practical sector.
For the planning of mitigation measures of the Schöttl-torrent, which is one of the affected tributaries of the Wölzer-river, a physical scale model was used in addition to the insights of the event analysis to design a check dam for sediment retention. As far as the transport capacity of the lower reaches is limited a balance had to be found between protection on the one hand and sediment connectivity to the Wölzer-river on the other.
The lessons learned kicked off discussions for future hazard assessment especially concerning the use of rainfall data and design precipitation values for small torrent catchments. Also the comparison with empirical values showed the need for differentiated concepts for hazard analysis. Therefor recommendations for the use of spatial rainfall reduction factors as well as the demarcation of hazard maps using different event scenarios are proposed.