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Monitoring and modeling of runoff from a natural and an urbanized part of a small stream catchment

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Runoff processes in natural catchments are significantly different compared to urbanized areas. Human impacts are manifested in high amount of paved surfaces like roofs, roads, parking plots and the compacted soils of quasi natural areas like public gardens and parks. Decay of permeability and storage capacity both induce higher amount of runoff. The common practice to treat the increased volume of runoff is to collect in pipes and drain to a stream as soon as possible. These interventions induce flash floods with smaller time of concentration and higher flood peaks as normal food waves therefore strongly load discharge capacity of stream channel.

Streams in urban areas are strongly modified and regulated. Sometimes the stream channel are dredged out to increase the discharge capacity. In worst case some smaller brooks are crowded with lid to increase urbanized habitat. Many climate change scenarios predict higher probability of heavy storm events, therefore increasing volume of runoff induces higher demands of strongly modified and enormous concrete channels.

This study presents one year monitoring of a small stream comparing runoff from natural, rural and urban sections. In this paper we also introduce the process of a model setup and an evaluation to investigate the weak points of a stream section in urbanized areas. The pilot area of this research is the Rák Brook which is the second largest stream of city Sopron (western Hungary). The natural headwater catchment is long-term research area of Hidegvíz Valley Project, therefore we had a good basis to extend the research catchment monitoring in the direction of urbanized lower part of the stream. Seven monitoring points are established along the longitudinal section of the stream. In each point the water stage is recorded continuously beside several other water quality parameters. These data sets help the later validation of the hydrodynamic model.