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# Combination of soil-water balance models and water table fluctuation methods for improvement and validation of recharge calculations

Roland Barthel, Jie Zhang, Jan van Heyden, and David Bendel
Institute of Hydraulic Engineering, University of Stuttgart, Germany (roland.barthel@iws.uni-stuttgart.de)

Despite a long history of related research, reliably quantifying groundwater recharge is still a major challenge, and the validation of groundwater recharge estimates remains difficult. The combination and comparison of at least two conceptually different methods for estimating groundwater recharge has been recommended as an estimate validation strategy. In the presented study, recharge estimates from Water Table Fluctuation (WTF) methods are combined with and compared to results from the spatially- and temporally-discretized soil water balance model PROMET (Mauser and Bach, 2009). Using PROMET and the WTF Method in combination allows the comparison of more than one measurable variable, in this case river discharge and groundwater levels, for cross-validation and plausibility checks.
An enhanced approach to the WTF Method has been developed which assumes that in the case of no recharge, there exists a maximum possible potential decline for any given groundwater level. The new approach is compared to previously published WTF methods, and then used in combination with PROMET for recharge estimate validation. Justification for the use of the modified approach is only possible on a theoretical basis. The primary conclusion of this work is that WTF methods are an excellent option for determining the plausibility of spatially-distributed, regional groundwater recharge estimation approaches and for detecting inconsistencies in available models. Recharge estimates derived from WTF approaches alone are, however, not suitable for regional-scale recharge estimation due to their strong dependency on local data, applicability which is limited to only very specific conditions, and their sensitivity to groundwater level influences other than recharge.

Mauser W, Bach H (2009) PROMET - Large scale distributed hydrologtical modelling to study the impact of climate change on the water flows of mountain watersheds. Journal of Hydrology 376: 362-377