Extreme Torrential Flooding at Simbach on June 1st, 2016 - Findings of a Detailed Event Analysis -

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INTRODUCTION

On June 1st, 2016 heavy rainfall caused a sudden and extreme flood event in the torrent Simbach. This event caused 5 fatalities and huge economic losses (LFU, 2017). The existing gauging station recorded the flood wave, but the measuring range was exceeded by far. Additional failures of technical structures, like a street dam and a dyke, occurred due to overtopping. To reconstruct the event and the resulting processes, a detailed event documentation and analysis was carried out. The main findings should help to improve the risk management for such extreme floods.

OBJECTIVES FOR THE EVENT ANALYSIS

The first objective of the detailed analysis (Hübl, et al. 2017) was to reconstruct the triggering rainfall and the maximum discharge during the event. The high complexity of this extreme event needed high effort, e.g. 838 photos and 62 videos were analysed. Although the water gauge (**Fig. 1**) recorded the water level far above its area of validity, the data can only be considered as a rough approximation for the real discharge. Therefore different approaches were used to identify the "real" discharge:

- Analysis of photos and videos to verify the water level
- Hydrologic modelling of the catchment area with the measured rainfall
- 1D and 2D hydraulic simulation of the area around the gauging station to calculate the rating curve

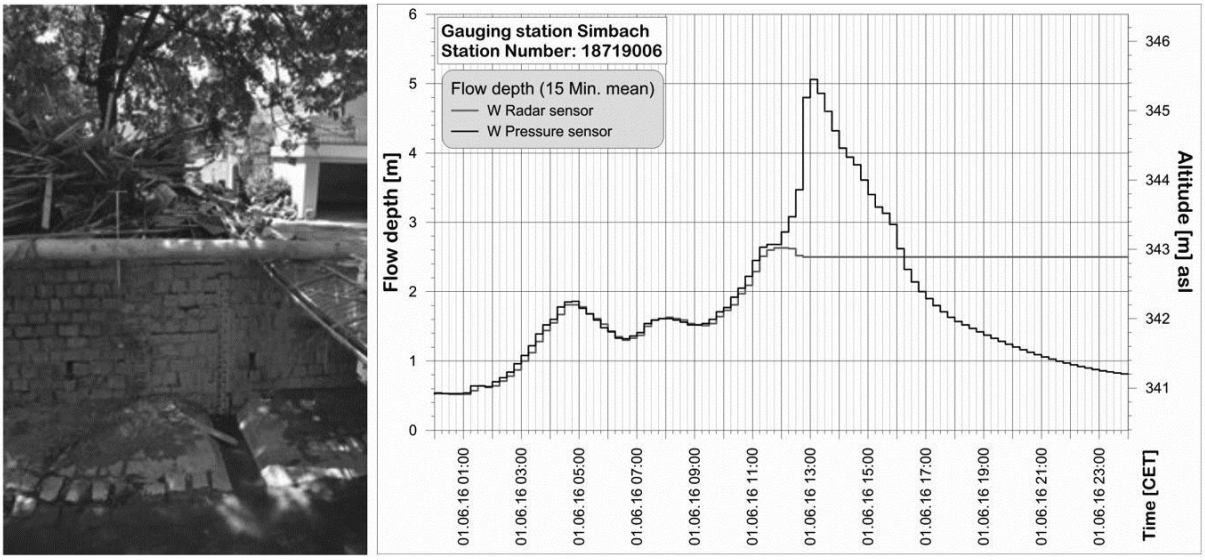

Fig. 1 Situation at the gauging station short time after the flood event and the recorded water level

The second objective was to identify the effect of the dam failure in the upstream area (**Fig. 2**) and the dyke failure within the town of Simbach. Therefore the failures of the street dam and the dyke had to be implemented into a hydraulic model. As input Hydrograph, the "natural" discharge of the catchment was used. Subsequently different hydraulic scenarios, applying different dam failure characteristics were calculated, including the preceding partial blockage of the dam culvert.

Fig. 2 Situation at the street dam during failure process (Polizeipräsidium Niederbayern)

FIRST RESULTS AND CONCLUSION

The analysis estimated the maximum discharge of about 280 -300 m^3/s at the gauging station using a newly developed rating curve, comparing 1D and 2D hydraulic simulation results.

The hydrograph of the "natural" runoff was calculated with a hydrological model and additionally by a simple method, using the existing hydrograph together with the characteristic data of the retention areas upstream of the gauge. The natural peak discharge could be estimated with about 180 -190 m^3/s, meaning a specific discharge of 6.6 $m^3/s.km^2$ and a mean runoff coefficient of 0.6.

Dam breaching resulted in an increase of the discharge of about 120 m^3/s immediately downstream of the failed dam and diminished along the channel downstream to the gauging site. To check this estimate the dam failure was implemented in two 2D-hydraulic models. The resulting inundation zone and flow depths were crosschecked with flow marks, pictures etc. to trace the discharge through the town.

The flooded area was not considerable enlarged by the breaching hydrograph, but the mean flow depth increased about 0.5 m in the town.

Keywords: Simbach, event analysis, dam failure, hydrologic modeling, hydraulic modeling