Geophysical Research Abstracts
Vol. 15, EGU2013-12635, 2013
EGU General Assembly 2013

Artificial groundwater recharge in ephemeral river systems – a modelling system for assessment and prognosis

Jens Grundmann and Andy Philipp

Institute of Hydrology and Meteorology, Dresden University of Technology, Dresden, Germany
(jens.grundmann@tu-dresden.de)

Improving groundwater recharge is of high importance for a sustainable water resources management in many dryland regions. Ephemeral rivers, which are quite common for those regions, contribute to groundwater recharge due to infiltration through permeable river beds. In numerous countries, this infiltration is artificially increased by means of dams in order to promote groundwater recharge of local aquifers. Such dams retain flood flow and support a decelerated release of water, which leads to higher infiltration opportunity times in the downstream river sections. Therefore, flow dynamics are significantly influenced by dam operation, i.e. process dynamics can get weak and standing/receding wave effects may occur. For the adequate portrayal of such flow processes, we develop a modeling system for flow routing in ephemeral rivers with groundwater recharge dams. The system is based on a process-oriented description of flow, infiltration, and evaporation under dam operation and allows for a robust application under limited data situations. It consists of three sub-models: a kinematic wave model for flood routing in the upstream reaches, a model for simulating the nonlinear flood retention in a groundwater recharge dam inclusive evaporation, and a combined zero-inertia/kinematic wave model for dam release flow. The routing models are each coupled with an infiltration model for the quantification of potential groundwater recharge rates. The proposed system is applied for Wadi Ma'awil, Northern Sultanate of Oman, where flow is controlled by a large groundwater recharge dam. The application results show that the modeling system can serve as a valuable and robust tool for the quantification of realistic groundwater recharge rates, which is of high importance for a sound water resources assessment and prognosis in the study area.