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Timetable of an operational flood forecasting system

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At present a new underground part of Zurich main station is under construction. For this purpose the runoff capacity of river Sihl, which is passing beneath the main station, is reduced by 40%. If a flood is to occur the construction site is evacuated and gates can be opened for full runoff capacity to prevent bigger damages. However, flooding the construction site, even if it is controlled, is coupled with costs and retardation. The evacuation of the construction site at Zurich main station takes about 2 to 4 hours and opening the gates takes another 1 to 2 hours each.

In the upper part of the 336 km2 Sihl catchment the Sihl lake, a reservoir lake, is situated. It belongs and is used by the Swiss Railway Company for hydropower production. This lake can act as a retention basin for about 46% of the Sihl catchment. Lowering the lake level to gain retention capacity, and therewith safety, is coupled with direct loss for the Railway Company.

To calculate the needed retention volume and the water to be released facing unfavourable weather conditions, forecasts with a minimum lead time of 2 to 3 days are needed. Since the catchment is rather small, this can only be realised by the use of meteorological forecast data. Thus the management of the construction site depends on accurate forecasts to base their decisions on.

Therefore an operational hydrological ensemble prediction system (HEPS) was introduced in September 2008 by the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL). It delivers daily discharge forecasts with a time horizon of 5 days.

The meteorological forecasts are provided by MeteoSwiss and stem from the operational limited-area COSMO-LEPS which downscales the ECMWF ensemble prediction system to a spatial resolution of 7 km. Additional meteorological data for model calibration and initialisation (air temperature, precipitation, water vapour pressure, global radiation, wind speed and sunshine duration) and radar data are also provided by MeteoSwiss. Additional meteorological and hydrological observations are provided by a hydropower company, the Canton of Zurich and the Federal Office for the Environment (FOEN).

The hydrological forecasting is calculated by the semi-distributed hydrological model PREVAH (Precipitation-Runoff-EVapotranspiration-HRU-related Model) and is further processed by the hydraulic model FLORIS.

Finally the forecasts and alerts along with additional meteorological and hydrological observations and forecasts from collaborating institution are sent to a webserver accessible for decision makers.

We will document the setup of our operational flood forecasting system, evaluate its performance and show how the collaboration and communication between science and practice, including all the different interests, works for this particular example.