

Flash floods in Bavaria

Recording, Exploring, Evaluating - The Project HiOS

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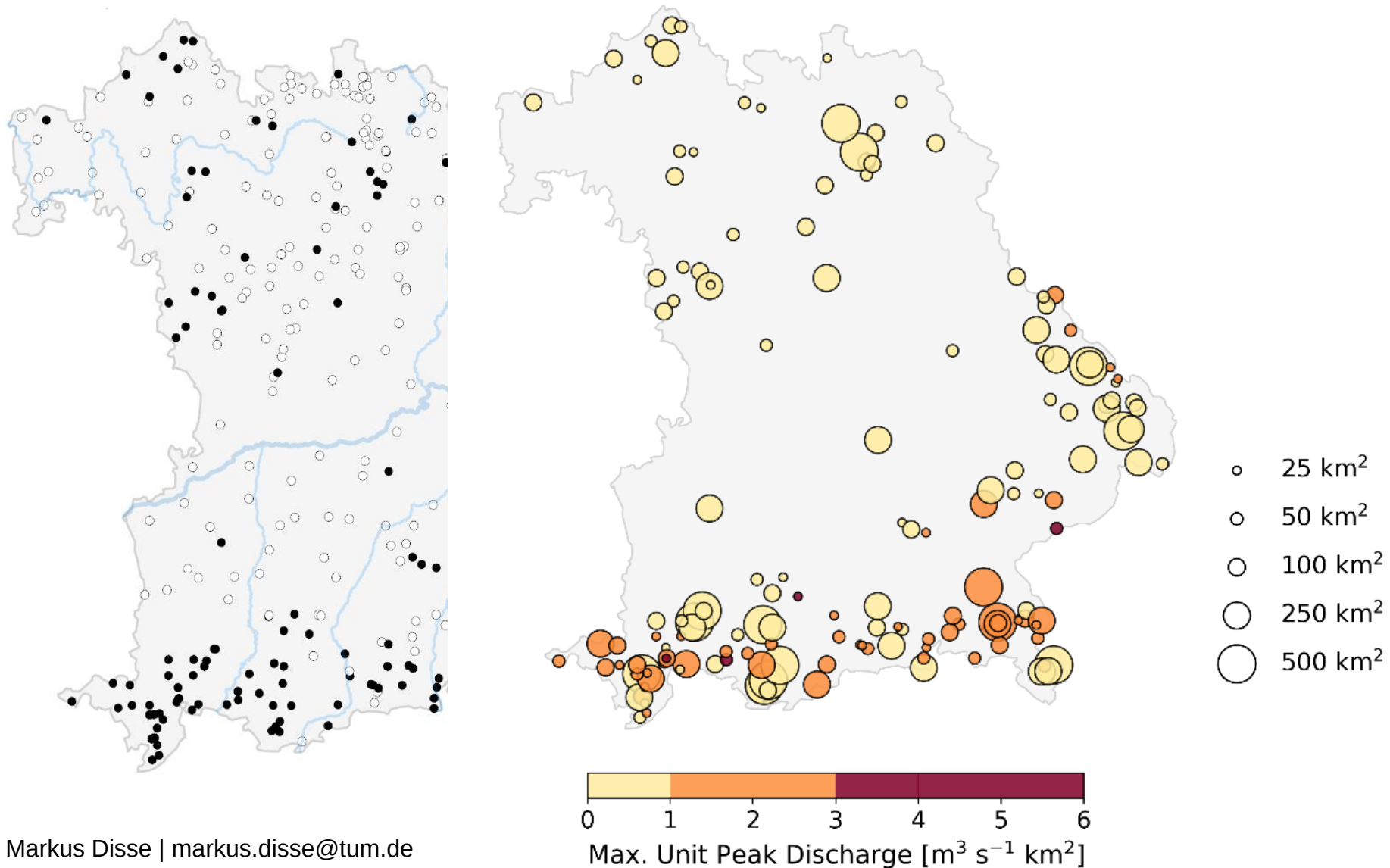


Outline

1. Introduction – Flash Flood in Bavaria in 2016 and the HiOS Project
- 2. Hydrodynamic Rainfall-Runoff Modelling HRRM**
3. GIS & Geostatistics
4. Conclusions & Outlook

1. Introduction – Flash Flood in Bavaria in 2016 and the HiOS Project

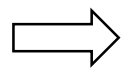
and the HiOS Project



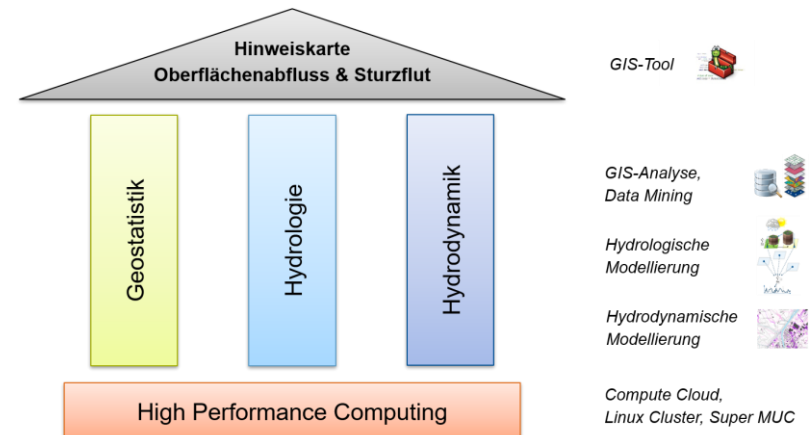
1. Overview of the HiOS Project

Project goals

- Development of a method for mapping surface runoff and flash floods by investigating triggering factors in a GIS application for Bavaria (*reference map*)
- Hazard investigation of 80 Bavarian municipalities for 4 precipitation scenarios based on coupled hydrological-hydrodynamic simulations (*hazard maps*)
- Development of a technical guideline for the hydrological and hydrodynamic simulation of surface runoff and flash floods



Interaction of the three fields
Geostatistics, Hydrology
and **Hydrodynamics**



2. Hydrodynamic Rainfall-Runoff Modelling

HRRM

using the

SCS-CN–Method

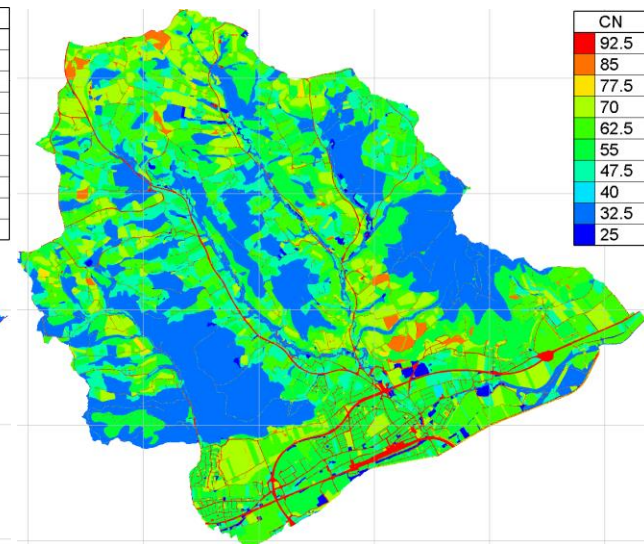
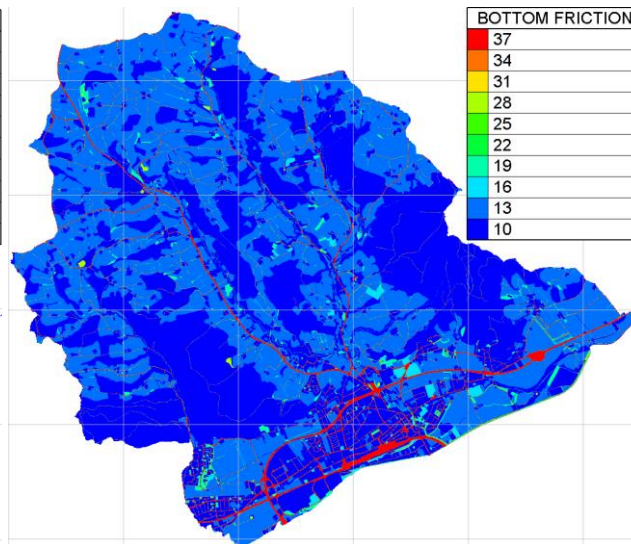
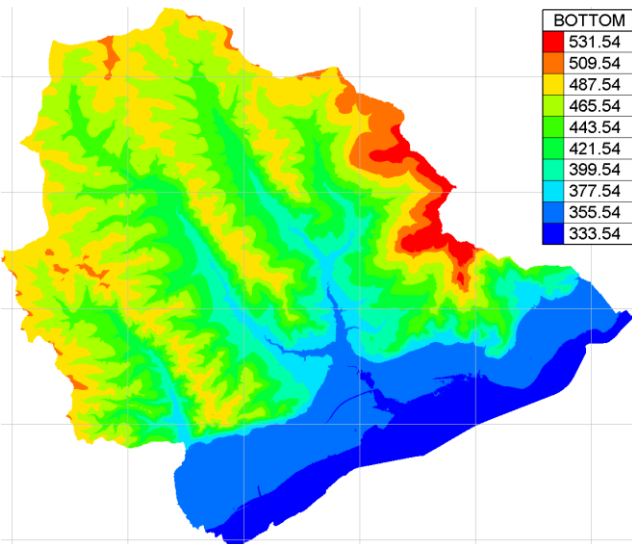
implemented in TELEMAC-2D

Inputdata Simbach a. Inn

DEM [masl]

Bottom Friction kst [$\text{m}^{1/3}/\text{s}$]

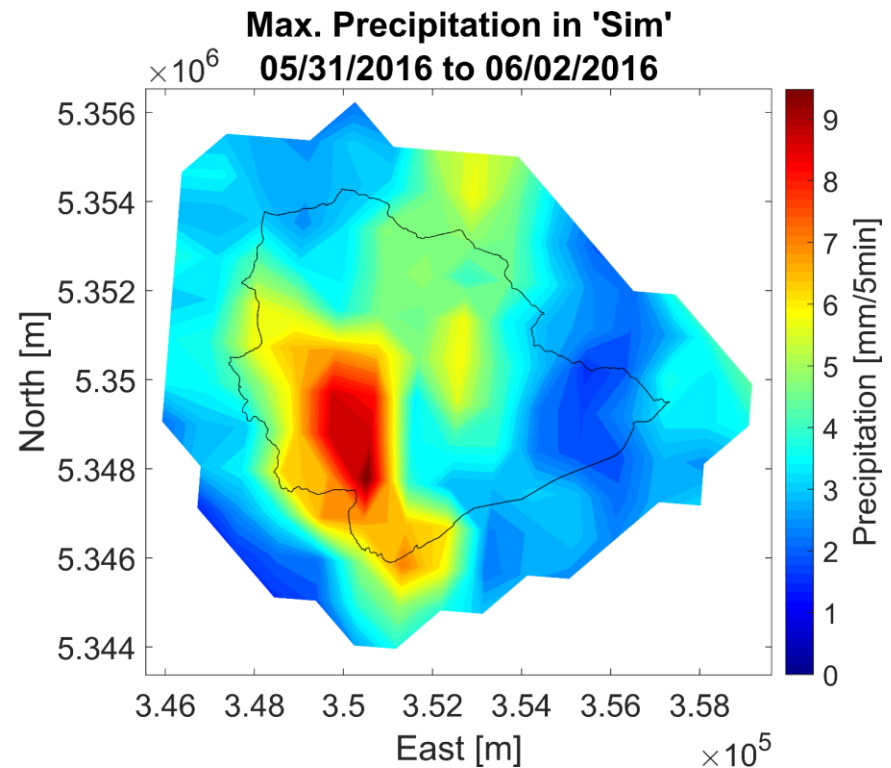
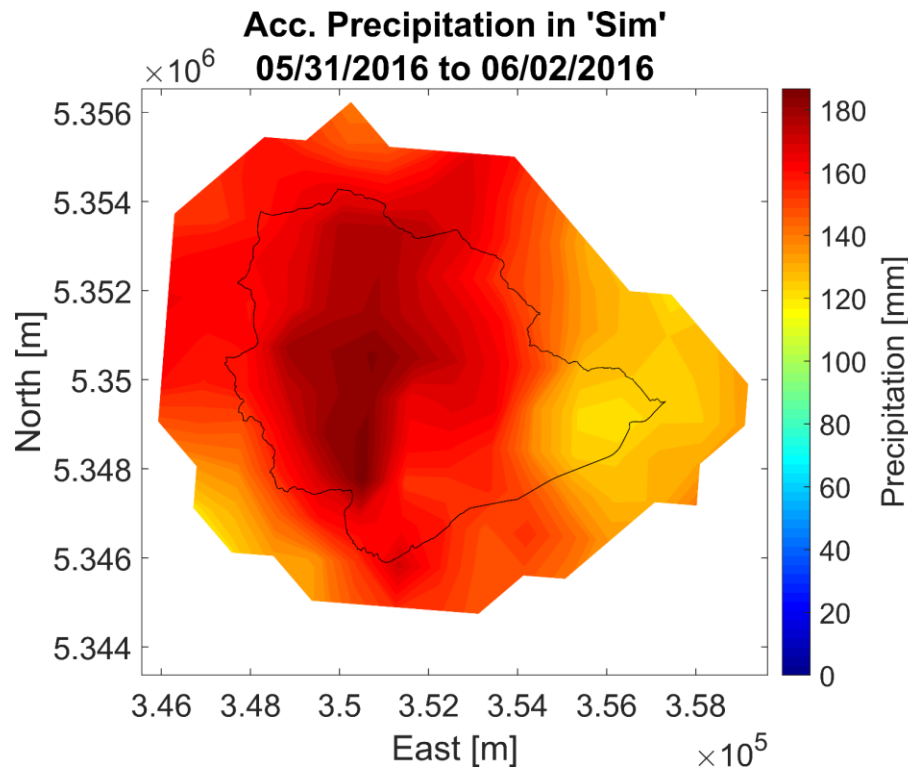
CN-Values [-]



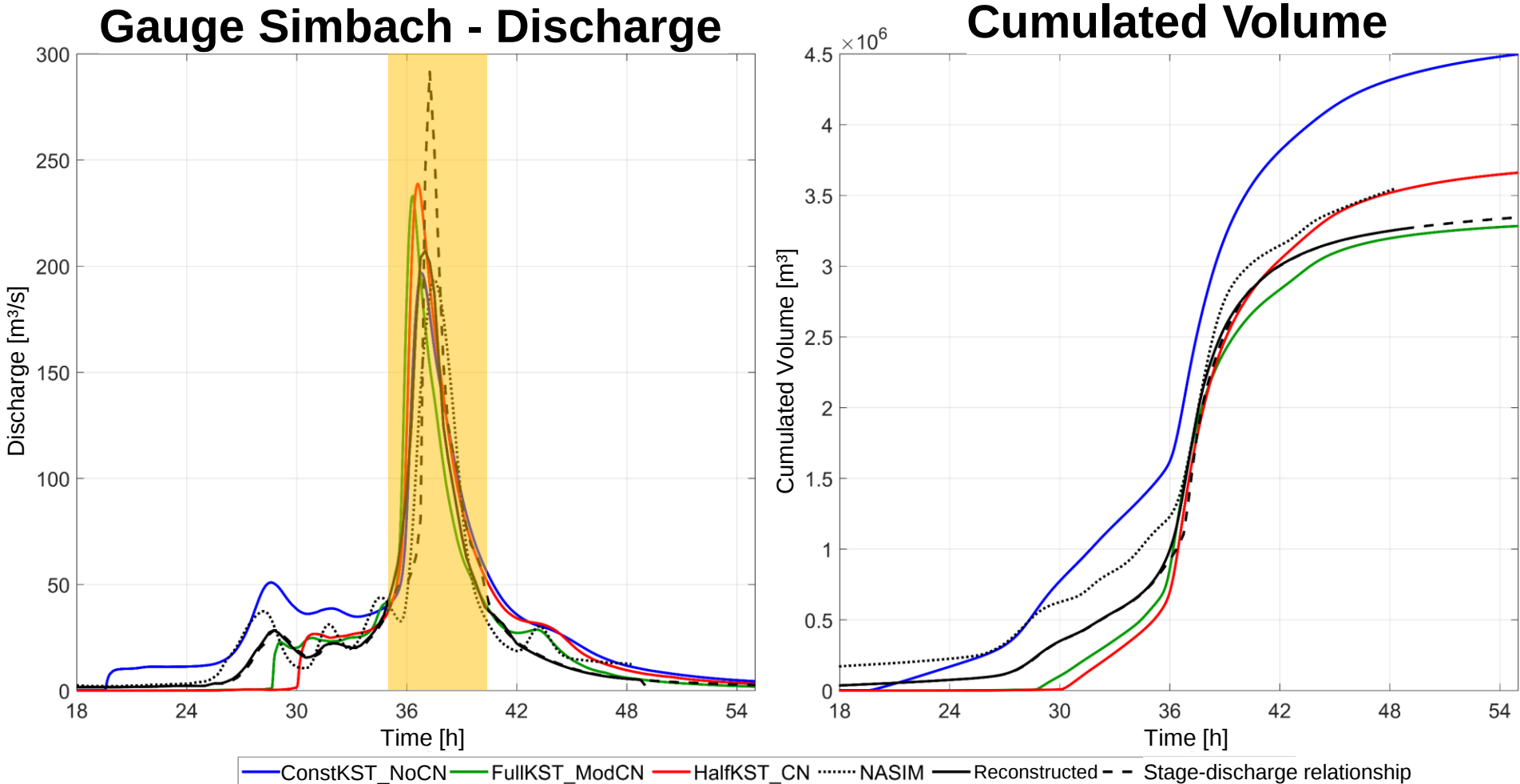
2. HDRRM using SCS-CN-Method

Max: $\Sigma = 188,6 \text{ mm}$ $I = 9,68 \text{ mm/h}$

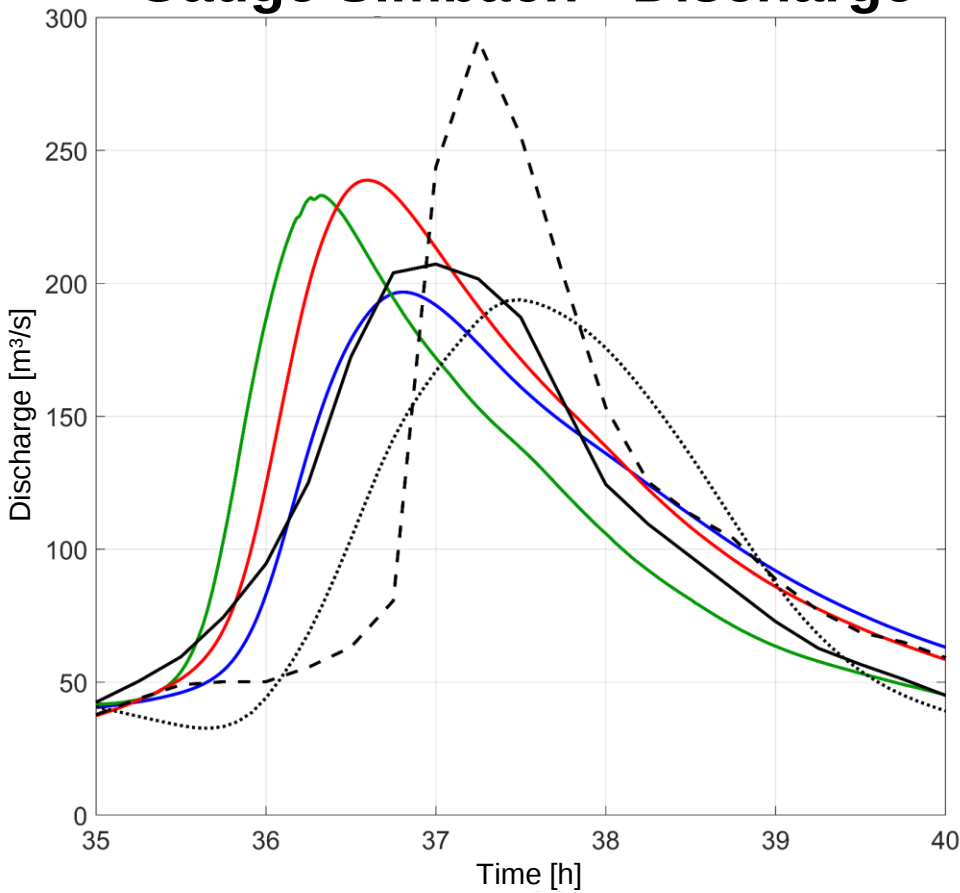
Min: $\Sigma = 122,5 \text{ mm}$ $I = 1,48 \text{ mm/h}$



Accumulated (left) and maximum precipitation (right) during the flash-flood event in Simbach a. Inn
from 31.05.2016 00:00 to 02.06.2016 00:00

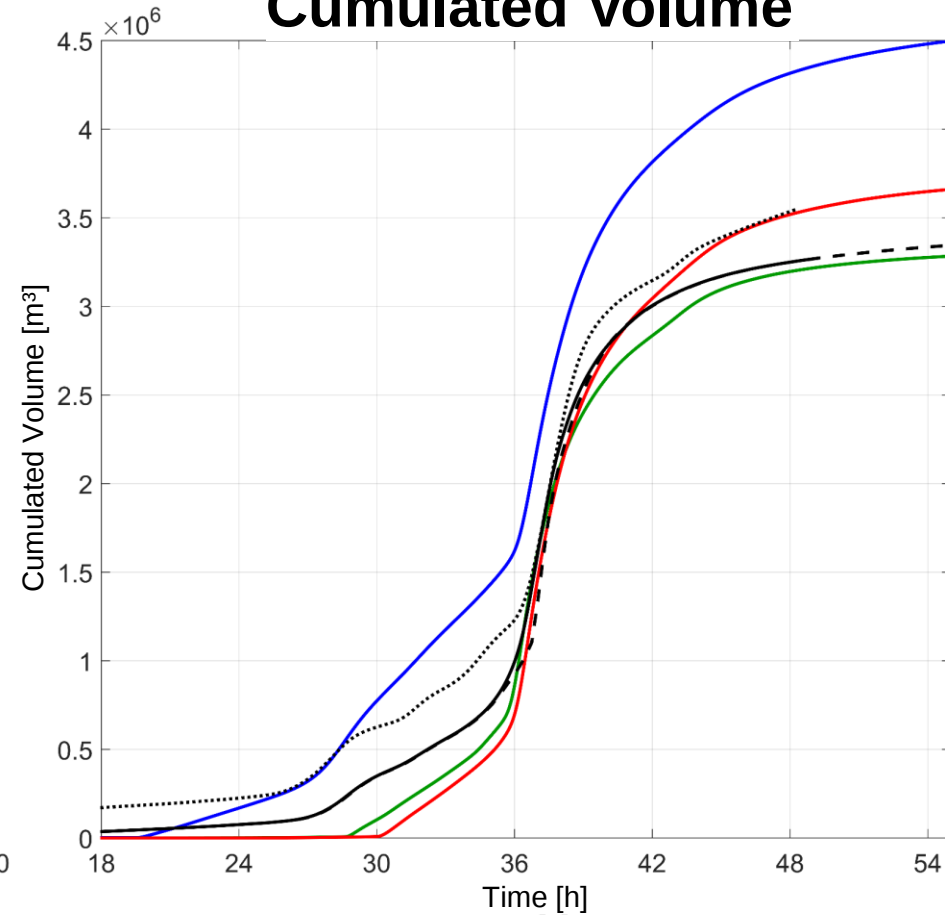


Gauge Simbach - Discharge

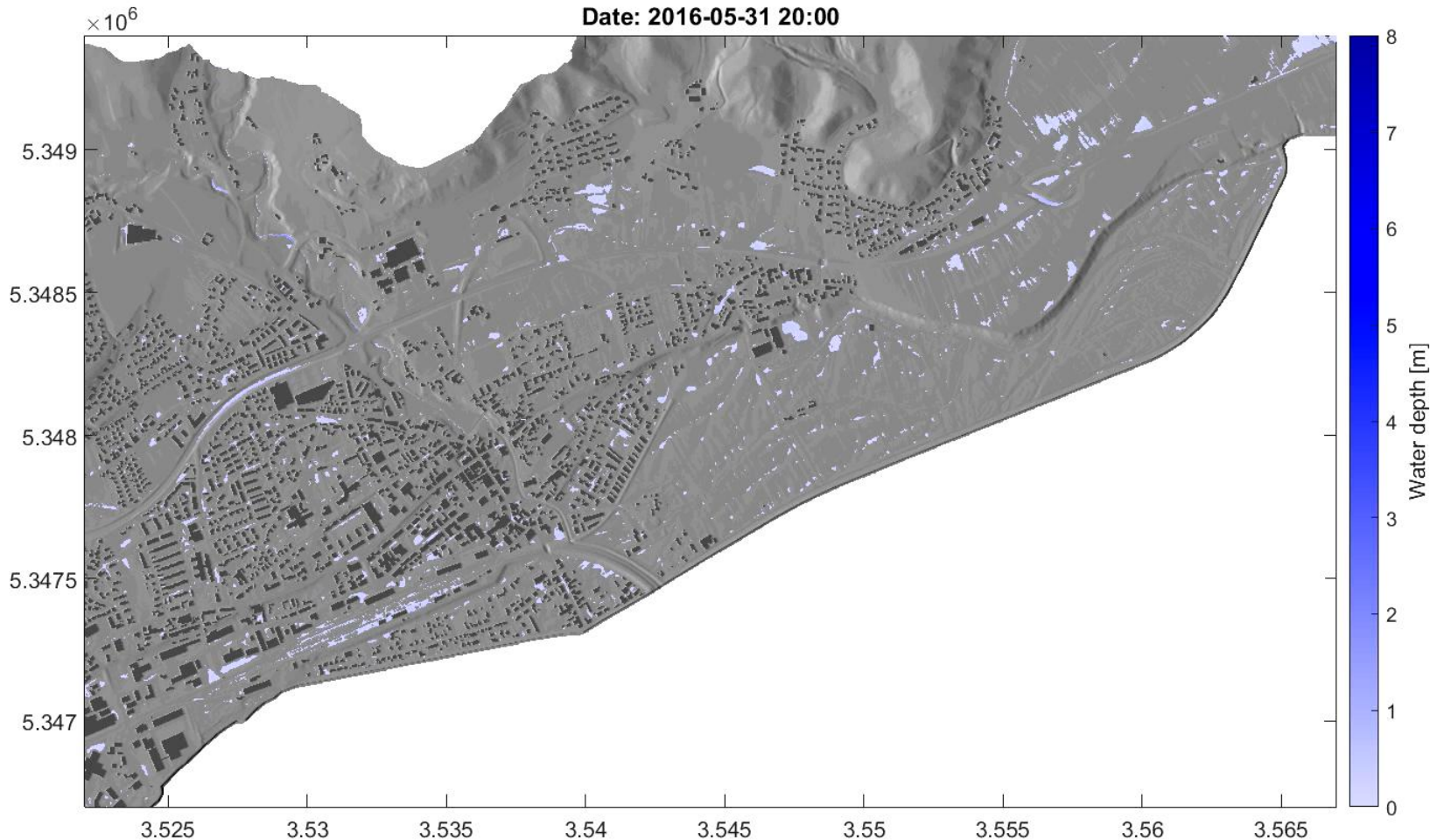


— ConstKST_NoCN — FullKST_ModCN — HalfKST_CN NASIM — Reconstructed - - Stage-discharge relationship

Cumulated Volume



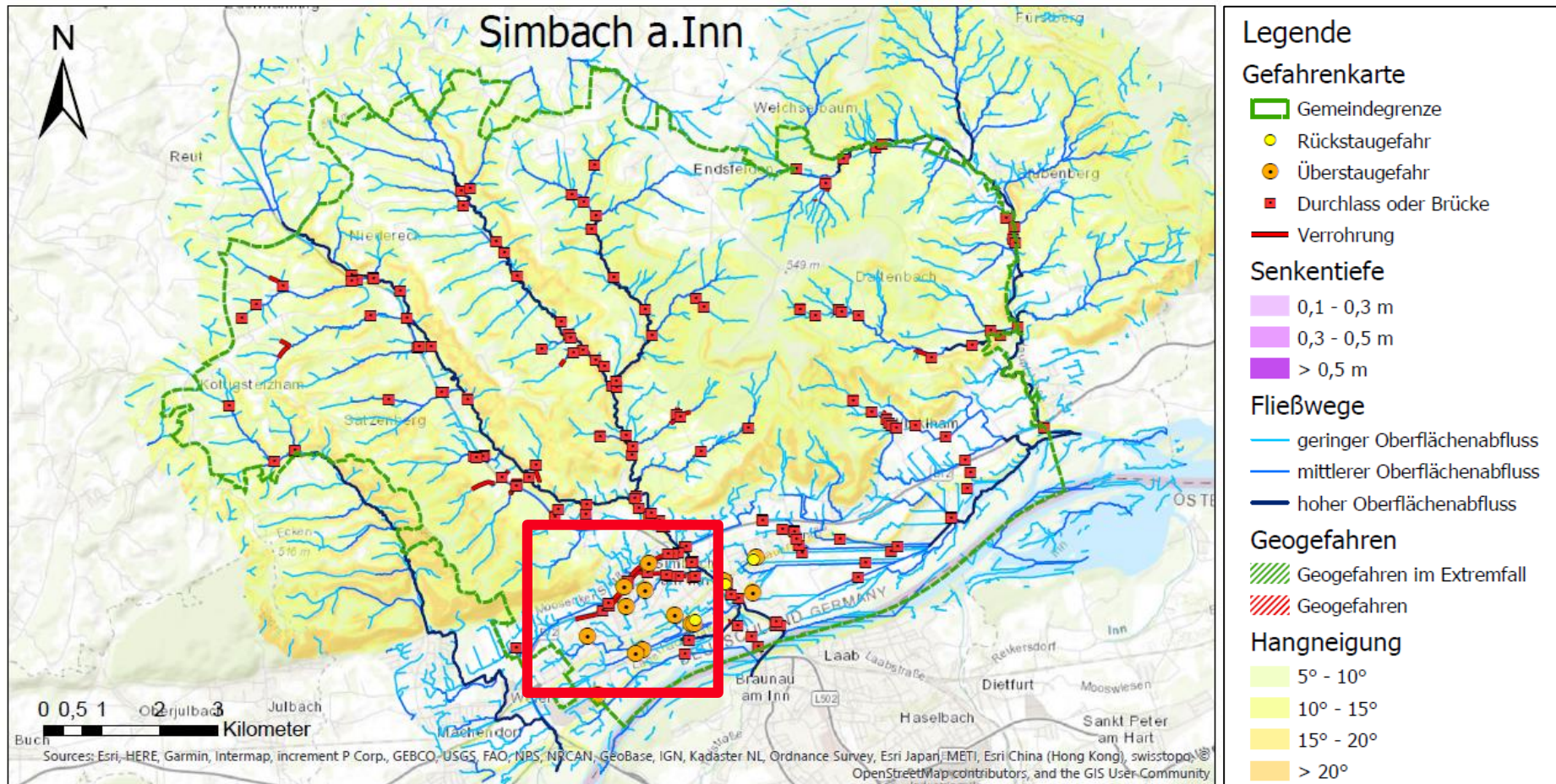
3. HDRRM using SCS-CN-Method



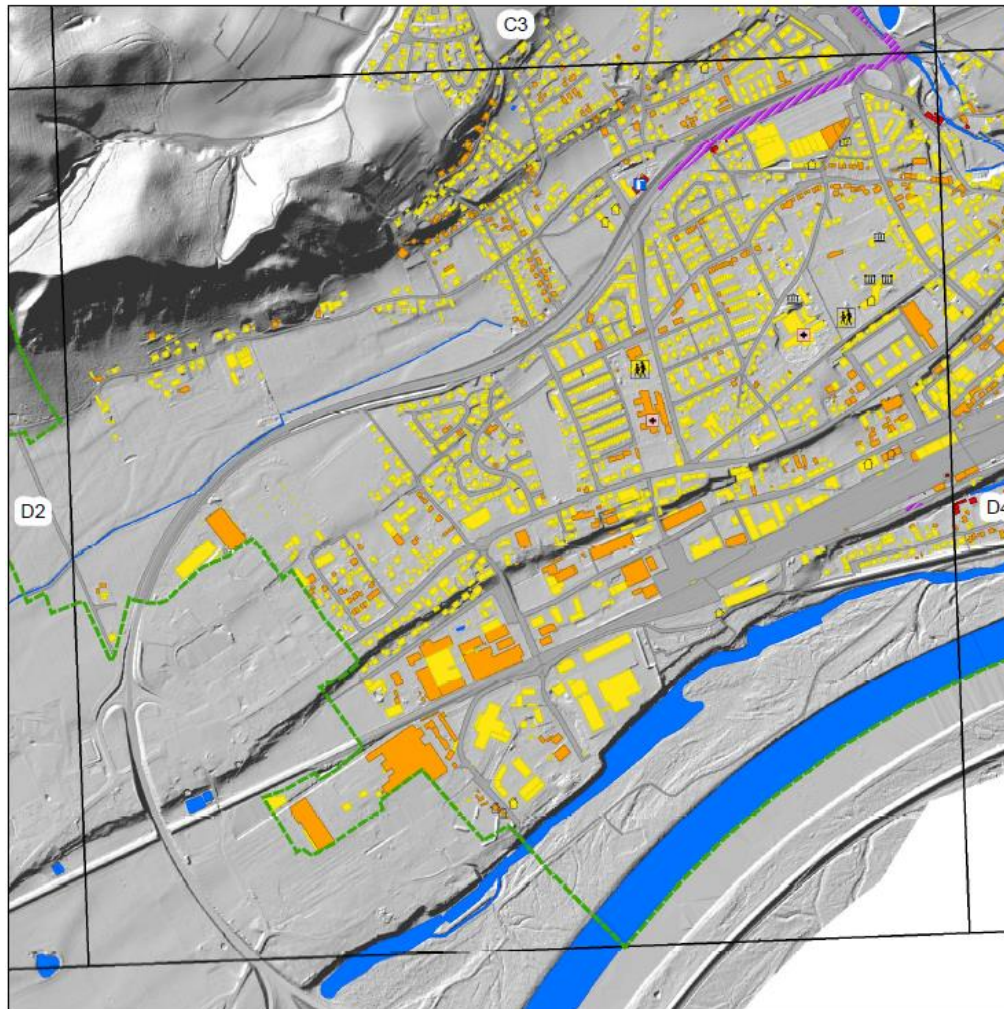
TELEMAC-2D		
CPU time / sim. time / nodes		
Simbach a. Inn	19 h (56 cores) 35 h sim. time	3.6 mio. nodes for 14.6 km ² , distance: 2 m

3. GIS & Geostatistics

Presentation of Hazard Layers



Presentation of Hazard Layers



Simbach a. Inn

Blattschnitt D3

Legende

-  Gemeindegrenze
-  Gewässer
-  Verkehrsflächen
-  betroffene Verkehrsflächen

Betroffene Gebäude

Risikoklasse

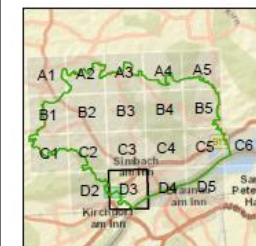
-  geringes Risiko
-  mittleres Risiko
-  hohes Risiko

Gebäudenutzung

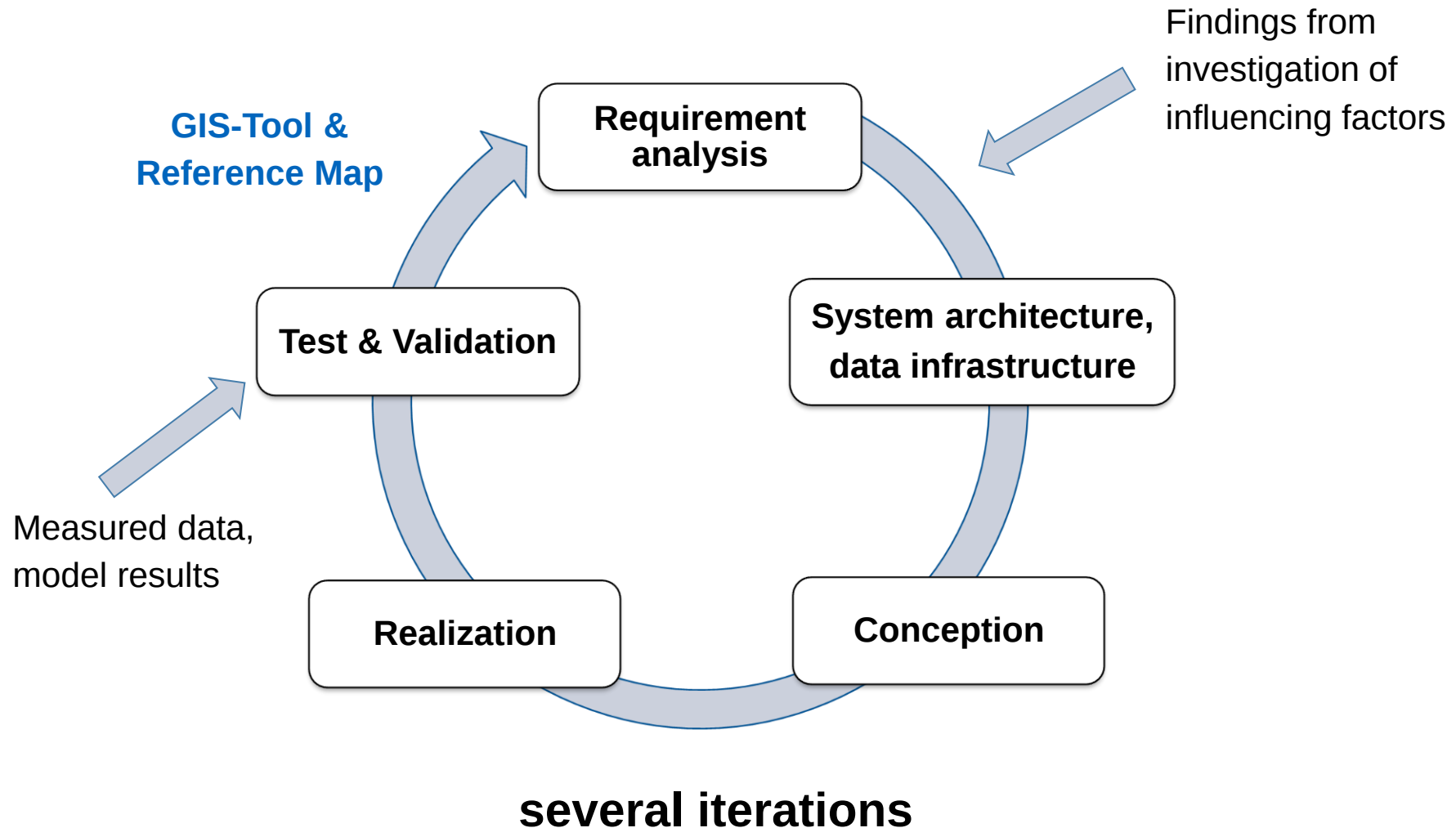
-  Rathaus
-  Gebäude für öffentliche Zwecke
-  Gebäude für Bildung und Forschung
-  Krankenhaus
-  Pflegeanstalt
-  Kindergarten
-  Polizei
-  Feuerwehr
-  PRTR-Standort



0 125 250 500
Meter



Next steps for creating reference maps for > 2000 municipalities in Bavaria



4. Conclusion & Outlook

- HDRRM using SCS-CN-Method offers great potential in combination with high resolution rainfall data (5 min. / radar)
- Coupling model with sewer system can reduce inundation in settlements (for lower return periods)
- A Rainfall Runoff Model is still needed for larger catchments
- A prototype flash flood reference map has been developed → will be applied for more than 2000 municipalities in Bavaria (07/2020)

