

Study of monster floods on ungauged catchments

E. Gaume¹

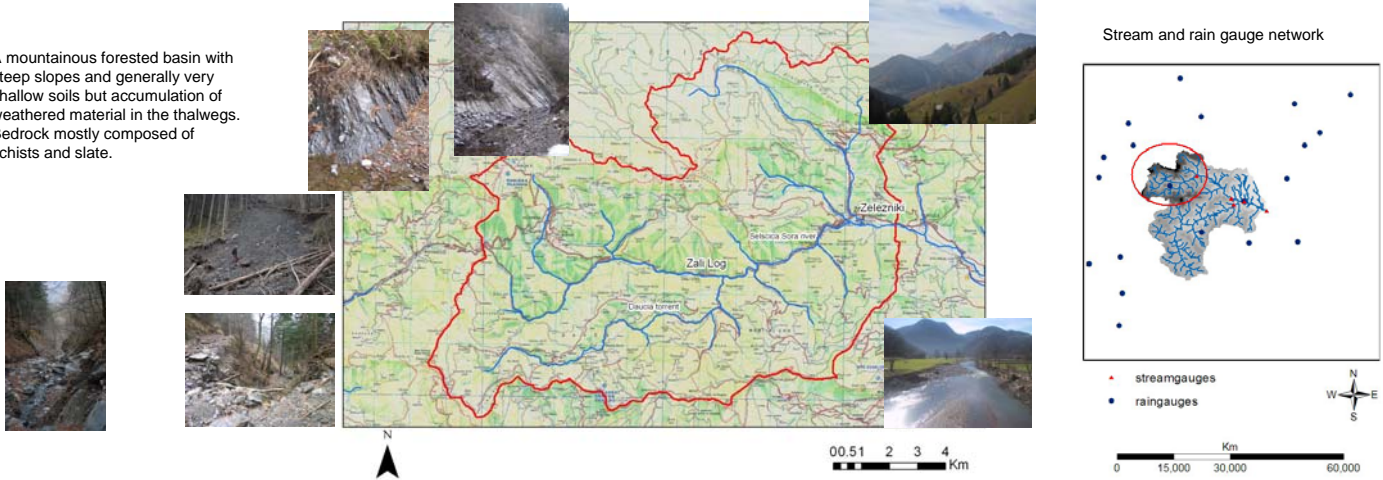
¹ Laboratoire Central des Ponts et Chaussées, Division Eau et Environnement, Nantes, France (gaume@lcpc.fr)
previously Ecole Nationale des Ponts et Chaussées, CERERE, Paris, France.



An intensive post flood field investigation has been conducted within the HYDRATE project after the extreme flash floods that occurred in Slovenia in September 2008. The data collected revealed an unforeseen rainfall-runoff dynamics for a mountainous catchment with steep slopes, shallow soils and a bedrock dominantly composed of schists. Despite the high rainfall rates and amounts (200 to 300 mm within a few hours), the runoff coefficients remained moderate (20 to 30%) during the flood event. Hydrological "common sense" is often contradicted by the facts. Post-flood reanalyses are therefore needed.

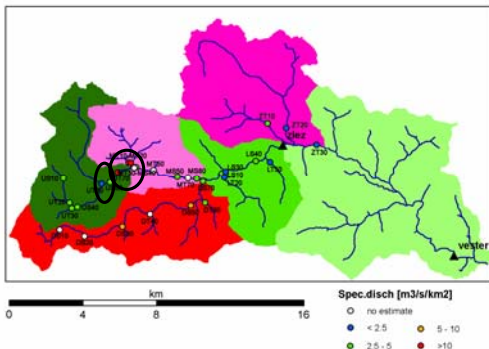
The Selščica Sora river basin upstream the town of Zelezniki (150 km²)

A mountainous forested basin with steep slopes and generally very shallow soils but accumulation of weathered material in the thalwegs. Bedrock mostly composed of schists and slate.

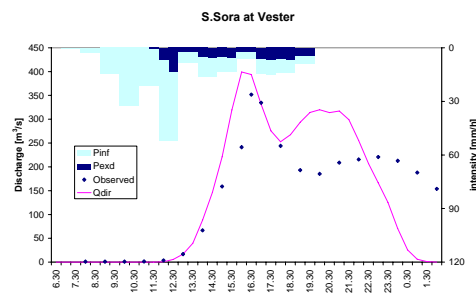


Post flood investigation after the 19 September 2007 flood

The Sora basin is one of the most affected by the floods which occurred in September 2007 in Slovenia. According to the rain gauge and radar data, it received on average about 200 millimeters within 12 hours with average rainfall intensities exceeding 30 mm/h between 10 and 13 o'clock. The town of Zelezniki has been submerged which induced huge damages and 3 casualties. A European post event survey has been conducted by 20 researchers participating to the HYDRATE project during November 2007 on the watershed to document this event. 24 cross sections were surveyed, 13 witnesses interviewed, pictures and films collected



Estimated peak discharge values during the post-flood investigation conducted on the upper Selščica Sora catchment



Comparison of simulated (line) and observed (dots) flood hydrographs of the Sora at Vester (estimated effective rainfall in dark blue)

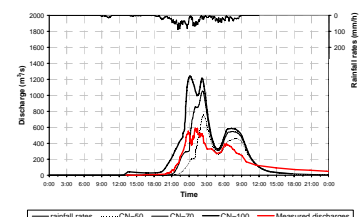
Interpretations

- The peak discharge is concomitant with the maximum rainfall intensities
- The estimated peak discharge values – generally less than 5 m³/s (18 mm/h) are modest if compared to the maximum intensity (about 50 mm/h) and reveal moderate runoff rates.
- These moderate rates are confirmed by the rainfall runoff simulations at the Vester Stream gauge (less than 20% runoff)
- A large part of the rainfall volume infiltrates.
- This is confirmed for other past event and is consistent with two other observations:
 - the slow decrease of the discharges after the rainfall event, sign that large volumes of water stored on the basin are released.
 - the spread erosion processes witnessing for a saturation of the soils and of subsurface flows.

A large variety of erosion processes linked to faults and subsurface flows



Conquérac 8-9 Sept. 2002 (65 km²)



Despite steep slopes, shallow soils and an impervious bedrock, the Sora basin appear as highly pervious, storing temporarily a large proportion of the rainfall volumes. Such a hydrological behavior resembles in its dynamics the one observed on the upper Vidourle karstic basin in September 2002, but with even larger storage capacities on the Sora basin !