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EPISODIC EXTREME RAINFALL EVENTS DRIVE GROUNDWATER RECHARGE IN ARID ZONE ENVIRONMENTS OF CENTRAL AUSTRALIA

Tuesday, 1 June 2021 10:00 (15 minutes)

To improve estimates of long-term average groundwater recharge in data sparse arid regions, we combined a numerical multi-model approach with century-long time series of meteorological data and site-specific regolith hydraulic properties. The numerical model was set up in the vadose zone simulator HYDRUS-1D for a bare soil and a Mulga (Acacia aneura) savanna-type soil in central Australia. Grain-size analysis from regolith cores were used to generate contiguous 12-m deep profiles of hydraulic properties by means of pedotransfer functions. In order to account for conceptual model uncertainty in generated hydraulic properties that are required as input for the physically based soil-water balance model, eleven pedotransfer functions were applied. Three types of PTFs were used: point estimation (Bruand et al. (1994), Canarche (1993), Gupta and Larson (1979), Hall et al. (1977), Petersen et al. (1968), Varallyay et al. (1982)), parametric (Vereecken et al. (1989), Wösten et al. (1999)), and class PTFs (Meyer et al. (1997), Schaap et al. (2001), Wösten et al. (1999)). Climate data from three stations were used to account for spatial heterogeneity in local climate of the Ti Tree Basin case study area. Analysis of simulated water fluxes in the vadose zone indicated that only rainfall events of more than 200 mm resulted in noticeable fluxes at the bottom of the 12-m deep regolith. Recharge events were linked to extreme rainfall associated with monsoonal cyclones. Based on the 130-year climate records, long-term average recharge for the savanna-type vegetation ranged from 4.3 to 7.4 mm/a across the three climate stations, with an overall mean of 4.6 mm/a. The bare soil had an overall mean recharge of 29.5 mm/a, ranging from 23.5 to 35.8 mm/a depending on climate station. Results from this study yield a better understanding of the highly episodic and spatially variable recharge in arid and semi-arid environments and is critical input to sustainably manage groundwater resources.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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Primary author: MALLANTS, Dirk (CSIRO)

Co-author: BOAS, Theresa (Forschungszentrum Jülich)

Presenter: MALLANTS, Dirk (CSIRO)

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