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The impact of climate change on causal flood types in two European Alpine catchments

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Climate change flood impact studies have generally focused on changing magnitude and frequency of the events, using projections of precipitation or extreme precipitation. However, future projections of intense rainfall, long lasting rainfall and snowmelt, all potential triggers for floods, may change differently. As a result, not only can the frequency or magnitude of floods change, but also other factors associated with the causal type of flood such as seasonality and duration. Therefore, not only should the changes in flood frequency be assessed, but also changes in the distribution of causal flood types.
This work develops a methodology for examining projected changes in causal flood types, focusing on meteorological triggers. Floods are firstly clustered into meteorological causal mechanisms, such as short rainfall, snowmelt, and rain-on-snow floods, using k-means clustering of floods based on relevant atmospheric variables. Future discharge and flood types are assessed through a semi-distributed conceptual runoff model using climate projections of the meteorological triggers. By applying this methodology, not only can changes in frequency be assessed, but also changes in seasonality, duration and response time. This methodology is applied to two different catchments in the European Alps: Ubaye Valley, France and Salzburg, Austria to address why the frequency of floods may change, as well as how other meteorological changes influence flood occurrence.
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