

## ***Interactive comment on “Hydrological cycle over south and southeast Asian river basins as simulated by PCMDI/CMIP3 experiments” by S. Hasson et al.***

**Anonymous Referee #1**

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### **General comments**

The manuscript compares the performances of CMIP3 climate models in reproducing the hydrological cycle over four major South and Southeast Asian river basins (Indus, Ganges, Brahmaputra and Mekong), which are the main source of fresh water for hundreds million people. The analysis is mainly split in two parts. In the first part, the capability of the models in reproducing some characters of the observed hydrological cycle in the XX century (specifically 1961-2000) are investigated in terms of precipitation (P), evaporation (E), atmospheric water balance ( $B = P - E$ ), strength of the hydrological cycle ( $P + E$ ), and internal consistency between water balance B and simulated runoff. In

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the second part, predictions of the same quantities are critically analyzed and compared in the 2061-2100 and 2161-2200 timeframes. The paper presents a systematic and huge analysis on the four major river basins, results are well documented and discussion offers several insights for future improvements of climate models, highlighting, e.g., the criticality in reproducing the roles of summer monsoon and winter mid-latitudes disturbances in the Indus basin.

Overall my judgment for the paper is very positive, I have only some technical corrections and suggestions.

### **Specific comments**

1. Eq. (1) and (2) contain some mistakes and inconsistencies in the sign to be fixed. Moreover the water balance B is used but defined later, please define just after the equation (2) in line 6, page 122.
2. Page 122, line 8. “The equation is satisfied for the short term storages as the average time of water in the atmosphere is roughly 10 days ...”, please clarify better which part of the equation is satisfied in short/long term.
3. Eq(3): please change  $\langle \beta \rangle_i$  into  $\langle \beta_i \rangle_t$  to keep coherence with previous eq.(1) and (2) or simply into  $\langle \beta \rangle_t$  according to next comment.
4. Eqs. (4) and (5): in both equations the subscript i is used ambiguously as summation index and to identify the considered variable, as described in the first line of page 123. In my opinion symbol  $\beta$  can be used without any subscript to denote any variable.
5. Page 130, line 23. “... suggested precipitation ...”. Please explain or rephrase.
6. Page 142, lines 22-27. The same concept is expressed twice. Please rephrase.

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7. Reference item for CIESIN(2005) is missing. Please double check citations and reference list.
8. I had several difficulties in understanding the text along the x- and y-axes in almost all the figures: please improve the readability.
9. In Figures 1, 2... (which are discussed in Section 4) results are often presented in terms of mean and 95
10. A general convention is to write that the quantity in the y-axis is plotted "versus" (or "against") the quantity in the x-axis. This is correctly used e.g. in the text (line 1, page 126) referring to Figure 2a, but it is systematically exchanged in almost all the Figure captions. Please check and correct.
11. Mean observed quantities (precipitation and runoff) are sometime reported in the captions and sometimes not, and only rarely they are reported in the plot. I would suggest to display in the Figures the observed quantities as reference whenever it is possible, and eventually to report them also the in the captions and/or even better in Table 1, where information on mean precipitation is missing.
12. Captions of many Figures provide the correspondence between 100 mm/y of runoff and discharge in cube meter per second. This information is often repeated in several captions. I believe that this information is not so crucial thus I suggest to remove this information from figure captions and to add the conversion as an additional row in Table 1.
13. Captions of many Figures are mainly copied and adjusted with the new information regarding the second, third, fourth basin. I suggest to careful write the caption for the first one of each series of Figure, and to report only the additional new information in the following, making reference to the first Figure with the full caption (e.g. "Same as Figure XX, but for the Ganges Basin, where mean precipitation is ... or runoff is ...").

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14. Maybe also that same Figures could be aggregated in larger plates. E.g. merging Figure 2 and 3 can originate a single plate with 4 subfigures (and similar merging could be done with following figures), but this also depends on the final formatting of the paper. For sure this would help the reader.
15. Captions of Figures 4, 5, 6 ...: now reference (a) follows the description of the first subplot, and reference (b) follows the description of the second subplot. It is a common convention that the reference should precede the description. Please correct all captions where this comment apply.

In conclusion I encourage publication after the above technical corrections.

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