Flow-vegetation interaction in an integrated river ecosystem model

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Within a river basin, as well a transport as a transformation of mass (water, nutrients, sediments, . . .) can be observed. These processes are highly influenced by temporal effects (eg. high versus low floods, changing roughness due to vegetation throughout the season,. . .) and spatial effects. The occurrence of vegetation in a lowland river is a good example of these spatial heteregoneity, as the distribution is far from homogeneous and a patchy formation occurs. This results in areas with higher stream velocities (between the patches), where eg. erosion becomes important, and areas with limited velocities (in the patches itself), where eg. sedimentation is more important. These flow heterogeneity has also an effect on ecological parameters like retention times (and its distribution), concentration of nutrients, etc.

To learn about these ecosystems characteristic functioning, a STRIVE (STReam River Ecosystem) model package that enables the construction of integrated river ecosystems to capture cascade effects and feedback mechanisms is developed. This model package consists of several modules, representing different aspects of the ecosystem, like a hydraulic module (1D), a macrophyte growth module, a transport of solutes module, . . . To account for the spatial heterogeneity described before, the current STRIVE version is extended with a 2D hydrodynamic module. In such a 2D hydrodynamic model, a local description of friction should be implemented, which is a function of the position and characteristics of the vegetation in the river and its boundaries.