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1 A multidisciplinary study on exchange processes in river ecosystems - The interaction between hydraulics and ecology on the retention of matter

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The quantity and quality of water transferred to the coastal zone is determined within the river basin. Not only because here the major input takes place, but also because hydrological and ecological processes lead to transformation or removal of materials. For an accurate description of exchanges at (sub)basin scale, a detailed understanding of the functioning of the land-water interfaces (ecotones) is necessary. Retention can be seen as a key feature of river ecosystems to describe transfer dynamics.

The main goal of our research project is to investigate how the diverse physical and biological processes and their interactions in land-water interfaces determine the exchange of **water**, **dissolved compounds** and **particulate matter**. This is studied at the stream-margin and the river-floodplain scale. In order to achieve this goal multidisciplinary research and integrated modeling of groundwater, hydraulic and ecological processes is required. The coupling of different models and model descriptions forms a methodological challenge.

The processes of incorporation of dissolved components in particulate form, biota (e.g. macrophytes, algae) or ecosystem compartments (sediments) will increase the residence time of matter within the basin. The role of hydraulics is twofold: it trans-

ports matter and influences the uptake and release of components. Within a stream, macrophytes affect the (resistance against) flow of water, take up or release of components, and create different in-stream environments. Patches of macrophytes will tend to have different flow conditions and accumulate organic matter. This leads to nutrient rich sediments with reduced environments. For nitrogen cycling, this results in preferential sites of denitrification and thus removal of nitrogen from the system. This can be seen as a cascade structure. On the other hand the increased growth of macrophytes as influenced by nutrient rich sediments effect the discharge and flow regime characteristics and thus form a feed back structure, though on longer time scales.

We will illustrate our attempts to develop submodels and their integration on ecosystem scale to gain insight into the functioning of the stream ecosystem and its role in transport and retention of matter in river (sub)basins.