

Referee report

General comments

The model calibration and validation is not fully convincing. Please see specific comments 5, 6 and 7 below. The recommendation is:

- to improve the calibration for the Ganges (maybe by including some intermediate hydrological stations in the study) or to explain where from the time lag could come;
- to add more hydrological gauges in the calibration, if possible; and
- to add PBIAS in the evaluation of results and to compare the simulated and observed long-term average daily (or monthly) discharges for the calibration and validation periods.

It is recommended to extend the length of time periods (reference and future) to the standard length of 30 years.

The correlation analysis should include estimation of statistical significance, which would help to analyse the results.

Presenting only the basin-averaged results for very large river basins is a serious weakness of the study, which does not correspond to the state-of-the-art level. An evaluation, at least partly, for the high mountainous and lowland areas would improve the quality of results.

And the language of the whole manuscript has to be necessarily checked by a native speaker.

A major revision of the manuscript is suggested. After that the manuscript has to be re-reviewed.

Specific comments

- 1. The length of time periods should correspond to the standard of 30 years applied in climate impact assessment**
2. From the abstract should be clear, which climate scenarios were applied, before describing the final results.
3. Abstract: “due to increased net radiation” and Section 4.4.6: why is the net radiation increasing? Please discuss.
4. Please include a Table with main characteristics of 3 basins, like: average elevation and elevation range, average T, P, Q, major land use classes, soils, extent of water use (irrigation etc.). It would be helpful for analysis the results, e.g. in Section 4.1.
- 5. Using only Nash and Sutcliffe efficiency and correlation coefficient for evaluation of model performance is not sufficient. In addition, at least one else criterion, e.g. PBIAS, should be applied. It is also recommended to compare the simulated and observed long-term average daily (or monthly) discharges for the calibration and validation periods in addition to graphs presented in Fig. 6.**
- 6. The calibration/validation results are not fully convincing, especially for the Ganges. It is doubtful that water use upstream can explain the time lag in the simulated hydrograph. Besides, is water used in the Ganges to a larger extent than in the other two basins? Please clarify this point, and add some numbers to make it evident.**
- 7. The calibration and validation only for one gauge per basin for such large river basins is still doubtful. In section 2.2 is said: “data were mainly for the outlets”. It means, there were additional data for other intermediate gauges? This would be very beneficial to include them into the calibration procedure (multi-site calibration).**

8. 5760: 2 sentences on lines 21-24 seems to have opposite senses: how the reduced discharge can be explained by backwater effect, and how the reduced discharge is connected with the overestimation of peaks? Besides, usually gauge stations are placed so that there is no backwater effect. Is it different in this case? If so, please clarify and add a reference.
9. 5761, l. 20-25: much lower ET in the Brahmaputra is probably mainly due to higher elevation and lower T, as vegetation in the Ganges is only slightly higher. Please check and correct.
- 10. Section 4.2: statistical significance of correlation coefficients has to be evaluated as well. This would help to better analyse the results. Besides, the usual Pearson correlation may be not eligible, as some of variables are not normally distributed, and other methods could be used.**
11. Fig. 8: were correlation coefficients calculated for all 3 periods together? ET: is it actual evapotranspiration? Please clarify this in the figure title.
12. Section 4.4: To add a sentence in the beginning on how the changes were estimated: by comparing simulations from the scenario and reference periods driven by climate model inputs in both periods. This is important!
13. Section 4.4. After the first introductory sentence Table 3, Figs. 10 and 11 should be introduced by explaining what they show. The titles of Figures 10 and 11 should state how the comparison was done: by comparing simulations from the scenario and reference periods driven by the climate model inputs in both periods. Besides, the lines for the reference period in Fig. 10 should be better distinguishable (another colour?)
14. Conclusion: not necessary to repeat all numbers again in the Conclusion section, as they were already presented in Tables and repeated in the text above. Please formulate the results in a more general form.

Technical corrections needed

1. Please check grammar. Some observed mistakes:

5747: “results shows” (abstract);

5750: “as one of the best available global forcing dataset” → “as one of the best available global forcing datasets”;

Section 2.1: “The WATCH Forcing Data set (WFD) (Weedon et al., 2011) are used” → The WATCH Forcing Data set (WFD) (Weedon et al., 2011) is used”.

5755: the energy and water budget → the energy and water budgets

5755: high temporal-resolution → high temporal resolution

5759: “No surface runoff generated” → “No surface runoff is generated”

5758, l. 6: less → lower.

5758, l. 17: were fixed → was fixed.

5759, l. 13: less → lower.

5759, l. 15: ranges → range

5761, l. 14: magnitude → magnitudes

5761, l. 18: less → lower

Section 4.1: numerous small mistakes, to be checked.

Section 4.2: numerous small mistakes, to be checked (monthly mean → monthly means, representing → represent, relationship → relationships, generate → generates, which result → which results in, etc.)

Section 4.3: varies → dynamics

4.4.1: century; → century (to remove ;), 2 different scenario → 2 different scenarios, which are → which were

4.4.2 much warm → much warmer

4.4.4. less change → lower change

4.4.5 less → lower

4.5, title: parameter → parameters

4.5 “increasing complex” → “increasing complexity of”, mistakes of singular/plural cases (e.g. 5767, l. 27), less → lower, peak → peak, etc.

5: 5769, l. 23: very less changes

2. **The language of the whole manuscript has to be checked by a native speaker.** There are many poor and/or unclear formulations, like:

5748: “the impact of climate change on not only the runoff”,

5748: relatively less → relatively low

5750: “this study, a hydrologic model simulation will be calibrated”

5751: “which has been demonstrated suitable“ → “which has been demonstrated as suitable”

5751: “which benefit the analysis of their combined influences”

5751: “in most previous work“ → “in most previous works”

5754: “MRI-AGCM3.2S is based on an atmospheric climate model with a 20km grid model” – too many “models”.

5754: “Climate change impacts on the south Asian climate” ???

5754: “by multiplying a correction coefficient” → “by multiplying using a correction coefficient”

5756: “The module accumulates runoff generated by the land surface model and rout them” → “The module accumulates runoff generated by the land surface model and routes it”

5756: “to become streamflow“ → “where it becomes streamflow“

5760: “This is likely due to that the Meghna as a tidal river ..”

Section 4.3: variability of runoff and precipitation are closely similar → inter-annual dynamics of runoff and precipitation are similar

Section 4.3: To reformulate: “Though there is no clear trend is noticed ...”

Title of 4.4: Projected changes in the mean → Projected mean changes

- 4.4.3: is predicted → is projected
- 4.4.3: directed → could be directed, flood → floods
- 4.4.4: “It is observed in Fig. 11m–o, changes of ET in near-future are very less” please formulate in proper English
- 4.4.6: “Due to projected air temperature increase in dry period is large”, and the rest of this sentence – please formulate in proper English
- 4.5: the sentence about “many parameter sets can reproduce the observations” is poor, please reformulate
- 4.5: “uncertainty of future projection due to model parameter should consider carefully” – please formulate in proper English
- 4.5, 5768, l. 23-25: “Larger uncertainty in predicting soil moisture is significant in land use management, agriculture in particular ...” – poor formulation (what does it mean: “larger uncertainty in land use management?”), please reformulate.
3. Abstract: “evapotranspiration is predicted” is wrong, it is only projected. The word “prediction” should never be used in this context. Please check in the whole manuscript (e.g. p. 5749, 5765).
 4. Abstract: the sentence about the “largest hydrological response” should be reformulated, as the largest hydrological response may not necessarily lead to the higher risk of flooding. Better: “the highest increase in discharge”.
 5. A reference to Fig. 1 is needed in Introduction, 2nd. Paragraph.
 6. Please correct: in Introduction: “encompasses a number of countries including China, India, ...” → “encompasses a number of countries including parts of China and India, ...”
 7. 5749: why “due to the lack of calibration data”? Probably, → “due to the lack of calibration”?
 8. 55750: what means “well-constrained hydrologic modelling”? Please reformulate.
 9. Introduction: please subdivide the long paragraph starting “Few studies ...”, and the next paragraphs in Introduction, as well as in the following Sections.
 10. Fig. 3: why is it called “climatology”??? It is a long-term average seasonal dynamics.
 11. 5759: Why “envelopes”??? What is the meaning? Maybe to reformulate?
 12. 5759: “for the Brahmaputra and Ganges basin”: Not, for all three basins.
 13. Title of section 4: Result and discussion → Results and discussion
 14. 5761, first sentence in 4.1: please correct, as Table 2 does not present seasonal cycles, only mean values
 15. 5761: second sentence in 4.1 about interannual variation precipitation: “was mainly from May to September “ → “was higher from May to September”.
 16. The last sentence in 4.2 is poorly formulated (“upstream water use ... is estimated as ET”), please reformulate.
 17. Section 4.3, second sentence is poor (there could be a long-term trend despite of a high inter-annual variability). Please correct.