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# Estimating storage capacities in steep mountainous catchments

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Switzerland was hit by an extreme flood in 2005 with precipitation amounts of 150 to 200 mm. In many rivers, the largest known flood was recorded during this event. The specific discharges observed were very different. Some mountainous catchments produced in 2005 discharges between 4 and 10 m3/s/km2, others less than 1 m3/s/km2. Obviously, these steep catchments were able to store temporarily100 mm of water or even more in the soil and the underground. A screening revealed that a considerable number of mountainous catchments react delayed. In some catchments, the specific discharge was low during many decades and was then nearly doubled during the 2005 flood. These observations lead to some questions: where can such an amount of water be stored in steep catchments and how much water is needed to exhaust these storage, provoking a much stronger response.
To answer these questions, the storage capacities were evaluated in more than a dozen alpine catchments, based on maps of dominant runoff processes. These maps were produced automatically in a GIS with a specially developed set of rules and using soil, geological maps and a DEM. With these maps, the observed behaviour could be explained in many catchments, and a rainfall estimate given, which would exhaust the storage capacities. In some catchments, however, the observed storage capacities were larger than the estimated one. It is discussed that the permeability of the rock, which is usually supposed to be impervious, has to be considered in these catchments.
Our results show that slow reacting catchments can suddenly change their behaviour and that the storage capacity has to be carefully assessed, if we want to assess the magnitude of extreme floods.