Geophysical Research Abstracts
Vol. 14, EGU2012-2476-1, 2012
EGU General Assembly 2012

Real-time precipitation forecasting in the Swiss Alps by means of the analogue method

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Tools for real-time hydrometeorological forecasting are now implemented in the Wallis Canton in the Swiss Alps. This is an outcome of the MINERVE project, which aims at reducing the flood peaks of the Rhône River by means of water retention in dams. Precipitation forecasts come from both a numerical weather prediction model at MeteoSwiss and a statistical weather forecasting developed during the project. This model is called Atmoswing (Analog Technique MOdel for Statistical Weather forecastING) and is based on the analogue downscaling technique, which allows precipitation forecasting on the basis of the synoptic circulation and humidity variables resulting from a global circulation model (GCM). The method searches for analog days in a long archive of past situations and uses their measured precipitation amount to build the empirical conditional distribution considered as the probabilistic forecast for the target day.

The analogue method was calibrated for different sub-regions of the Rhône catchment. Various regions are sensitive to specific atmospheric circulations, such as south circulation or strong westerlies, and thus are parameterized according to the main influences.

An improvement of the analog method is proposed. The classic technique is to consider the synoptic circulation at a certain hour of the day and to search for analogues only at that same hour. This constraint is a consequence of the precipitation daily timestep. However, the availability of finer timeseries allows us to explore the effect of a moving time window. Such an improvement was expected, as similar atmospheric situations may happen at various hours of the day, but couldn't be quantified until now. We also observed a seasonal effect of the improvement and a positive trend with precipitation amounts.

The system is operational since late September 2011 and various interesting – or critical – meteorological situations happened since. The method showed a clear signal of the coming situations one weak ahead, which helped raising awareness. However, the large precipitation distribution given by the method was not trivial to interpret and it is easy to overestimate the rainfall amount. The user needs to pay attention to certain characteristics of the forecast that can help interpreting the outputs.