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Analysis of riparian vegetation dynamics in an Alpine river

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River systems are generally considered to be one of the most dynamic ecosystems. One of the strongest natural factors influencing river dynamics is discharge and its distribution in time. Several studies have assessed long-term change in riparian vegetation for example due to flow regulation, river damming, etc. In this paper we focus on the short-term changes in riparian vegetation, more precisely on changes in vegetation activity during the growing season in the floodplain of a braided gravel-bed river and the potential influence of inundation and erosion by floods.

In the study we analyze a 500 m reach of the Maggia River floodplain located in the Southeast of Switzerland. It is an Alpine braided river with a natural riparian forest and a gravel-cobble bed. Since 1953 its regime is regulated by the hydropower system in the headwaters, which has caused a 75% drop in average annual flow. The drop in discharge led to the spreading of fast growing, flood tolerant grass, shrubs and occasionally soft-wooded species such as Alnus incana, Salix elaegnos, and Salix purpurea. They are located on the higher elevated alluvial terraces and bars which are affected by inundation several times a year. In our study we attribute the rapid change of their spatial distribution to the influence of inundation. We expect a positive relation between inundation intensity and vegetation disturbance.

To study the spatial distribution of vegetation and its change in time we use the Normalized Difference Vegetation Index (NDVI). We compute NDVI from a pair of co-referenced images in the visible and near-infrared band taken by 2 digital SLR cameras located about 400 m above the valley floor. We used 3 years of daily photographs in our analysis taken usually from May to September. Only good quality images were selected for the analysis due to the frequent occurrence of misty days during winter and early spring. After image ortho-rectification, the NDVI maps were compared with inundation maps modeled with the hydrodynamic model BASEMENT. Changes in NDVI in time were computed and their possible causes were examined.