



## The influence of spatial and temporal rainfall structure on the PMF for small alpine catchments

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The estimation of the extreme flood, often referred to as the design flood, is an important issue for the safety of dams and other anthropogenic structures. However, it is still related to huge uncertainties. The design flood is considered in Switzerland as  $1.5 \cdot Q_{1000}$ . Nowadays, hydrological modeling offers great possibilities for flood estimation, starting from a known precipitation. However, most of the time this precipitation is uniformly distributed, and the influence of its particular spatial or temporal structure is disregarded.

This paper aims to shed light on the issue of the influence of spatial and temporal structure of precipitation on the flood hydrograph, not only in terms of concentration time, but also as maximum flow. From an initial spatial distribution point of view, different distributions of the intensity clouds over the watershed are analyzed. The number and shape of these clouds, as well as their initial position, can have a significant influence on the shape of the resulting flood. The paper analyzes the influence of these initial conditions. In the second part of this paper, the influence of a spatio-temporal structure is analyzed. Several precipitation structures are built for long durations of 9, 12 and 24 hours, using as building blocks the spatial distributions up to 6h, for which the used model has already been tested. The goal of this development is to obtain rain structures which are both spatially and temporally closer to these occurring naturally. As opposed to a uniform distribution, these realistic spatio-temporal distributions can lead to variations in the maximum discharge, out of which only the maximum value is retained as the design flood.

The precipitation values used as inputs in the model are the PMP (Probable Maximum Precipitation), and thus the obtained flood is the PMF (Probable Maximum Flood). Results are presented for two Swiss alpine catchments and various spatial and temporal rain distributions. These are compared to the uniform and triangular hyetographs, constant in space.