



Is the snow of yesterday, the flood of tomorrow?

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"The snow of yesterday, is the flood of tomorrow." This famous quote could just as much be a folk wisdom or a farmer's wisdom, but it describes the social awareness that the water of the winterly snow amounts may lead to flooding in the spring. Furthermore, this common experience finds its confirmation in reality – though only at a first glance. For example, in spring 1999, a major flooding occurred after a winter with the highest snow amounts recorded over the last 30 years. This is to forget that sustained rainfall occurred prior to the flood event. For scientists, the question remains whether and to what extent winterly snow contributes to spring flooding and how this information might help in forecasts.

As snow depth measurements are insufficiently for an empirical study, we set up a hydrological model approach, combining the various snow conditions with the different spring weather conditions of the last 29 years (1981-2009). The study was conducted in three mesoscale (380-550 km²) headwater catchments in the Bernese Oberland. We set up the hydrological model WaSiM-ETH and validated the model against runoff and snow water equivalent. Then, we estimated the start of the melting season for each year following the approach of Egli and Jonas (2009). This date and the according SWE serves as the initial condition to model the spring runoff using all weather conditions during the last 29 years (until June). This leads to 841 possible spring runoff series.

Assuming that the last 29 years represent a major part of the natural variance, the influence of snow on the spring discharge and the flood peak in specific is presented. We found that the snow amount and the flood peak are not directly correlated as suggested by the saying. But, the snow amount causes primarily higher mean flow values while the effect on spring flood peaks are a function of weather. Thereby, snow conditions primarily alter the disposition of the catchments to a flood event. We estimate the probability change for a flood occurrence depending on snow conditions. This might help in future to quantify the effect of yesterday's snow on tomorrow's floods.

Egli, Luca and Tobias Jonas: Hysteretic dynamics of seasonal snow depth distribution in the Swiss Alps; Geophysical Research Letters, 36, L02501, doi:10.1029/2008GL035545, 2009.
Schulla, Jörg (2012). Model Description WaSiM. Technical report, 2012.