Geophysical Research Abstracts
Vol. 12, EGU2010-12090, 2010
EGU General Assembly 2010

Modeling flooding patterns in the Kafue Flats, Zambia

Philipp Meier and Wolfgang Kinzelbach
ETH Zurich, Institute of Environmental Engineering, IfU, Zürich, Switzerland (philipp.meier@ifu.baug.ethz.ch)

The Kafue Flats is one of the most important wetlands in Zambia. In the early 70's the Kafue Gorge reservoir was built mainly for hydropower production not far downstream the outlet of the Kafue Flats. Only a few years later a dam was constructed upstream the Flats to extend the limited storage of Kafue Gorge. Besides its ecological value the Kafue Flats are also important economically. Around 700 000 people are dependent mainly on fisheries and flood recession agriculture. An increasing number of large irrigation schemes are drawing water from the Kafue river along the wetland.

Floodplains in semi-arid and arid areas are often the only source of water supply available throughout the year. They provide numerous economical and ecological services of tremendous value. The ecological uniqueness of many wetlands results largely from a strong seasonality of flooding. As the pressure on water resources grows these natural seasonal patterns are often altered due to water abstractions or the construction of dams. Many efforts have been taken to restore more natural flooding patterns. To assess both, the effects of altered flow regimes and of restoration efforts, a hydrological model reproducing the dynamics of the flooding is required.

However, in many cases hydrological modeling of these floodplains is often hampered by the poor availability of data. Data gathering is also limited by the large extent and the limited accessibility of the wetlands. Therefore the application of remote sensing techniques is an attractive approach.

The model presented in this study is based on a relatively simple approach which was initially designed for the Okavango Delta. The model is based on the widely used software *MODFLOW*. However, due to a different environment and technical advances of the software there are some significant differences between the Okavango Delta model and the model presented hereafter.

The model is based on *MODFLOW 2005* and basically consists of two layers: a subsurface layer, representing the saturated flow in the groundwater, and a surface water layer, representing the flow on the flooded surface. In between these two layers the unsaturated zone is modeled using the kinematic wave approach of the *MODFLOW UZF* package. To couple the surface water layer and the *UZF* module, an additional module was developed in order to route excess infiltration water to either the surface layer or a river. Flow in the main river channel of the Kafue is implemented using the stream flow package. Model outputs are calculated on a daily basis. Input data for the model are derived mostly from globally available datasets.

Since the purpose of the model is to predict the flooding patterns as accurate as possible, model parameters have to be calibrated against the measured extent of flooding. Images from the *ENVISAT ASAR* instrument are used to detect flooding patterns. These data provide a good compromise between spatial resolution, spatial coverage and temporal coverage. As additional calibration data measured water levels are available. The calibration is carried out using *PEST*.

This model predictions can serve as a base to provide information on future effects of a changing inflow regime on the ecology as well as on the socio-economic system of the Kafue Flats.