



## **Advanced Flood Forecasting and Warning for Switzerland**

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Since the large and devastating floods in Switzerland in 2005 and 2007 the Swiss Federal Office for the Environment FOEN has put considerable effort into improving the quality and extending the range of their operational flood forecasts. Today the FOEN produces and disseminates hydrological forecasts for all three major Swiss river systems, namely Rhine, Rhone and Ticino. The underlying data basis has been significantly improved in the last years. This allows the implementation of detailed water balance models, yielding a higher modelling quality especially when modelling smaller and hydrologically complex catchments. Nevertheless, the complex topographical and meteorological and hydrological situation of Switzerland is still very challenging for flood forecasters.

The FOEN has been one of the first hydrological forecasting centres to implement and also disseminate not only hydrological forecasts based on different deterministic numerical weather prediction models (NWP), but also forecasts based on probabilistic NWP. Moreover different hydrological models are implemented in FOEN's forecasting system for a growing number of river basins. Therefore forecast results can be compared not only on the basis of different NWP, but it is also possible to evaluate forecasts of up to 3 different hydrological models for many catchments. The use of these hydrological model ensembles allows the comparison of different modelling approaches and an evaluation of the predictive hydrological uncertainty of forecasts. It is also envisaged to include the possibility of merging different hydrological forecasts in a flexible way. Operationally suitable approaches for this need to be evaluated and discussed.

At the same time important improvements have been made in storm, flood and avalanche warnings and alerts. Today in the event of hazardous situations, the specialist federal agencies FOEN, MeteoSwiss and the Swiss Federal Institute for Forest, Snow and Landscape Research work closely together and distribute joint warning products to the public and cantonal authorities. In the event of large-scale high level natural hazards the federal Special Natural Hazards Committee may be involved in the warning process.