Geophysical Research Abstracts, Vol. 7, 03022, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03022
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Groundwater modelling in a remote Chinese Basin - How can models be improved in areas where data are scarce?

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The presentation focuses on the modelling of the water and salt fluxes through an agriculturally used basin. The field site, the semiarid Yanqi Basin, is located in the Northwestern Chinese province of Xinjiang. This agriculturally highly productive region is heavily irrigated with water drawn from the rivers flowing through the basin. Irrigation in the Yanqi Basin has led to a series of environmental problems. Alternative water management strategies have to be developed and evaluated in order to improve the situation in the basin and in the downstream irrigation areas. One promising alternative is to substitute a portion of the irrigation water drawn from the rivers by groundwater. If a part of the irrigation water drawn from the rivers is substituted by pumped groundwater, the groundwater table drops and the process of salination is slowed down or stopped. The basis for evaluating the ideal ratio between river-water and groundwater applied to irrigation, is a model describing the flow of groundwater as well as the surface hydrology and the salt distribution. To guarantee that such a model produces reliable results, the required parameters both for the construction of the model as well as for its validation must be known with a high spatial resolution.

Remote sensing is a powerful tool to obtain spatially distributed parameters. This presentation demonstrates how parameters like topography, the distribution of soil salinity or the water fluxes at the soil surface are derived.

The topography (DEM) is obtained through a combination of ground truth and radar interferometry techniques. The topography is one of the most important input param-

eters as it is directly related to the evaporation from groundwater. The accuracy of the DEM and its spatial variability allow to estimate an ideal spatial resolution for the groundwater model.

The spatial distribution of salt can be obtained using space borne multispectral images and spectral matching techniques. Such a salinity map has been calculated and a high correlation with ground truth has been found. The extent of soil salinity is related to the depth to groundwater, therefore this parameter can be used to validate the model.

Other important input feature like the location of drainage channels or the location of irrigation areas can be easily obtained with remote sensing and of course are also included in the model.

The project shows that remote sensing can significantly improve the reliability of groundwater models by reducing the number of free parameters, especially in areas where only little data is available.