



The shift in onset of unprecedented hydrological drought as a response to different levels of global warming

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It is expected that global warming alters hydrometeorological cycle and influences on occurrence of drought. Future drought is projected to increase with high probability in some regions, such as the Mediterranean region, the west side of USA, and so on. However spatial-temporal change of drought still remain uncertain. The timing of onset when future drought is going to become severer than that of historical period is one of the important question for adaptation planning. Furthermore, understanding about variation of the onset under different levels of global warming is necessary for mitigation discussion as well.

This study focuses on hydrological drought, particularly on stream drought, and estimates the onset and its variations among different RCP scenarios. HiGW-MAT, a state of arts land surface model capable to reproduce energy and water cycle considering the anthropogenic water management, is used to simulate the historical and future terrestrial water cycle. Five bias-corrected CMIP5 GCM outputs provided by ISI-MIP fast track for 1980-2099 are used to force a set of simulations. The timing of onset of unprecedented hydrological drought is estimated by using an indicator, the timing of perception change for drought (TPCD). TPCD is defined as the timing when a time series of drought data exceeds the experienced range (minimum-maximum) and does not get back into the experienced range. For example, in the case of RCP8.5, TPCDs for the Mediterranean region, the west side of USA are 2017 and 2027, respectively. 13 out of global 26 regions indicate earlier TPCD than 2050. The variation of TPCD under different levels of global warming is estimate and its regional characteristics is discussed in this study.