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# How land use and land cover change affect the water retention of alpine landscapes in Austria

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Long-term land use and land cover changes (LULCC) are estimated to affect almost one third of the global land area (Winkler et al., 2021). This also alters hydrological processes and has implications on the ability of the landscape to retain water. In alpine areas of Austria, extensive LULCC have occurred since the mid-19th century, which also led to changes in flood hazard and an increase in flood risk, especially in the valley floors.

This contribution analyses, how long-term LULCC from the 1820s until now affect the water retention potential of the Austrian catchments of the rivers Rhine, Salzach and Drava. The Water retention index (WRI) (Vandecasteele et al., 2017) was calculated at a high spatial resolution (100*100 m) for the past and present LULC situation. The WRI is a qualitative indicator and shows the water retention capacity on a relative scale (0-10) by a composition of the governing physical processes (e.g. interception, percolation) through proxy datasets.

The resulting WRI maps of the historic and present state reveal that the general spatial features and characteristics exhibit similar WRI patterns. High values (WRI > 5) occur in valley floors and rather flat areas. Areas dominated by steep topography and alpine characteristics show low WRI values (< 3). The comparison of the two time periods shows a moderate to strong reduction (< -2) of the water retention potential especially in the alpine valleys and low elevations for the current state. This is largely explained by the expansion and development of settlement areas and soil sealing. Additionally, the draining of wetlands, river channelization and disconnection of flood plains and deforestation also strongly reduced the WRI values. In contrast, increasing WRI values occur primarily in areas at higher altitudes. Here, forest areas increased and wasteland transformed to grassland. In addition, new artificial water reservoirs have been constructed to produce hydropower, which have a positive effect on the retention potential. Generally, the spatial and altitudinal changes in the water retention capacity reflects the land and settlement development in the past 150 years. This development resulted in higher flood exposure but might have also reduced flood hazards due to higher water retention capacities.

**References:**

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