Impact of climate change on groundwater resources: Feedback mechanisms and thresholds under drought conditions

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Recent investigations by Stoll et al. (20011) suggest feedback mechanisms between dry climatic conditions and increasing water demand that exaggerate the depletion of groundwater resources in drought periods. This thesis aims at identifying such feedback mechanisms and related thresholds that are critical to the development and management of groundwater resources. The responsiveness of groundwater systems to climate change will be assessed using time series of hydrometeorological and hydrogeological data. On the one hand, various time periods that differ in their weather conditions and, on the other, sites in similar hydrogeological but different climatic settings will be compared with respect to the variability and correlation of groundwater recharge, storage, and discharge. For a selected field site a detailed conceptual model will be developed and implemented in a numerical groundwater flow model. In addition to natural recharge and discharge, this model needs to account for anthropogenic influences such as water withdrawals for public water supply or irrigation. Using the groundwater model the sensitivity of groundwater storage and discharge to concurrent changes in recharge and water demand will be examined under various hypothetical scenarios of water management practices and changing climatic conditions.

References:

Stoll, S., H. J. Hendricks Franssen, R. Barthel, and W. Kinzelbach. 2011. "What can we Learn from Long-Term Groundwater Data to Improve Climate Change Impact Studies?" Hydrology and Earth System Sciences 15 (12): 3861-3875.

The project contributes to answering the DK research question 2