*Dear Authors,*

*Thank you for submitting the revised version of your manuscript. We appreciate the effort you have put into addressing comments and suggestions. After reviewing the revised manuscript, we are pleased to note that it has improved significantly, and your revisions have enhanced the clarity of the work.*

*In addition, feedback from an additional reviewer is now available, requiring minor revisions. Please review the comments carefully and incorporate the necessary changes to strengthen your manuscript further.*

*We look forward to receiving your response and the revised manuscript.*

*Best regards, Elham Freund*

Dear Elham Freund,

We wish to thank you for handling the review of our manuscript submitted to HESS for possible publication. We wish to sincerely thank the reviewers for their extensive and thoughtful comments on our manuscript which we have addressed in the revised manuscript as discussed below. Throughout, *reviewer comments* are in *blue* font and *italic* type, and **our response** in **black** font. OM and RM stand for original and revised manuscript, respectively.

There have been textual changes throughout the manuscript, mostly in Method, Results and Discussion. All the changes were given in the marked version.

Thanks a lot for your consideration.

Thank you and with regards.

Sincerely,

Xuezhi Tan

*The topic selection of this paper holds significant practical significance, focusing on the blue and green water resources in intensively developed watersheds, which is crucial for understanding and responding to challenges in global water resource management. The study employs methods such as hydrological model simulation, statistical analysis, and cluster analysis to examine the combined impacts of climate change and human activities on blue and green water resources at both the watershed and sub-basin scales. Using three water security indices, this study comprehensively assesses the water resource condition of the Dongjiang River Basin, explains the dynamic changes of blue and green water resources in intensively developed watersheds, and provides a new theoretical perspective for water resource management. The innovations include the establishment of the SWAT model through multi-water flux calibration and verification, and the exploration of the combined impacts of climate change and land use change on water resources from the perspectives of blue and green water. The manuscript is well organized, and the methods are robust. Overall, I would recommend a minor revision for this manuscript. The detailed comments are given below.*

*Major comments:*

*1. Methods: More details on the simulation process should be added, such as potential evapotranspiration calculation methods, the surface runoff process, etc.*

Response: We have added the details of the SWAT model. Lines 149-153 in the RM:

*The SCS curve number method was used for flow partitioning according to land use, soil type and antecedent soil moisture. The Penman-Monteith method was used to calculate potential evapotranspiration, which comprehensively considered various climatic factors such as solar radiation, air temperature, wind speed and relative humidity (Arnold et al., 1998; Neitsch et al., 2002).*

*2. Line 210: Although the blue and green water scarcity index have been defined here, how can we assess the degree of blue and green water scarcity in the basin according to these indices? A description of the blue and green water shortage classification should be added.*

Response: We have added the description of the blue and green water scarcity classification and thresholds. Lines 215-217 in the RM:

*Based on the blue water scarcity and green water scarcity, water scarcity of a region is categorized as: mild scarcity, moderate scarcity, severe scarcity and extreme scarcity, with thresholds set at 100%, 150% and 200%, respectively.*

*3. Results: The model was calibrated and verified by using the reconstructed natural streamflow, but only the method of streamflow reconstruction was introduced. Comparative analysis of observed and natural streamflow should be added.*

Response: We have added the comparative analysis of observed and natural streamflow. Lines 273-285 in the RM:

*3.1.1 Streamflow reconstructed*

*The difference between the monthly average observed streamflow and the monthly average natural streamflow is small (Figure 2). The monthly average measured streamflow and natural streamflow at the Heyuan station is 492.1 $m^3$ $s^{-1}$ and 507.9 $m^3$ $s^{-1}$, respectively, while the monthly average measured streamflow and natural streamflow at the Boluo station is 768.4 $m^3$ $s^{-1}$ and 796.7 $m^3$ $s^{-1}$, respectively. The difference between the measured streamflow and the natural streamflow mainly occurs in November, December, January, and February (where the measured streamflow is greater than the natural streamflow) and May, June, and July (where the measured streamflow is less than the natural streamflow) (Fig. 2a and Fig. 2c).*

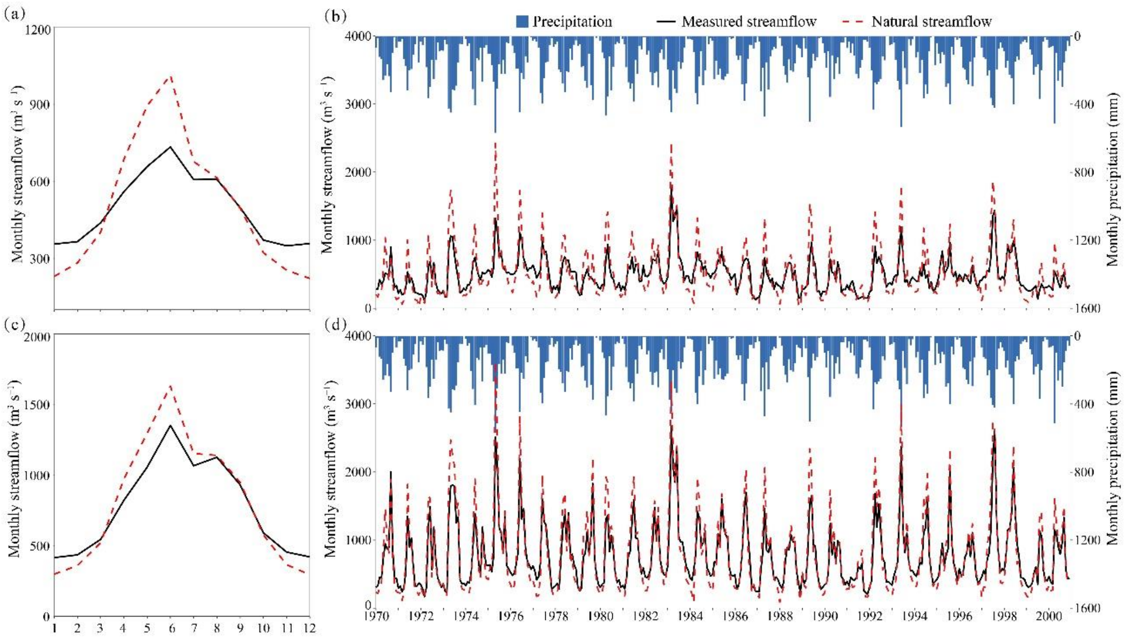

Figure 2. Observed streamflow and natural streamflow processes at the Heyuan and Boluo stations from 1970 to 2000. (a) Annual distribution of streamflow at the Heyuan station, (b) streamflow process at the Heyuan station, (c) annual distribution of streamflow at the Boluo station, (d) streamflow process at the Boluo station

*4. Lines 357-366: The Dongjiang River Basin is located in the subtropical monsoon climate zone, and the distribution of water and heat is uneven throughout the year. It might be better to add seasonal variations in blue and green water and its scarcity.*

Response: We have added the seasonal variations of blue and green water scarcity in the supplementary materials.

*1 Seasonality variation of blue and green water scarcity*

*The time of occurrence of blue and green water scarcity in the basin during the year is different, with the peak of blue water scarcity occurring from October to March, while green water scarcity mainly occurs from May to September (Figure S5). The climate of the Dongjiang River Basin belongs to the subtropical monsoon climate, and precipitation is mostly concentrated in the flood season (April to September), resulting in larger river streamflow from April to September and larger blue water resources available in the basin; The available blue water resource is low in the dry season (October to March), so moderate, severe, and extreme blue water scarcity occurs in the downstream sub-basins with a large population during the dry season. The population in the upstream sub-basins is smaller, so the risk of blue water scarcity is smaller. It is worth noting that this study only distributes the annual blue water demand evenly to each month and does not consider the intra-year change in blue water demand, which may cause certain errors in the results. Green water demand tends to be smaller from October to April, while vegetation growth is strong from May to September, and therefore evapotranspiration from the watershed is larger, based on the results in the previous section green water storage (soil moisture) fluctuates within the year much less than evapotranspiration (green water streamflow), resulting in moderate green water scarcity in May to September in the four sub-watersheds of the middle reaches of the watershed.*

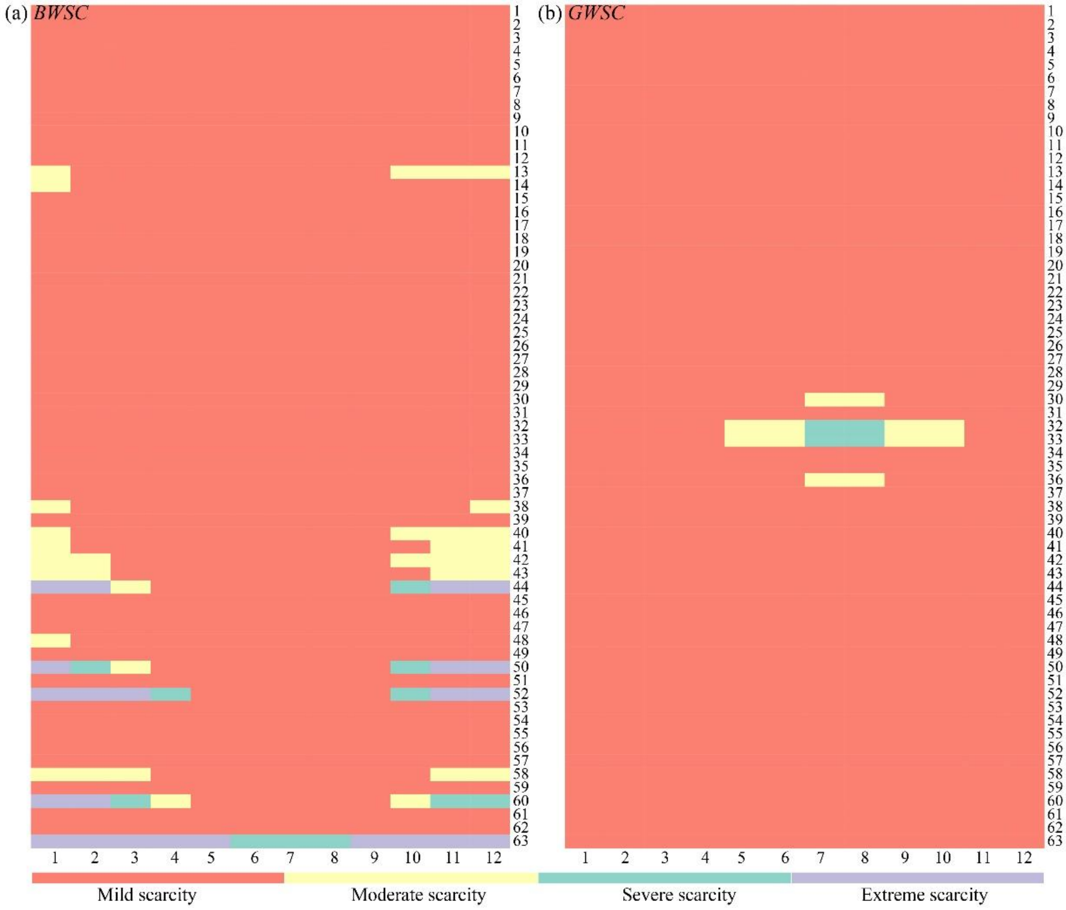


Figure S5 Intra-annual variation of blue and green water scarcity in each sub-basin of Dongjiang River basin.

*5. Lines 400-418: It is more interesting to compare the differences in blue and green water shortages across sub-basins.*

Response: We have added the blue and green water scarcity in each sub-basin. Lines 438-442 in the RM:

*Figure S4 shows the annual variation of blue water scarcity and green water scarcity in the basin. Except for some sub-basins, the blue and green water scarcity in most sub-basins is less than 50%. The degree of green water scarcity is higher than that of blue water scarcity in most of the sub-basins. Only the sub-basin 63 in downstream experienced a severe blue water scarcity.*

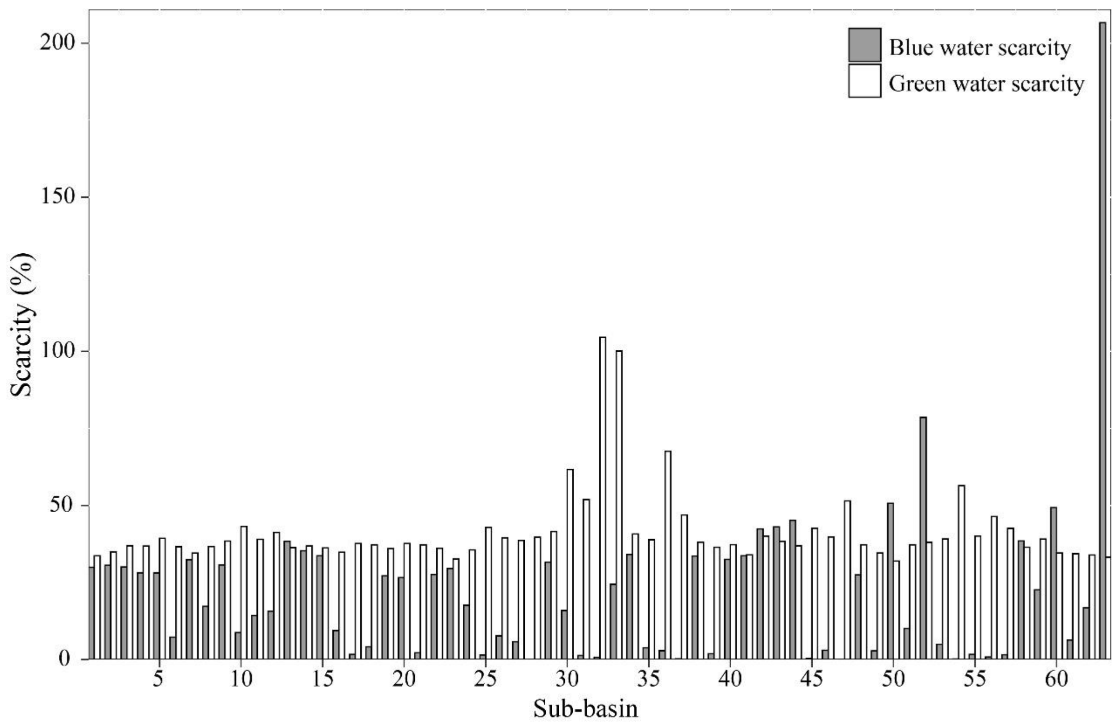


Figure S4 Annual average blue water scarcity and green water scarcity in each sub-basin of the Dongjiang River basin.

*6. Discussion: When quantifying the scarcity of blue water, a coefficient of 0.8 was used to represent the proportion of environmental flow in blue water resources. Should the coefficient be adjusted in different wet and dry basins? Whether the use of varying coefficient ratios will affect the results.*

Response: We have added the discussion of the effect of threshold for environmental flow on the results. Lines 561-569 in the RM:

*(3) Both the calculations of BWSC and the FLK index include environmental flows. This study represented the proportion of environmental flow in streamflow as 80%. Some studies have suggested that assuming environmental flow to be 80% of the total water resources in a basin may overestimate water scarcity (Liu et al., 2017; Richter et al., 2012). Therefore, we varied the proportion of environmental flow and assessed the degree of BWSC using 60% and 70% proportions. Results show that only the 63rd sub-basin changed from severe BWSC to moderate to severe BWSC, while other sub-basins remained with low BWSC. Therefore, the threshold for environmental flow has a minor impact on this paper.*

*Minor comments:*

*1. Line 16: change “have” to “has”.*

Corrected.

*2. Line 87: “India” should be “and India”.*

Corrected.

*3. Line 116: change “of” to “in”.*

Corrected.

*4. Line 210: Please check the period here.*

Corrected.

*5. Line 356 and 398: delete “during”.*

Corrected.

*6. Line 470: change “was” to “were”.*

Corrected.

*7. Line 551: “restriction is” should be “restrictions are”.*

Corrected.

## References


Arnold, J. G., Srinivasan, R., Muttiah, R. S., and Williams, J. R.: Large Area Hydrologic Modeling and Assessment Part I: Model Development1, JAWRA Journal of the American Water Resources Association, 34, 73–89, https://doi.org/10.1111/j.1752-1688.1998.tb05961.x, 1998.

Liu, J., Yang, H., Gosling, S. N., Kummu, M., Flörke, M., Pfister, S., Hanasaki, N., Wada, Y., Zhang, X., Zheng, C., Alcamo, J., and Oki, T.: Water scarcity assessments in the past, present, and future, Earth's Future, 5, 545–559, https://doi.org/10.1002/2016EF000518, 2017.

Neitsch, S., Arnold, J., Kiniry, J., Williams, J., and King, K.: Soil and water assessment tool (SWAT): theoretical documentation, version 2000, Texas Water Resources Institute, College Station, Texas, TWRI Report TR-191, 2002.

Richter, B. D., Davis, M. M., Apse, C., and Konrad, C.: A Presumptive Standard for Environmental Flow Protection, River Research and Applications, 28, 1312–1321, https://doi.org/10.1002/rra.1511, 2012.