

FACTSHEET RISK ASSESSMENT AND MAPPING ACTIVITIES

Guideline for numerical simulations for surface flow induced by heavy rain events

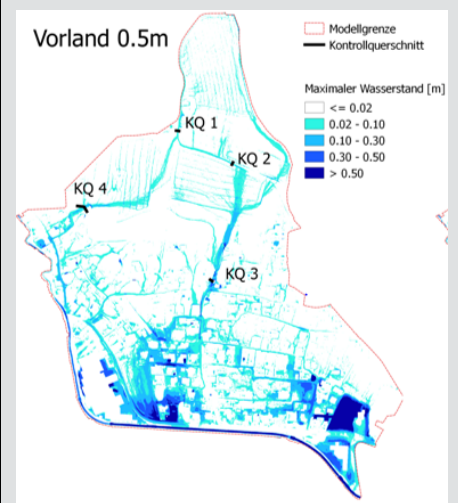
Where was it implemented?

Upper Austria, Austria

Problem / background

Deterministic hydrodynamic simulation software packages for surface flow modelling are still developing. First-hand up-to date experience with these softwares is not widespread in civil engineering practice.

There are different software types on the market, with different technical features and simulation capabilities. For simulation results to be of sufficient quality, a good understanding for effects of parameter choices is essential. Currently, comprehensive overviews on these issues from a practitioners standpoint are lacking.



Description and aim

A comprehensive numerical study was undertaken, starting with an overview of four available software packages for simulation of surface flow and their basic features. Performing and extending benchmark tests from earlier studies allowed to assess which aspects of surface flows can be simulated in a physically reasonable way. Based on these results, two software packages with different characteristics (one raster-based, one working with unstructured meshes) were selected and applied to actual real world test sites.

Based on datasets from two test-sites different aspects of the two selected software packages were investigated. In a first step the impact of varying grid- or mesh-resolutions on model results was analysed. In a further step the sensitivity of model results to varying model inputs (precipitation) and model parametrizations (flow resistance, runoff parameters) was investigated. Eventually, also the capabilities of the two models to consider hydraulically relevant structures (e.g. walls, culverts) were tested and the effects of considering/omitting these structures in the modelling process were assessed.

The aim of the investigation was to provide an up-to date overview on software packages with their relevant technical features, and to condense the experiences from the simulation studies into recommendations.

The conclusions from the numerical studies are enclosed in the present guideline. This guideline has two purposes:

- on one hand, it can be used to support administrative authorities in developing requirements for surface flow simulations, in order to achieve results with comparable results and in adequate quality.
- on the other hand, the guideline can be used by civil engineers in practice, to update their knowledge on surface flow softwares, to benefit from the documented experiences, and to make better informed decisions in surface flow modelling.

Area characterisation

Area type: predominantly rural

Landscape type: hilly

Specifications of method / measure

Level of complexity

complex

Method

deterministic hydrodynamic/hydrological simulations

Description of implementation	
Implementation <ul style="list-style-type: none"> • 2018 - 2020 	Effect horizon <ul style="list-style-type: none"> • Medium-term
Initiator / responsible <ul style="list-style-type: none"> • Umweltbundesamt GmbH • Amt der Oberösterreichischen Landesregierung 	Involved stakeholders <ul style="list-style-type: none"> • three municipalities in Upper Austria
Lessons-learned	
Main success factor: <ul style="list-style-type: none"> • Understanding of impacts and uncertainties introduced in real cases due to variation of parameters, mesh and grid resolutions and consideration of relevant hydraulic structures. 	Main challenge: <ul style="list-style-type: none"> • Pluvial floods are influenced by several parameters. The calibration of the simulation models is often hampered by missing data or uncertainties in the input data. • Different methods for implementation of e.g. hydraulic structures in different types of software products.
Key message to others starting with a similar task	Contact
Investigate the individual parameters in generic examples to show their influence on the simulation results.	Dr. Yvonne Spira Oberflächengewässer Umweltbundesamt (AT) Mag. Felix Weingraber Abt. Wasserwirtschaft Amt der Oberösterreichischen Landesregierung assoz.-Prof. Stefan Achleitner Arbeitsbereich Wasserbau Universität Innsbruck