flooddynamics.ch – Spatiotemporal dynamics of extreme flood events in Switzerland

Markus Mosimann, Martina Kauzlaric, Simon Schick, Andreas Zischg
Institute of Geography & Mobiliar Lab for Natural Risks (OCCR), University of Bern, Bern, Switzerland

---

Hazard maps show categories of combined flood probability and intensity, what leads to a high level of synthesis and makes it difficult to reconstruct single scenarios leading to the corresponding classification. In addition, the static character of such maps does not allow to understand the temporal evolution of a flood, what is important for the process understanding of people or institutions being dependent on such analysis when it comes to learning how to (re-) act in case of a flood event. The change of perspective "from precipitation to damage", the focus on a national scale and the dynamic over time supports the understanding of an integral view on the process chain *precipitation–flood–direct impact–indirect impact*.

For the purpose of this study, we extract precipitation scenarios with different return periods for several accumulation periods (100, 300 and 1'000 years over 1, 2, 3, 4, 5 and 10 days, currently regarding hydrological Switzerland) from hindcast archives. The meteorological scenarios are used as inputs for the hydrological model DECIPHeR, whose output hydrographs at predefined locations define the upper-boundary condition of the BASEchain modules in the 1D-2D coupled models (BASEMENT v2.8). For the submodule BASEchain, we use the cross-section data available for the *rivers of national interest,* owned by the Federal Office for the Environment (FOEN). The rivers are divided into roughly 150 sections (see figure on the left) that represent geomorphologically and topologically correct floodplains. River junctions, where multiple rivers potentially share a floodplain, are simulated together in one *section*.

The raw data for setting up the sub modules BASEplane and BASEchain is stored on a PostgreSQL database with PostGIS extension. Python is used to pre- and post-process the data with PostGIS and PyQGIS (accessing BASEmesh v. 1.4.2), as well as for (semi-) automatically setting up the BASEMENT command files and initiating them. Flow depth and velocity is stored in the database in hourly timesteps, such that the direct impact (e.g., on buildings, workplaces, habitants, …) and indirect impact on the road network can also be analyzed for every timestep.

The results of the simulations of nine different extreme precipitation events with different spatiotemporal patterns over Switzerland will be visualized in the webtool flooddynamics.ch (access currently only via the URL http://www.test.hochwasserrisiko.ch). The mesh with flow depth information is transformed into TIFF-, PNG- and finally WebM-format, information on direct and indirect impact is spatially aggregated and visualized in hourly timesteps for each section. With this webtool, the spatiotemporal evolvement of a flood event over Switzerland can be demonstrated with a cartographic storyline. It complements the methods for risk communication