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Hydrology and Earth System Sciences Discussions

Interactive comment on "SWAT use of gridded observations for simulating runoff – a Vietnam river basin study" *by* M. T. Vu et al.

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REFEREE COMMENTS

Thank you for your detailed and constructive comments. We have tried our best to reply to your questions. Here is our answer:

1. The global datasets used in this study can be classified into three categories: ground truth-based, satellite-based and reanalysis data. Given that different datasets may have different spatial resolutions that affect simulation, a number of plots showing the grid cell information for each dataset, station locations and information of Hydrologic Response Units (HRUs) are quite necessary.

Authors' Response: That is correct. There are 3 categories used in this study: ground truth (APHRODITE, GHCN2), satellite (TRMM, PERSIANN, GPCP) and Reanalysis (NCEP) with different spatial and temporal resolution (see Table 1). But our main concern is not to compare ground-truth with satellite data or reanalysis. The purpose is to assess the uncertainties in gridded observation data when used for the hydrological model over the study region.

2. Interpolation of gridded data to three rainfall stations in section 4. I can understand the interpolation when comparing gridded data with station rainfall data, but why it is necessary in deriving forcing data for hydrologic modeling? The authors may argue that such interpolation facilitates using the calibrated parameters based on station rainfall data, but why not calibrating parameters for each gridded dataset independently without interpolation? I think the gridded datasets are not necessarily worse than the three station rainfall data in representing the spatiotemporal distribution of precipitation over the catchment, though they are biased. At least some sensitivity experiments should be carried out to make sure whether using station data calibration with interpolated gridded data is superior to calibrating SWAT by directly using gridded data or not. If the calibration is performed by using gridded data (using center point to represent each grid cell for the input of SWAT model), the statistics in Table 4 may change. And I think this method is more useful in ungauged basins where no station rainfall data (or location information) exists.

Authors' Response: We agree with the comments from the reviewer. There are 2 typical ways to study the sensitivity of gridded data (1) using observed station data (as a bench mark) as in this study or (2) do the calibration separately for different gridded dataset as suggested by reviewer. The latter might lead to different results other than stated in this study in Table 4 but it is worth a prize. We will note it for our future research.

3. The abstract is short of quantitative and detailed conclusions. Please include some statistics about the results, such as the range of Nash-Sutcliffe coefficients and

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squared correlation coefficients from stream flow simulations driven by different gridded datasets; and which gridded dataset shows the best result in Dakbla River basin and why.

Authors' Response: Modified accordingly

4. P10681, L9 and hereafter. Please list the references in the order of published year. Response:

Authors' Response: Changed accordingly

5. P10682, L12. Since the author mentioned "rainfall distribution code (skewed distribution or mixed exponential distribution)" in the introduction, where the code is usually used to generate daily forcing data from monthly values in SWAT. However, the gridded datasets used in this study are available at least in daily time step. So my question is whether the weather generator code being used in this study. If so, I am not sure why the authors do not use the daily gridded datasets for interpolation. If not, the authors should add some clarifications since it is confusing in L12.

Authors' Response: Noted and Changed accordingly

6. Please shorten the last three paragraphs of the introduction to avoid mentioning too specific information regarding method and data. For instance, interpolation, calibration period and validation methods etc could be moved to section 2.

Authors' Response: Noted and Changed accordingly

7. P10684, L10. Please explain the reason for selecting Soil Conservation Service (SCS) curve number method to calculate surface runoff volume (e.g., Green & Ampt method needs sub-daily precipitation data which is not available for some gridded datasets)

Authors' Response: Daily precipitation data is used when the SCS curve number method is chosen to model surface runoff and Green&Ampt method needs sub-daily

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precipitation data.

Changed accordingly in main text

8. Please clarify in section 2.2 whether there are any sub-basins in the modeling area or not.

Authors' Response: The catchment is divided into 9 sub-basins. We have replotted Figure 1 to make it clear and referenced it in the main text

9. P10688, L25. Is there any specific concern that the calibration period should be after the validation period? Is it because of extreme flood events during 1996-2000 that may affect calibration (Fig.3)?

Authors' Response: Noted your comment with thanks. The reason for using period of 2000-2005 as the calibration period is based on the availability data of the land use and soil map collected from local authorities for the year 2002 (which we did not mention in the main text). In addition, we do not have any data up to date for the recent year, hence we use 1995-2000 as validation.

10. Fig.1, please highlight the river outlet at Kontum station to make it different from other outlets since only the streamflow at Kontum is used in this study.

Authors' Response: Changed accordingly

11. Fig.3, what does "observed station rainfall" mean? Weighted average values based on three rainfall station data? Calculating correlation or lag-correlation between rainfall and stream flow in the calibration and validation periods may help to interpret the statement in P10689, L14.

Authors' Response: "observed station rainfall" are the actual rainfall data collected at 3 stations. It is used here as a bench mark to compare with other gridded observation data. Noted your last statement, which we will corporate in our future research.

12. The labels and legends in Fig.4 are too small. What are meanings for the red dots

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in the right panels of Fig.4?

Authors' Response: The right panels of Fig. 4 show the box plots for 3 different rainfall stations with 7 rainfall sources. The red dots are extreme value outside the data range and do not appear in all plots.

13. P10690, L1. Change "daily average" to "monthly average".

Authors' Response: Changed accordingly

14. Table 4, why APHRODITE is better than GPCP at daily scale, while the former is worse than the latter at monthly scale? I think incorporating monthly statistics in Table 4 (could be in brackets following the daily statistics) might be helpful for interpretation.

Authors' Response: Those are uncertainties in the model that we are discussing. We are trying to prove that the better spatial resolution does not mean that it yields better discharge result.

In daily scale, APHRODITE is better than GPCP in term of spatial resolution (0.25° vs 1°) and in Table 3, the comparison between statistics for 3 rainfall stations also show that APHRODITE dataset has advantage over GPCP in daily scale. That leads to better discharge generated by APHRODITE than GPCP in daily.

On a monthly scale, because the uncertainty/bias in daily time step have been ignore/cancelled, that might lead to a better result of GPCP for this region over APHRODITE, despite its coarse resolution.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/8/C6459/2012/hessd-8-C6459-2012-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 10679, 2011.