Hydrology and Earth System Sciences Discussions

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Comment on hess-2021-472

Anonymous Referee #1

Referee comment on "Projecting end-of-century climate extremes and their impacts on the hydrology of a representative California watershed" by Fadji Z. Maina et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-472-RC1, 2021

The manuscript simulates End of Century (EOC) extremes and their effects on the water-energy balance in the Cosumnes river basin, using cutting-edge global climate and integrated hydrologic models (ParFlow-CLM). I really like the way the authors used to analyze the hydroclimatic changes by median WY, dry WY and wet WY (e.g., Figures 3-5). The manuscript is overall clearly written, and the results are well discussed.

My first concern is the insufficient validation of the models' simulations in the historical period. Besides temperature and precipitation outputs, other watershed-integrated fluxes, and storages (e.g., ET, soil moisture, TWS and streamflow) should also be validated as much as possible using the observations, remote sensing data and reanalysis, to ensure the models' simulations reasonable. Only then will we believe the further analysis between future and historical periods is valid. In my opinion, the historical simulation of VR-CESM is not so good because the simulated dry, median, and wet water years are distinct from the PRISM (Figure A2).

The authors may argue the historical simulations are acceptable, because a global climate and integrated hydrologic models are used (more complex and larger simulation domain). However, one can use a finer-resolution hydrological model (e.g., VIC, SWAT, and many others) driven by statistically or dynamically downscaled regional climate model outputs to obtain more reasonable (maybe more accurate from the perspective of validation) simulations in this river basin (7000 km^2), and to do further analysis like the authors did in this study. Please explain why the global climate and integrated hydrologic models are more suitable for this case study?