Geophysical Research Abstracts
Vol. 16, EGU2014-2550, 2014
EGU General Assembly 2014

Impacts of land use change on hydrological components and macroinvertebrate distributions in the Poyang lake area

Britta Schmalz (1), Mathias Kuemmerlen (2), Jens Kiesel (1), Sonja C. Jähnig (2), and Nicola Fohrer (1)

(1) Dep. Hydrology and Water Resources Management, Kiel University, Kiel, Germany (bschmalz@hydrology.uni-kiel.de),
(2) Dep. River Ecology and Conservation, Senckenberg Research Institute, Gelnhausen, Germany

Climate and land use changes affect river ecosystems globally and cause environmental impacts at different spatial and temporal scales. An integrated modelling approach for depicting the effect of environmental changes on aquatic ecosystems was developed and tested. Catchment characteristics, the flow regime and the distribution of aquatic organisms were linked together. The Changjiang river catchment (1717 km^2), as part of the Poyang Lake basin in China, was selected as the test area.

Measuring and sampling campaigns at 50 locations were carried out for collecting land use, hydrological, hydraulic and biological (macroinvertebrate) data. The water balance of the catchment was modeled with the eco-hydrological model SWAT (Soil and Water Assessment Tool). The streamflow time series computed with SWAT at each of the 50 sampling points were tranfered to the species distribution model BIOMOD which predicted the occurrence of macroinvertebrates in the stream network based on hydrological, climatic and topographic variables. The SWAT modeling results showed high temporal dynamics where 72% of the annual streamflow occurred during the monsoon season from March to July. Due to various slopes, soil characteristics, land cover and associated land management, a high spatial variability of surface runoff between the subbasins and HRUs was detected. The highest values occurred on agricultural land with cabbage cultivation, the lowest in forest areas. The SWAT model indicates that deforestation scenarios result in higher streamflow, higher surface runoff and altered flow patterns compared with the base model. In contrast, model runs representing afforestation showed opposite trends.

The predictions for the stream macroinvertebrate community, arising from the integrated modelling framework were found to be suitable for describing changing environmental conditions. The deforestation scenario reduced macroinvertebrate richness through the increase in agriculture and tea plantations.