

Interactive comment on “Sensitivity of future water availability projections to Global Climate Model, evapotranspiration estimation method, and greenhouse gas emission scenario” by S. Chang et al.

Anonymous Referee #2

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General comments The future projection of water availability is important for understanding the response of the hydrological regime to climate change and improvement to regional strategy for water resources management. However, projected availability is still a crucial challenge since uncertainty exists in estimated projected availability. Although the authors made an interesting investigation on the sensitivity of future water availability to GCM, RET estimation method and emission scenario, there are several aspects that need to be further considered and improved before it is considered for publication in HESS.

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Specific comments (1) Before using the GCMs output to force hydrological model (even estimate RET), the some forms of prior bias correction are always conducted due that GCM often show strong bias over historic period (Wood et al., 2002; 2004). I can only believe the authors use the raw data causing I did not find any information associated with the bias correction description in the paper. So how about the matching degree between the GCM-simulated variables and historical observation? And whether some bias correction jobs should be done before employing these GCMs output. (2) GCM-simulated temperature is commonly considered to have high confidence than other climatic variables such as vapor pressure and radiation (Randall et al., 2007). The differences of estimated ET between temperature-based ET equations and radiation-based equations maybe due to the uncertain input data quality rather than the method selection as the authors declared. (3) In fact, temperature-based equations have been considered not competent in RET change (e.g., Roderick et al., 2009) due that a steady increase in temperature over time will translate into a calculated steady increase in evapotranspiration. Generally, using combination equations maybe more suitable for projection future RET. However, as the above comment pointed out, the GCM-simulated temperature was also widely considered to have relatively high confidence in comparison with other meteorological variables. The different combinations between methods and data should be discussed (see some literatures, Kingston et al., 2009; Wang et al., 2015). Some other minor comments (4) ET always mean actual evapotranspiration, it maybe better use RET/ET₀ to represent reference evapotranspiration. (5) It is better to divide the results into several sub-sections. (6) Results should be presented as such and not mingled with explanations (analysis section), so please separate the results section and discussion section

Used literatures [1] Kingston, D.G., Todd, M.C., Taylor, R.G., Thompson, J.R., Arnell, N.W., 2009. Uncertainty in the estimation of potential evapotranspiration under climate change. *Geophys. Res. Lett.* 36, L20403. <http://dx.doi.org/10.1029/2009GL040267>. [2] Randall, D.A. et al., 2007. Climate models and their evaluation. In: Solomon, S.D. et al. (Eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working*

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Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge Univ. Press, Cambridge, U.K., pp. 589–662. [3] Roderick, M.L., Hobbins, M.T., Farquhar, G.D., 2009. Pan evaporation trends and the terrestrial water balance. II. Energy balance and interpretation. *Geogr. Compass* 3, 761–780 [4] Wang W, Xing W., Shao Q., 2015. How large are uncertainties in future projection of reference evapotranspiration through different approaches? *Journal of Hydrology*, 524, 696-700 [5] Wood AW, Leung LR, Sridhar V, Lettenmaier DP (2004) Hydrological implications of dynamical and statistical approaches to downscaling climate model outputs. *Climate Change* 62:189–216. [6] Wood AW, Maure EP, Kumar A, Lettenmaier DP (2002) Long-range experimental hydrological forecasting for the eastern United States. *J Geophys Res* 107(D20):4429. doi:10.1029/2001JD00659

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