Geophysical Research Abstracts
Vol. 20, EGU2018-5847, 2018
EGU General Assembly 2018

Identifying critical climate variables for use in scenario-neutral climate impact assessments

Sam Culley, Seth Westra, Holger Maier, and Bree Bennett
School of Civil, Environmental and Mining Engineering, The University of Adelaide, Australia

Scenario-neutral methods are increasingly being used in climate impact assessments of water resource systems. These methods proceed by 'stress testing' a system against a range of plausible hydroclimate scenarios (i.e. time series) to uncover system sensitivities and modes of failure. This information can then be used in conjunction with climate projections to better understand the plausibility of the examined hydroclimate scenarios occurring. The hydroclimate scenarios are characterised by statistics of the climate variable time series (herein referred to as climate 'attributes').

Typically, scenario-neutral climate impact studies consider changes in simple attributes, the most common being annual averages of the system's driving hydroclimate variables (e.g. rainfall and temperature). However, as the interactions between water resource systems and hydroclimate variables are non-trivial this narrow investigation means that there is the potential for 'surprising' modes of failure or other critical sensitivities to be ignored. To address this limitation, we have developed an approach to identify climate attributes that are most critical for system performance. The approach begins by evaluating a comprehensive set of candidate attributes that may affect system performance. Sensitivity metrics are then used to reduce the number of attributes down to those most critical for system performance.

The regulated Lake Como reservoir system in northern Italy is used as a case study to demonstrate the new approach. From a comprehensive set of 10 hydroclimate attributes (including means, extremes and measures of persistence of the input hydroclimate variables) the approach was able to identify a smaller set of four critical attributes. Assessing performance with respect to changes in annual averages alone was found to be insufficient for the examined reservoir system. Instead 'stress testing' the system using the identified set of four critical attributes provided a more effective evaluation the system's behaviour and resilience.