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Modelling regional water fluxes in a semiarid environment - a case study from the Xilin River catchment, Inner Mongolia (PR China)

K. Schneider (1), L. Breuer (1), S. Huisman (2), K. Vaché (1), N. Archer (1), H.-G. Frede (1)

(1) Justus-Liebig-University Giessen, Institute of Landscape Ecology and Ressources Management (ILR), Germany, (2) Forschungszentrum Jülich, Germany (katrin.schneider@agrar.uni-giessen.de / Phone: +49-641-9937394)

The grasslands of Inner Mongolia have traditionally been used as rangeland. Increasing herd sized (mainly sheep) have degraded the steppe ecosystem and partly turned it into badlands. Water and wind erosion occur more intense where the steppe ecosystem has been disturbed. We wonder if grazing intensity does influence water fluxes, and at which spatial scale. The eco-hydrological model SWAT (Soil and Water Assessment Tool) is used to evaluate the water balance of the Xilin river. The investigations are carried out within the DFG founded research group MAGIM (Matter fluxes in Inner Mongolia as influenced by stocking rate). The research area, the Xilin river basin, is situated approx. 700 km north of Beijing. It is an endorheic drainage area and stretches over 5000 km^2. Long term monitoring data with a sufficient spatial resolution for the entire catchment is not available. Hence, we selected a multi-criteria approach to merge manifold hydrologic information and to extend the knowledge about water-related processes in the basin by collecting various data on different spatial and temporal scales.

- Field scale: effects of grazing intensity on water fluxes were analysed following a multi-temproal geostatistical approach. A sampling grid was established on five fields with different treatments, ranging from no grazing to heavily grazed. On all treatments, soil moisture in the top 6 cm was measured consecutively by FDR technique. Our findings will be compared to measurements of our project partners (e.g. microclimate, soil properties).

- Subcatchment scale: discharge was monitored with additional level gauges along the main river and its tributaries and rain gauges were installed throughout the catchment.

- Catchment scale: remotely sensed information on land use classification based on hydrological plant functional types is used as input for the hydrological model. MODIS derived information on large scale evapotranspiration patterns is finally used to verify the soil-biosphere-atmosphere exchange of H2O as predicted with the SWAT model.

The presentation will outline first results and challenges of the work in a semiarid environment with respect to the field and the subcatchment scale. The soil moisture distribution evaluated by measurements will be compared to output of the SWAT model and remote sensing information. Finally, the overall approach will be critically discussed, taking into account its potential but also its limitations in remote areas such as the Xilin river catchment.

Key words: grazing impact, soil moisture, river catchment hydrology, steppe ecosystem, scaling