Geophysical Research Abstracts
Vol. 21, EGU2019-2238, 2019
EGU General Assembly 2019

Future trends in flood characteristics and their interdependence: potential drivers and uncertainty

Massimiliano Zappa (1), Manuela Brunner (1), Benoît Hingray (2), and Anne-Catherine Favre (2)

(1) Swiss Federal Research Institute WSL, Mountain Hydrology and Mass Movements, Birmensdorf, Switzerland (massimiliano.zappa@wsl.ch), (2) Institut des Géosciences de L'Environnementm Grenoble, France

The safe and cost-effective design of flood protection structures requires reliable flood estimates. Such estimates usually describe a flood in terms of peak discharge but neglect other flood characteristics such as flood volume and the interdependence between these characteristics. Furthermore, non-stationarities in hydrological time series and in particular the dependence between peak discharge and flood volume due to climate change are often neglected. This study quantifies trends in peak discharge, flood volume, and the dependence between the two variables on a spatially comprehensive dataset of 307 medium-sized catchments in Switzerland. In addition, it identifies potential climatological drivers for changes in these two variables and their dependence. To do so, the hydrological model PREVAH is driven with future meteorological time series given by the Swiss EURO-CORDEX based CH2018 climate scenarios. Flood and climatological event characteristics are extracted from the resulting discharge time series and analyzed for trends. The results show spatially heterogeneous trends in both the dependence between peak discharge and flood volume as well as the potential climatological drivers precipitation, snowmelt, and soil moisture. Trends in the climatological drivers can partly explain trends in the dependence between peak discharge and flood volume only if they are jointly considered. The rather positive trend in dependence in the Alps can partly be explained by a decrease in snowmelt and an increase in precipitation. The negative trend in dependence in the Plateau region can in some catchments partly also be explained by changes in snowmelt while it can be explained by changes in soil moisture in other catchments. Trends in dependence but also the links between drivers and trends are uncertain since they depend on the climate chain considered. It remains to be discussed whether such uncertain, expected changes in the dependence between peak discharge and flood volume should be considered in modeling efforts.