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Possible impacts of a hydropower reservoir on the flood hazard of an Alpine valley

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High mountain ranges are characterised by steep slopes and high precipitation rates, making Alpine catchments prone to frequent flood events. Fast runoff during heavy rainfall events, sometimes in combination with snow melt events, can cause severe damages in residential areas. Flood retention mainly depends on retention properties of the headwater catchment area and its interaction with the occurring flood regime. However, due to their special characteristics, Alpine catchments are ideal candidates for storage power plants as well. Currently, around 70 storage power plants are operating in Austria. Their large artificial reservoirs alter the flood retention properties in the upper catchment by potentially providing a higher flood peak attenuation, which of course depends on the available storage volume at the time of flooding. Since it already has been reported that climate change driven processes will increase flood intensity and frequency in Austria, it is of particular interest to understand how hydropower reservoirs alter flood dynamics and if they systematically could be used for flood retention in the future.

In this study the influence of a storage power plant on flood dynamics is shown for an example in the central Austrian Alps. The chain of analysed reservoirs is situated in the headwaters of the river Salzach, a Danube tributary. Based on observed runoff, the retention potential is analysed by comparing the possible natural flood event and the retained flood event in the catchment influenced by the storage power plant. Then its possible impact on the flood hazard downstream is investigated until the tributary drains into the Danube.

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