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Understanding how the value of physically-based models depends on data availability for the prediction of drought indices

Jude Lubega Musuuza (1,2), Thorsten Wagener (1), Jim Freer (2), Ross Woods (1), Nicholas Howden (1), Chris Hutton (1), and Gemma Coxon (2)

(1) University of Bristol, School of Engineering, Civil Engineering, United Kingdom (jlmusuuza@gmail.com), (2) University of Bristol, School of Geographical Sciences, United Kingdom

Droughts are the most expensive natural disaster that can last from a few months to decades. They are mainly driven by precipitation deficits but are often transmitted to the soil and groundwater compartments. Observed data is not always available for drought-related studies, which makes it inevitable to use model outputs as proxies for the data. However, such outputs depend on the quality of the available input data, specifically their measurement accuracy and spatial and temporal resolutions. The exercise of data collection can be very expensive and time consuming and, even after it is collected, data handling and storage can pose serious challenges. The assimilation of sub-grid (and possibly imperfectly-sampled data) demands increased model complexity, but may also add to the sources of uncertainty. The high complexity of sub-grid equations increases the number of parameters and renders the solution strategy tedious without guaranteed improvements in predictions compared to simpler models. In this study we utilise sensitivity analysis to assess the impact of the different catchment characteristics on output precision and accuracy in the experimental Plynlimon catchment located in Wales. We want to understand how data availability changes the value of using a physically-based catchment model for the prediction of drought indices in temperate environments such as the UK.