

**Project or Master Thesis
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Modeling vegetated bar morphodynamics on the Alpine Rhine river

Gravel bars represent a fundamental instream habitat for riparian vegetation creating morphologically active substrates that allows for establishment and development of several riparian plant species. Acting as an ecosystem engineer, vegetation can in turn modify the surrounding environment interacting with the flow field and the sediment transport, thus altering overall bar dynamics. However, the evolution of vegetated bars, or partially vegetated bars, remains unclear and parameters that control vegetation distribution and dynamics are not fully understood. Since 2005, an increasing vegetation cover has been observed growing on the alternate bars characterizing the Alpine Rhine River in the river reach located between Landquart's confluence and the confluence with the Ill River (Fig. 1). Interestingly, a persistent vegetation cover has been observed to develop solely on steady (non-migrating) bars, while vegetation growing on the migrating bars has been removed by flow erosion during the major flood events in the period between 2005 and 2017.

The overall goal of this project is to investigate the vegetated bar morphodynamics through the application of the new 2D version of BASEMENT (v2.8), which includes a description of the vegetation dynamics and its feedback on morphodynamics. A sensitivity analysis of the main model parameters will be performed to test the model capability on reproducing the observed vegetation pattern on the alternate bars and to define the most important processes possibly explaining differences on the vegetation cover observed on steady and migrating bars.



Fig. 1: Alpine Rhine River in Bad Ragaz (1971). ETH-Bibliothek Zürich

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Notes:

Correspondence and report/thesis in
English;
Either for single Master or Project thesis
(2 persons)