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Hydrogeological time series analysis using scripts: objective and reproducible criteria for model construction

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Time series analysis is an increasingly popular technique to decompose measured groundwater heads into contributions of different stresses (precipitation, evaporation, pumping, etc.). Reproducibility of the results is enhanced by using scripts, which represent a report of the entire modeling process. The use of scripts forces modelers to define objective and scriptable criteria to determine model structure, for example to identify the most significant drivers of measured groundwater head fluctuations. This decreases the number of subjective choices made in the model construction process, increasing reproducibility. In addition to the use of scripts, reproducibility is enhanced by using open source software. For this purpose, we developed the open source Python package Pastas for the analysis of hydrological time series, which is available from http://github.com/pastas/pastas, including documentation. In this presentation, we show how time series models can be constructed using Pastas and Python scripts and present a set of criteria to be used for selecting appropriate model structure. Two case studies of the analysis of groundwater head observations in the Netherlands and in Austria are presented, showcasing the reusability of scripts and objective criteria.