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Revealing hydrological subsurface properties by a nationwide automated time series modeling

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The characteristics of groundwater head time series are influenced by the hydrological properties of the subsurface. Knowledge of these properties is important input for e.g. groundwater flow models. We present a method to reveal these properties by application of time series modeling.
In The Netherlands, a national database exists with about 60,000 groundwater head time series. An automated procedure has been developed to apply a transfer-noise (TFN) modeling to all these time series, with precipitation and evaporation as explanatory variables. This automated procedure has been developed for two reasons. Firstly, to make the time series models available through a web-interface, where anyone interested may benefit from the results without applying TFN modeling themselves. Secondly, the number of time series is too large to model manually. The web site is currently operational, and when new data becomes available for certain time series, these models are automatically recalculated over night.
The spatial distribution of the parameters of the time series models can be used for a deterministic interpretation. A first analysis of these data shows a clear connection of the model results to physical properties of the hydrological system. Some examples are: the strength of the response of the groundwater head to the precipitation and evaporation shows a relation to the type of area; the response time of the models is related to the depth of the groundwater head. Further, models can be split in sets with their filter in a certain aquifer. Differences in model parameter values between these sets can be related to the hydraulic vertical resistance between these aquifers. These relations will be explored and quantitative results will be presented.