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Water fluxes across scales – a case study from Inner Mongolia

B. Blank (1) and the MAGIM-Team

Institute for Landscape Ecology and Resources Management (ILR), Justus-Liebig-Universitaet Giessen, 35392 Giessen, Germany (Benjamin.Blank@agrar.uni-giessen.de / Fax: +49 641 9937389 / Phone: +49 641 9937385)

Many factors play a role in the degradation process of semi-arid grasslands in China. In the MAGIM project German and Chinese scientists are working together to understand how grazing by sheep affects the water and matter fluxes of steppe ecosystems on various temporal and spatial scales. MAGIM was started in April 2004 and is carried out in the Xilin river catchment, P.R. China. MAGIM involves detailed laboratory and field experiments as well as development and application of site and regional models. Here we want to focus on hydrological fluxes across scales and present first results of the project. On the plot scale experiments were started to characterize soil properties and soil hydrology applying techniques such as FDR probes and eddy covariance. On the regional scale research focuses on catchment hydrology by nested catchment sampling and remote sensing. Experiments and investigations were carried out on specifically set up experimental plots, representing various grazing intensities, as well as on pristine sites of the catchment.

Results of the first project phase were grouped under consideration of the project's main goal, i.e. to investigate the impact of the grazing intensity on ecosystem fluxes. For certain parameters such as soil physical properties a strong effect of grazing could be shown. In terms of soil moisture a trend indicating decreasing soil moisture contents could be detected while the grazing intensity was increasing. The total amounts of soil water content differed only little. Also in the case of evapotranspiration no pronounced differences between areas of different grazing intensities could be found. Whereas clear differences existed in terms of the processes, which caused this water loss. On sites of a higher grazing intensity the vegetation density decreased, thus the evaporation gained more importance compared with transpiration. Hydrological

investigations on the catchment scale revealed that discharge is not only generated by precipitation and surface runoff but must be the product of various processes in which precipitation stored as snow, snow drift and the lateral flow on frozen soil layers towards the river might play an important role. Remote sensing data was used to determine the NDVI and soil heat fluxes which could be used to test its agreement with measured field data and for upscaling.