

Bridging scales between the catchment and global scale to understand hydrological drought in the Anthropocene

Description:

How a lack of input (precipitation and snowmelt) is transformed into hydrological drought, depends on many factors related to both natural processes (evapotranspiration, unsaturated zone processes, groundwater storage and discharge) and anthropogenic processes (effects of water abstraction or land-use change, such as dam building, deforestation, urbanisation, agriculture). How these natural and human processes interact is still highly uncertain.

Research is being done to quantify the influence of human activities on hydrological drought by using observations in case studies spread around the world and by using large-scale hydrological models (see Figure), but it is still hard to compare and reconcile these two approaches. This is essential so that what is found in local case studies can be upscaled to global scale and so that global models represent the situation on the ground.

This project therefore **aims to compare human influences on hydrological drought obtained with an observation-based approach and a model-based approach for selected case studies**. Case study data and model simulations are available. Hydrological drought analysis using a threshold level approach has already been applied on the case study data, but still needs to be performed on the model data. Potential differences will be investigated by comparing the human and drought processes in the model with those happening in reality.

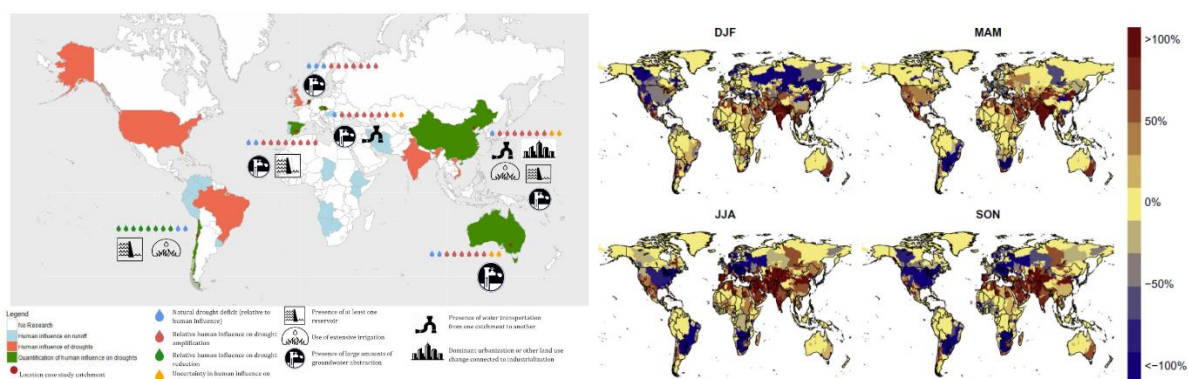


Figure: Human influence on hydrological drought in case studies (left) and in global-scale models (right). Source: Marianne Bosman; Wanders & Wada (2015)

Literature:

AghaKouchak A., Feldman D., Hoerling M., Huxman T., Lund J. Recognize Anthropogenic Drought, *Nature*, 524 (7566), 409-4011, doi:10.1038/524409a (2015)

Rangecroft, S., Van Loon, A. F., Maureira, H., Verbist, K., and Hannah, D. M.: Multi-method assessment of reservoir effects on hydrological droughts in an arid region, *Earth Syst. Dynam. Discuss.*, doi:10.5194/esd-2016-57, in review (2016)

Van Loon, A. F., Stahl, K., Di Baldassarre, G., Clark, J., Rangescroft, S., Wanders, N., Gleeson, T., Van Dijk, A. I. J. M., Tallaksen, L. M., Hannaford, J., Uijlenhoet, R., Teuling, A. J., Hannah, D. M., Sheffield, J., Svoboda, M., Verbeiren, B., Wagener, T., and Van Lanen, H. A. J.: Drought in a human-modified world: reframing drought definitions, understanding, and analysis approaches, Hydrol. Earth Syst. Sci., 20, 3631-3650, doi:10.5194/hess-20-3631-2016 (2016)

Wanders, N., & Wada, Y. Human and climate impacts on the 21st century hydrological drought. Journal of Hydrology, 526, 208-220 (2015)

Requirements:

We are looking for a student with the following skills / characteristics:

- good (R) programming skills
- interest in drought and data-crunching
- based at Birmingham or at one or more of the other partner institutes

Designed by:

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