



Co-funded by the European Union





### **North-West Europe**

## FlashFloodBreaker

## Integration of hydraulic processes in 2dimensional simulations of heavy rainfall scenarios



Climate and environment

FlashFloodBreaker Integrated simulation of pluvial fluvial flood events

# From Rainfall to Runoff: Development and validation of approaches for improving heavy rain hazard maps using 2D hydraulic modeling

**Importance of Flood Hazard Management:** Heavy rain risk management is crucial for identifying areas vulnerable to surface water accumulation and overland flow paths.

**Heterogeneous Methodologies:** Germany's federal structure has led to inconsistent heavy rain hazard mapping approaches.

**Study Focus:** The study evaluates the accuracy of a 2D heavy rainfall simulation model for a part of the Emscher river basin, using the June 22–23, 2023 rainfall event for validation.

**Model and Scenario Development:** The 2D hydraulic model was developed using HydroAs MapWork, incorporating different methods to include hydrological processes with the help of SCS-CN Method, Horton Infiltration and the Nasim hydrological model of the EGLV.



Fig. 1: Study area



### **Preliminary Results for the Rossbach Catchment:**

The performance of four methods—Standard, SCS-CN, Horton drained but not dried out, and Nasim Complete Integration (CI)—was evaluated at Gauge 10120 in the Rossbach catchment.

	RMSE↓	NSE↑	r↑	sMAPE↓	Peak Mag. (m³/s)	Peak Time	Runoff Vol. (m <sup>3</sup> )	Runoff Coeff. c
Measured Gauge 10120	-	-	-	-	9.64	2023-06-23 03:50	418083.3	0.15
Standard	11.8	-14.93	0.83	124.63	33.71	2023-06-23 01:36	1337055.61	0.47
SCS-CN	7.23	-4.98	0.97	96.81	22.17	2023-06-23 03:00	1036726.69	0.37
Horton drained but not dried out	1.53	0.73	0.95	112.87	11.35	2023-06-23 03:45	288667.79	0.1
Nasim Complete Integration Cl	1.55	0.72	0.93	98.0	11.26	2023-06-23 04:15	304795.86	0.11

*Fig. 2: Discharge over time of different simulation runs and evaluation.* 

**Physically-based methods (Horton/Nasim CI)** outperformed the Empirical SCS-CN and the Standard Scenario in discharges, with lower errors and stronger temporal alignment.

#### **Conclusion:**

Incorporating hydrological runoff processes into heavy rain hazard mapping can prevent overestimation and ensure accurate risk assessments.

Authors: B. Sc. Sabrina Huber





