Geophysical Research Abstracts
Vol. 19, EGU2017-12009, 2017
EGU General Assembly 2017

Groundwater Modelling For Recharge Estimation Using Satellite Based Evapotranspiration

Mahmoud Soheili, T.H.M. (Tom) Rientjes, and C. (Christiaan) van der Tol

Department of Water Resources, Faculty of Geo-Information Science and Earth Observation, University of Twente, Enschede, The Netherlands. (soheili.mahmoud@gmail.com)

Groundwater movement is influenced by several factors and processes in the hydrological cycle, from which, recharge is of high relevance. Since the amount of aquifer extractable water directly relates to the recharge amount, estimation of recharge is a perquisite of groundwater resources management. Recharge is highly affected by water loss mechanisms the major of which is actual evapotranspiration (ETa). It is, therefore, essential to have detailed assessment of ETa impact on groundwater recharge.
The objective of this study was to evaluate how recharge was affected when satellite-based evapotranspiration was used instead of in-situ based ETa in the Salland area, the Netherlands.
The Methodology for Interactive Planning for Water Management (MIPWA) model setup which includes a groundwater model for the northern part of the Netherlands was used for recharge estimation. The Surface Energy Balance Algorithm for Land (SEBAL) based actual evapotranspiration maps from Waterschap Groot Salland were also used.
Comparison of SEBAL based ETa estimates with in-situ abased estimates in the Netherlands showed that these SEBAL estimates were not reliable. As such results could not serve for calibrating root zone parameters in the CAPSIM model. The annual cumulative ETa map produced by the model showed that the maximum amount of evapotranspiration occurs in mixed forest areas in the northeast and a portion of central parts. Estimates ranged from 579 mm to a minimum of 0 mm in the highest elevated areas with woody vegetation in the southeast of the region.
Variations in mean seasonal hydraulic head and groundwater level for each layer showed that the hydraulic gradient follows elevation in the Salland area from southeast (maximum) to northwest (minimum) of the region which depicts the groundwater flow direction.
The mean seasonal water balance in CAPSIM part was evaluated to represent recharge estimation in the first layer. The highest recharge estimated flux was for autumn season and was equal to 28 m3/day whereas the lowest flux was -5.6 m3/day in spring. The spatial distribution also shows that maximum groundwater recharge estimated was in the southeast of the region due to the lack of vegetation cover and deep groundwater levels. Lowest groundwater recharge estimated in urban and agricultural areas in the northwest of the Salland area.
The overall conclusion of this study is that groundwater level fluctuations in the Salland area are affected by seasonal climatic variations specially precipitation and evapotranspiration. Such however was not supported by the SEBAL images which proved to be unreliable.