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FloodAlp! Frequency and climatic forcing of Holocene floods in the Central Alps - a project summary

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For a better assessment of the future Alpine flood hazard in the face of climate warming, an improvement of our understanding of the occurrence of floods in the past is important. The goal of the FloodAlp! project is thus to reconstruct the Holocene flood history of the Central Alps and to investigate the controlling climatic forcing, in particular regarding the flood occurrence during warmer and cooler climatic periods. 15 lake-sediment records served as flood archives, providing an Alpine transect from northeastern Switzerland to northern Italy covering a wide range in altitude (197 to 2065 m asl). The established flood catalog comprises over 4500 flood deposits, which are composed of terrestrial material mobilized by high fluvial runoff in the catchment areas.

As the most important result, we found that during the past 10 kyrs the occurrence of Alpine floods was enhanced during cool climatic periods. Evidence is given by comparing our paleoflood record to independent reconstructions of air temperature and solar activity. This relation is explained by the latitudinal position of Atlantic and Mediterranean storm tracks, which generally shift southward during periods of low temperature/solar activity. In addition, we observe periods of enhanced flood occurrence in the Southern compared to the Northern Alps (most distinct from 4.2 to 2.4 kyr BP and during the Little Ice Age), suggesting a pronounced southward position of the storm tracks and/or blocking over the northern North Atlantic. Since such a setting resembles a negative NAO state, we interpret the South-Alpine flood frequency as a qualitative record of variations in a paleo-NAO pattern during the Holocene.

This paleoclimatic evidence of a decreased Alpine flood frequency during warmer periods is most likely also applicable to warmer climatic conditions in the future. However, this result does not consider the intensity of the catalogued events. Studies addressing this issue are currently undertaken. Our results clearly demonstrate that changes in flood dynamics are regional in nature, thus underscoring the importance of expanding the spatial coverage of paleoflood studies in order to better understand past atmospheric circulation patterns.