Groundwater tipping points trigger multi-year droughts

project subtitle

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Project description

Groundwater acts as the primary source of water for more than 2 billion people around the world. As a result, below normal levels of groundwater can have wide reaching financial, social and environmental impacts. This is particularly true for multi-year groundwater droughts which, due to their prolonged nature, can be particularly catastrophic for society. Initial investigations into the mechanisms behind multi-year groundwater droughts have found that in some regions these prolonged drought events could be influenced by tipping points. In these locations the groundwater system can buffer shorter, or less intense droughts. However, when droughts become too long the have multi-year drought impacts. Since small changes in groundwater management could prevent or trigger this mechanism, it is important that we can predict where and when this process might occur.

In this project, the student will use an observational dataset groundwater dataset from the Netherlands to identify regions which exhibit this behavior. Once they have located the vulnerable areas, the student will build a machine learning timeseries model to characterize this behavior. Eventually, the model will be used to predict whether or not this process is likely to become more prevalent in the future, and will try to disentangle the influence of abstractions and water management on the initiation, duration and recovery from this type of multi-year drought.

Job requirements

Ideally the student will have experience using Python and be interested in hydrology.

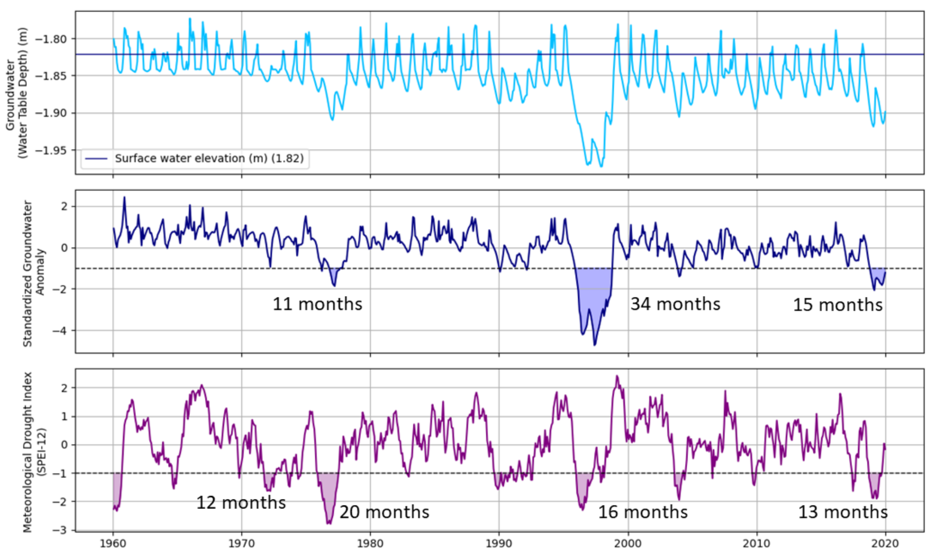

Figure 1 Model simulations demonstrating how multi-year meteorological drought can translate into prolonged groundwater drought when the water table becomes disconnected from the surface water.