Review of "Evaluating the Atibaia River Hydrology using JULES6.1" by Chou et al.

Comments

- Another highly relevant paper (because it looks at runoff production and riverflow in JULES, and the sensitivity of various runoff parameterisations) is Martínez-de la Torre et al., 2019, Using observed river flow data to improve the hydrological functioning of the JULES land surface model (vn4.3) used for regional coupled modelling in Great Britain (UKC2), Geosci. Model Dev., 12, 765–784, https://doi.org/10.5194/gmd-12-765-2019.

The relevant paper is cited for comparison in sensitivity analysis and results section.

- L31 and following: The phrasing and punctuation make some aspects slightly difficult to follow. Also the final sentence - there are already models, and the perceived need is for one in the public domain (which isn't quite was is said).
- L32: The Sacremento model (SAC-SMA?) will almost certainly have papers that can be cited - assuming this is the same model.
- L34: The discussion of Bayseian and MCMC models is confusing, as neither is used here. Clarify that these are possibilities, not currently used for this catchment.

Due to this comment alongside with the other reviewer's comment, I have removed the less relevant content in this section.

- L74-77: Much of this is about the region, not the model. Move to Sec2.2? Also you talk about sub-catchments before you have introduced us to the whole area (in Sec2.2). I would be tempted to move all the geographical information to before the model is introduced.

I move the geographical information forward. L74-77 is combined to geographical information.

- L74: Somewhere (probably near here) you should clarify that you run the model representing each sub-catchment (Fig.1) as a single model gridbox.

Description added: in gridbox.

- L76: How many data are missing? It would be good to know something about this aspect of data quality. Do you need to swap entire years, or can you just patch data where they are missing (e.g. days or months)?

I replaced the entire year of 2012 and 2015. Over 40% of continuous data are missing (2012/3-2012/8).

- L83-86: This is about your methodology, not JULES. I suggest this might be better in Sec2.3 (which could be renamed).

This is combined to Sec 2.3.

- L86: The TOPMODEL parameterisation in JULES also includes an exponential decline with depth of the saturated hydraulic conductivity, with parameter f (see Gedney and Cox (2003) or Clark and Gedney (2008)). Results are potentially sensitive to that parameter (I expect), so why did you not include that parameter in your sensitivity analysis?

I include parameter f in the sensitivity analysis (JULES code:fexp). I also removed the original content of ti_max since it is less relevant. (Also referring to Martínez-de la Torre et al., 2019)

- L99: Time series - for how many locations? (Fig.1. tells us.)
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3 stations of Campinas-IAC and 5 stations of DAEE. Also updated in Figure 1.

- L105: Note that higher resolution reanalysis-type datasets are available (e.g. ERA5-based data available via the Copernicus service) - not that that alone guarantees improved accuracy.

We used observed data for air temperature, pressure, humidity. Wind speed and radiation data from reanalysis could affect the model performance. But I believe the change won't be the major part. Also, we haven't got time to parameterize the higher resolution reanalysis-type datasets (ERA5-based data), but will use it in the upcoming research.

- L130: This section only makes much sense if the reader is already familiar with the PDM and TOPMODEL parameteristions in JULES. In general, these parameeristions should be introduced in more detail - e.g. assumptions, how they work, how they differ. The functional forms used should be presented in your manuscript, to save readers having to search through other papers, and so that they can understand how the parameters you vary are used in the model.

Content and functions added in section 2.2 The JULES model.

- The model configuration (parameter values) and the modelling approach should be described in more detail. Suggestions and questions follow:
  How did you go from the MODIS land cover map to fractions of the model surface types?

Description added: The original 17 land use classes reclassified into 10 JULES land use classes by Houldcroft et al. (2009).

- To what extent is the catchment hydrology modified by human behaviour? If modication is important, is this represented in the model?

The catchment is affected by dam operation. The dam release in the upstream is represented in the model.

- What topographic index data were used for TOPMODEL?

Topographic index data was obtained from (Marthews et al., 2015). The mean value and standard deviation of the basin is used.

- How was the model initialised, and was there any "spin up" period?

The model is spin up using the first year of data (2009). It is allowed to overlap with the main modelling period. Description is added in the content.

- How were all the other parameters and switches set - e.g. did you start from an existing configuration? A keen reader can find all the settings in the Zenodo bundle, but that still doesn't explain where they came from.

There are example data sets which could be installed from the JULES server.
Description added in Code and Data availability section.

- Were the optimal parameter settings determined using "expert judgement"? e.g. You present various statistics of the flow, and describe some of the model sensitivity, but how did you come to your final decision? It does not appear to have been through anything such as a weighted-average of the statistics. For some metrics PDM was better than TOPMODEL.

- Was the sensitivity analysis performed "one at a time"? What about any possible interaction between parameters? This possibility should at least be mentioned.

Content Added. We examined the model performance with a combination of soil depth, shape factor, and minimum soil water content, and found that the highest performance with combination dz=1.0, b=0.5, s=0, which altered the shape factor alone.

- You present results only for the flow gauging station that is furthest downstream (I think). Fig.1 suggests that you have two or three other gauging stations that are close to catchment outlets - could you also look at model performance at those points? Those could potentially also tell you if the model behaves better in some parts of the catchment (e.g. headwaters) than elsewhere.

Content Added. The results in compared in the upper, middle, and lower basin.

- Clarify your final parameter settings - i.e. the values that were used for the main runs.

PDM: We found that the highest performance with combination dz=1.0, b=0.5, s=0, which altered the shape factor alone. Therefore, we run the full-time series of modelling with this parameter combination. (L134)

TOPMODEL: In terms of model performance, we found a value of 3.0 simulates the highest NSE (0.61). The value is then selected to be used for the full model simulation. (L138)

General comment on the language - while the manuscript is understandable and written in fairly good English, there are quite a few bits where the language could be improved to make the meaning clearer. If it is possible to get someone (e.g. a native speaker) to spend a bit of time on this, I think you could make improvements without having to spend a lot of effort.

- A few specific examples (just a few phrases that I noted; the more important changes would be about the phrasing of certain sentences):

L50 "JULES's model"
L54 "detailly described"

L70 "physics and chemical properties"

L140: "we found a merely change"

More minor comments

Citations appear in various formats - tidy up.

L202: The reference for Brooks and Corey (1964) looks to have been mangled.

L77: DAEE is (currently) only explained later.

Fig.3: Add units of flow.

Fig.5: Clarify that this is using TOPMODEL.

Relevant modification has been made.