



## **On the Definition of Groundwater Drought**

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Groundwater droughts are caused by lack of groundwater recharge that result into low groundwater levels and groundwater discharge. Simulated or observed time series of recharge, levels and discharge are used to identify droughts. In drought analysis studies, well-known methods as the threshold level approach and the Sequent Peak Algorithm are applied to search for droughts in the time series. Droughts are characterized by its severity (usually a deficit) and duration. Often the maximum deficit and the associated duration is used for frequency analysis. Moreover the intensity (severity divided by duration) is investigated. This paper explores how these methods can be applied to groundwater in a way that the propagation of the drought through a groundwater system is well reflected.

Simulated time series of daily recharge, groundwater levels and discharge from 2 adjacent lowland catchments in the Netherlands are used. The catchments are more or less similar except that one catchments has urban influence, which results in a more flashy streamflow hydrograph. The time series cover a period of 50 years.

It will be shown that the time series for the recharge have to be smoothed (moving average) to identify droughts that are reflected in the groundwater levels. Drought characteristics derived from groundwater levels (state variable) have spatial effects. This complicates comparison with droughts derived from recharge or discharge (fluxes). These spatial aspects are important for the monitoring of droughts using groundwater levels. It also will be shown that the maximum deficit and the associated duration do not provide a complete picture of the drought that is required for drought propagation studies. The paper concludes with suggestions on how groundwater droughts can best be defined considering the propagation through the groundwater system.