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A multidisciplinary study on exchange processes in river ecosystems

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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 modelling of groundwater, hydraulic and ecological processes is required. The coupling of different models and model descriptions forms a methodological challenge.

In this project detailed models for two study sites will be developed to investigate ruling processes.
In the first study area, a reach of the Aa River (Belgium) is studied with respect to nutrient and water exchanges between the stream and its surroundings. The Aa is characterised by massive growth of macrophytes, influencing both hydraulics and nutrient cycling. Groundwater seepage and river discharge monitoring extended by coupled groundwater-hydraulic modelling will be used to describe water fluxes. Monitoring of nutrient and other water quality parameters will be performed to develop model formulations for transformation processes.
The second study area is a floodplain along the Demer River (Belgium). Regular flooding directly and indirectly affects the occurrence and dynamics of the vegetation. The input and spreading of dissolved and particulate nutrients within the floodplain is the focus of research. Here also detailed measurements will be coupled to integrated models, describing the transfer of water, dissolved compounds and particulate matter to investigate the retention features of floodplains.