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Estimation of extremely high runoff of the Selška Sora River after the storm of 18 September 2007

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Extremely high runoff occurred on 18 September 2007 on the Selška Sora catchment with drainage area of 104 km2 due to the heavy and intense rainfall which fell in just a few hours. The catchment lies in the north-western hilly part of Slovenia where precipitation started early in the morning. Meteorological forecast predicted precipitation for the September 18, but not in the quantity and intensity as it happened. More than 300 mm of the daily sum of the rainfall was recorded on some rain gauging stations, but the amount of precipitation fell mainly within six hours. The precipitation rates reached up to 70 mm/h and 100 mm in 2 hours on the most affected area along Selška Sora river upstream the town of Železniki. High differences in the amount of precipitation were detected at small distances.

Under the influence of the very intense precipitation streams from the catchments of northwest Slovenia started to rise very quickly. Flash floods caused destruction and enormous material damage, the most in villages Davča and Železniki where three people lost their lives. Unfortunately the equipment on the water gauging station at Železniki stopped working during the flood and the flood wave was not recorded entirely. The highest water level 551 cm was determined after the flood according to the flood trace. The peak discharge was estimated to approximately 300 m3/s by extrapolation of rating curve and it exceeded the highest discharge from the period of observation 1991-2006 two times. The WMS system and HEC-1 hydrological model was used for the simulation of the hydrograph. According to the modelling results the peak of flood wave is estimated to 278 m3/s, what means 2670 l/s/km2 of maximum specific runoff. The results of analysis give the cumulative areal precipitation for the Selška Sora catchment to Železniki 219 mm, while the effective precipitation which caused direct runoff is only 57 mm. The runoff coefficient is rather low considering the high rainfall intensities for the short periods of few hours. However, the spatial distribution of the rainfall in the area was highly variable and spatial positioning of rain gauges is obviously inadequate for proper representation of the actual spatial amount of rainfall. Regarding to small antecedent soil moisture and consequently low flows before flood event, the infiltration into the soil was very high. The geological structure of the catchment is not uniform; the northern part of the catchment is more permeable whereas the southern part is much less permeable leading to non-uniform hydrological response of the catchment.

According to the meteorological and hydrological situation, the flash flood event in Železniki has typical characteristics which make the analysis of the flash flood events difficult, not even mentioning the possibilities to make a prediction of the occurrence of such event in advance.