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Modelling the effects of surface water flood pulses on groundwater

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Flood pulses in wetlands steer ecosystem development directly through surface water processes and indirectly through the effects of the flood pulse on groundwater. Direct effects on ecosystems are exerted by e.g. inundation and deposition of sediments containing nutrients. Indirect effects include the rise of groundwater levels and accompanying soil moisture contents following the flood pulse, and the transport of solutes and nutrients from the flood waters to the root zone of wetland vegetation by groundwater flow. The dynamic interaction between surface water and groundwater are steered by their relative water levels. Surface water levels may invoke recharge of the adjacent groundwater systems during the high stages of the flood pulse, while they may invoke drainage at later stages when surface water levels are lowered. The resulting dynamic groundwater levels and solute concentrations influence terrestrial vegetation development and zonation in wetlands. To obtain insight in the effects on wetland ecosystems of human interventions like climate change, water management and land use change, instruments are needed to (quantitatively) simulate the processes involved. The groundwater model Hydrus-2D has been successfully applied to simulate the effects of human interventions on the transport of water and solutes in both the unsaturated and saturated zone towards the root zone of wetland vegetation in The Netherlands. This paper will present preliminary results of the application of Hydrus-2D to simulate the effect of the flood pulse in the Okavango delta on the transport of water and solutes in the adjacent groundwater, based on data taken from literature.

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