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Estimation of flash floods in small ungauged basins in Slovakia: case studies

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In the paper application of a methodology for analysis of flash flood events in several ungauged small basins in Slovakia was evaluated. The methodology proposed within the framework of the FP6 HYDRATE project (www.hydrate.tesaf.unipd.it) is based on the post-event surveying and hydrological modelling, using a spatially distributed hydrological model with a high spatial resolution of rainfall data and physiographical basin properties. Six large flash floods which occurred in Slovakia during the last 10 years were selected, with the emphasis on their extremity and different physical and geographical basins properties. The estimation of the maximum flood peaks and flood wave volumes was provided on the base of the post-event analysis after the flood events. The areas of channel's cross-profiles were measured for maximal water level, longitudinal slope of water level was approximated to the bottom slope and roughness was estimated according to the river banks and channel bottoms. Flow velocities were estimated using Chézy equation and Manning roughness coefficient. The reconstructed flood waves were compared with the simulated discharges using the distributed event-based rainfall-runoff model KLEM. The distributed hydrological model KLEM is based on the availability of raster information of the landscape's topography, soil and vegetation properties, and radar rainfall data. The SCS-Curve Number procedure is applied on a grid for the spatially-distributed representation of runoff-generating processes, a description of the drainage system response is used for representing the runoff's routing. Digital elevation models as well as soil, geology, land use and rainfall data for the basins were prepared in the grid form (resolution of 20 m). Radar rainfall data or maps of isohyets in 15-minutes time step or were used as input precipitation in the model. Comparison of the results achieved by the KLEM model and the post-event analysis for floods showed the consistency of simulated and estimated discharges both in time and space, and the methodology has proven its applicability for practical purposes.