Flood routing in the river Aa using 'Femme'

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The software *'Femme'*, (*a flexible environment for mathematically modelling the environment*) is developed by the Netherlands Institute of Ecology (NIOO)(Soetaert et al., 2004) and is used for the modelling of ecological processes. *Femme*'s code is open source and works on a modular base. The implementation of a one dimensional hydrodynamic model into '*Femme*' to study the interaction between ecological processes and surface water flow as a driving force and the validation using field measurements is subject of this research. For example, the presence of macrophytes has an influence on the discharge by way of the entire roughness of the river, expressed by the Manning coefficient.
River hydraulics is characterised by changing discharges and water levels due to rain fall, so studies have to take into account the non-permanent character of the flow.

In a first phase, the river characteristics and the simplified Saint-Venant equations have been built into the model. The simplification to the parabolic and the kinematic equations allow a faster and easier solution. The parabolic model is known as the convection-diffusion equation and describes the translation, deformation and attenuation of a wave in open channels and is valid for stretches with mild slopes. The kinematic model doesn't take into account the flattening of the wave and can only be applied in short stretches.

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Calculation results are presented by the variation of the discharge as a function of distance. Also the influence of the roughness coefficient is shown.

The integrated study of ecological processes and surface water flow is situated in a multidisciplinary research were attention is paid to the interaction of groundwater, surface water and the ecological system in order to describe the transport of matter through river basins (Buis et al.,2005). An important study area is the river Aa near Poederlee (Belgium, Flanders, province of Antwerp), were discharge, grondwater and biomass measurements are carried out on a regular base, to perform studies in the field and to collect calibration data for the integrated hydraulics and ecology model.