Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
https://doi.org/10.5194/hess-2022-204-RC2, 2022

Comment on hess-2022-204

Anonymous Referee #2

Referee comment on "On the value of satellite remote sensing to reduce uncertainties of regional simulations of the Colorado River" by Mu Xiao et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-204-RC2, 2022

The authors present a well-written and well-motivated study on the value of remote sensing data to improve hydrological simulations. I enjoyed reading the manuscript and only have a few comments that will require some attention by the authors.

The authors chose to evaluate the model against monthly runoff. In my point of view this cannot be justified since the remote sensing data are used at daily scale to evaluate the model. In order to achieve a balanced evaluation of the model runoff should also be evaluated at daily scale.

More details are required with respect to the “adjustment of the VIC parameters” as presented in section 3.2. Did the authors conduct a manual calibration or where the parameter values estimated via automatic calibration? Please specify.

One of my main concerns relates to how the fit between observed and simulated spatial patterns was assessed. The authors chose to do a grid-wise evaluation of the simulation. I think this makes sense for the forcing adjustment where the temporal dynamics of simulated LST are strongly linked to the forcing data (air Temp). However, when it comes to model parameters, I would suggest to evaluate the model against spatial pattern that are aggregated over time, for example a long term average annual (or summer) LST map. Evaluating a model at daily scale will always be very much affected by the quality of the forcing data and the model parameters have a limited affect here. Nevertheless, the imprint of the model parameters emerges when aggregating the simulation results over time and quantifying the spatial pattern match (e.g. with help of the SPAEF metric (https://doi.org/10.5194/gmd-11-1873-2018)) instead of the grid-to-grid comparison. Along these lines, the spatial patterns of RMSE and Bias presented in Figure 9 do not show a clear improvement of the model developments. Maybe a spatial pattern oriented evaluated of the long term average LST patterns is more insightful.

The authors only present maps auf the three selected metrics. For interested readers, observed and simulated maps of the actual variables will provide insightful information. The authors could select single days or long-term averages of LST (night and day) and snow cover to illustrate the catchment characteristics and how the model represents those.

It would be interesting to see how the three steps of model development affect the water balance of the model. The authors only present the simulated runoff of the various simulations, but aggregated numbers of evapotranspiration, runoff, groundwater recharge, etc. would provide relevant alternative information.