

Interactive comment on “Less Frequent but More Severe Hydrological Drought Events Emerge at 1.5 and 2 °C Warming Levels over the Wudinghe Watershed in northern China” by Yang Jiao and Xing Yuan

Anonymous Referee #1

Received and published: 20 August 2018

The manuscript by Jiao and Yuan assessed the possible changes of drought characteristics (frequency, duration and severity) under future climate at Wudinghe watershed in the semiarid region of China, which is one of the largest sub-basins of the Yellow River basin. The content generally falls into the interests of HESS and its broad audience. Overall, the technical framework is well designed and the manuscript is in good shape for publication. I suggest a minor revision for the authors to address my following concerns.

First, I found some critical details are missing in section 2 and 3 of this manuscript.

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Most importantly, there is no details on temporal disaggregation of the GCM-based Ta and Prec. Also, there is no information about other input variables for the CLM-GBHM model. Moreover, the performance of CLM-GBHM model in reproducing the historical streamflow is largely unknown, though there is some validation work in previous works (Jiao et al., 2017; Sheng et al., 2018). To make the future projection more convincing, the authors should first demonstrate the model performance in the whole baseline period (1986-2005) considering that Jiao et al. (2017) only showed the model validation results during 1964 to 1969, which is out of the baseline period here.

Second, the uncertainty separation framework is valid for GCM outputs. However, for streamflow and drought frequency, the model should be “GCM+CLM-GBHM”. If the error propagation in the CLM-GBHM is totally linear (which is the assumptions of the current manuscript), then the uncertainty contribution ratios for “GCM+CLM-GBHM” should be the same with those for the “GCM”. Otherwise, they may be different.

Other minor comments: P6L91: please specify the time range for the “long-term annual mean...” P7L104: please justify the choice of “eight” GCMs. Do you have any criteria for this selection? Will the selection affect the later analysis? P7L117-119: this temporal downscaling should be elaborated in more details. Section 3.1: what’s the input variables needed for CLM-GBHM model? Besides Ta and Prec, there should be some other variables. How would you deal with those other variables and what’s the data sources? P8L132: Why did you choose to use the monthly LAI of 1982 for all the experiments? Please justify this. Would use the historical climatology of LAI (say from 1986 to 2005) be more reasonable here?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-255>, 2018.

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