We would like to express our thanks for your constructive and valuable comments and suggestions on our manuscript, which has significantly improved it. We have revised the manuscript thoroughly based on all the comments. The reviewer's comments are enumerated. Our replies to each comment start with "Response".

In the revised manuscript, we added Dr. Zilong Zhao as a co-author, who contributed substantially to the revision, particularly in interpreting the results and revising the manuscript structure. All authors have agreed to this addition, and we believe that Dr. Zilong Zhao's contribution warrants his inclusion as an author. We appreciate your understanding and hope that this addition does not cause any inconvenience.

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Reviewer #1: This paper analysed the Drought-Flood Abrupt Alternation (DFAA) in the Lancang-Mekong River Basin under three climate projection scenarios from five Global Climate Models (GCMs) of CMIP6. Authors found that future DFAA trend varies widely in upstream and downstream and reservoirs operations can reduce DFAA's intensity, limit multiple peaks and shorten the monthly span. The paper is structured, however, there are some concerns.

Response: We sincerely appreciate your positive comments and valuable insights on potential enhancements for our paper. Kindly find our detailed responses provided below.

1. **The introduction lacks sufficient discussion and comparison with recently published studies that examine the role of reservoir modules in hydrological modeling under climate projections.**

Response: Thank you for your constructive comment. We added a description of the reservoir module in hydrological modeling under climate change in lines 75 to 83 of the revised version. It reads as follows:

Research has shown that reservoirs play a crucial role in preventing extensive damages during the wet season and in minimizing low-flow occurrences in LMR Basin (Arias et al., 2014; Räsänen et al., 2012; Dang et al., 2024). The integration of a coupled reservoir module within the hydrological model is a widely adopted approach for evaluating reservoir impacts under changing climate. Wang et al. (2017b) utilized this approach to show that reservoir operation can minimize flood intensity and lower flood occurrence rates. Yun et al. (2021a; 2021b) demonstrated that, despite a trade-off in hydroelectric benefits, reservoir management can substantially alleviate extreme drought and wet hydrological events in LMR Basin. These studies collectively indicated that reservoirs represent a practical solution for addressing the impacts of climate change.

2. **Authors mentioned CMIP6 data collected from five GCMs, but only show the averaged meteorological data. Since each GCM may incorporate different assumptions and mechanisms for projecting climate variables, relying solely on the mean values could introduce bias or obscure important variability. If averaging is justified, please provide a clear rationale.**

Response: We sincerely appreciate your comment. Each GCM generally operates under distinct assumptions and mechanisms, leading to potential uncertainties when relying on a single GCM simulation. Our main objective in averaging five GCM outputs is to reduce the uncertainties associated with GCM projections. In the earlier submission, our explanation on this point was inadequate. We expanded this explanation within Section 2.6 in the revised manuscript. Furthermore, as you underscored, the variability among GCMs requires attention. We incorporated an examination of GCM result variations in the revised manuscript. The specific elaborations on this aspect are provided in lines 368 to 377 of the revised manuscript, which reads as below:

As each GCM possesses unique structure and assumptions, projections of climate change by a single GCM inherently possess uncertainties, which in turn introduce uncertainties in the simulation of hydrological outcomes (Kingston et al., 2011; Thompson et al., 2014). Thus, averaging across multiple GCMs is a crucial approach, as it minimizes model biases, eliminates outliers, reduces uncertainties, and ensures more robust and universally applicable outcomes (Lauri et al., 2012; Hoang et al., 2016; Hecht et al., 2019; Wang et al., 2024; Yun et al., 2021b). This method has been extensively employed in prior studies (Dong et al., 2022; Li et al., 2021; Wang et al., 2022; Yun et al., 2021a). Therefore, this research determines the average DFAA probability from five GCMs to lessen the uncertainty in their predictions and assesses the fluctuation in these probabilities across the models to demonstrate their variability.

Additionally, we revised Figs. 5 and 6, as well as the descriptions in Sections 3.3 and 3.4, to provide a more comprehensive depiction and elaboration of the variability in GCM results. The amended versions of Figs.5 and 6 are shown below for your review, and the corresponding updated content can be found in Sections 3.3 and 3.4 of the revised manuscript.

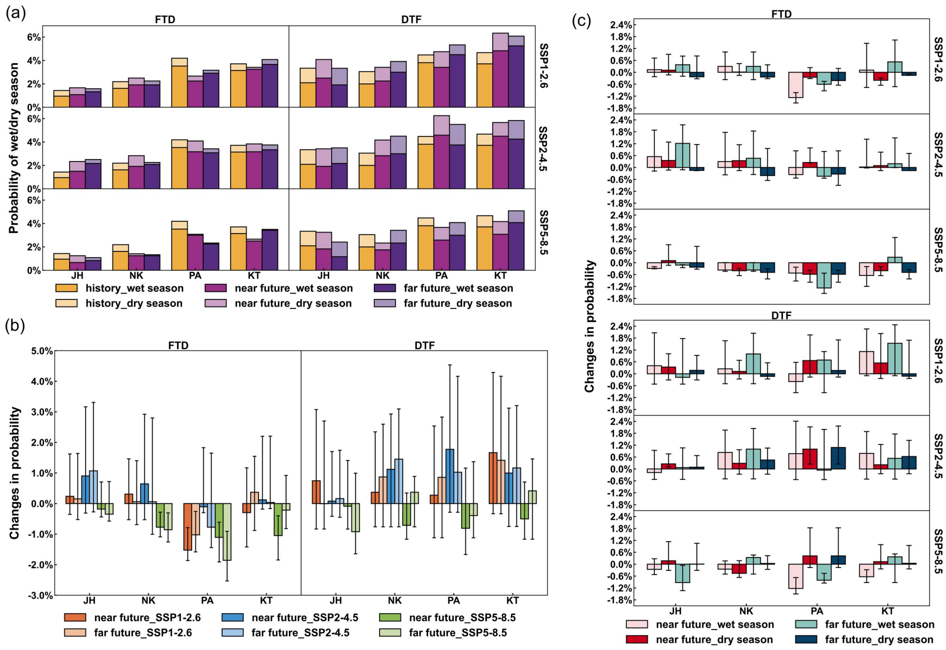

Figure 5: DFAA under natural scenario. Here, JH, NK, PA, and KT respectively denote JingHong, Nong Khai, Pakse, and Kratie stations. (a) Seasonal probability of DFAA averaged across five GCMs during history (1980-2014), near future (2021-2060) and far future (2061-2100) periods, as well as under three SSPs. The annual probability is half of the sum of wet and dry season probabilities. (b) The annual change in DFAA probability averaged across five GCMs and their ranges in the near and far future periods with respect to history period under three SSPs. (c) The seasonal change in DFAA probability averaged across five GCMs and their ranges in the near and far future periods with respect to history period during wet and dry seasons under three SSPs.

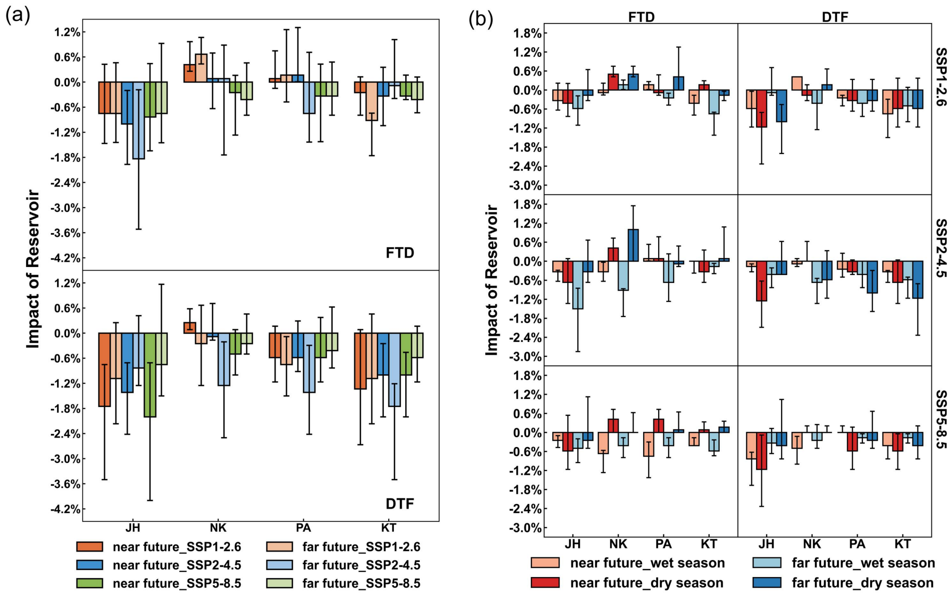

Figure 6: Reservoir impacts on DFAA during near future (2021-2060) and far future (2061-2100) under three SSPs. Here, JH, NK, PA, and KT denote JingHong, Nong Khai, Pakse, and Kratie stations, respectively. (a) The annual reservoir impacts averaged across five GCMs and their ranges. (b) The seasonal reservoir impacts in wet and dry seasons averaged across five GCMs and their ranges.

3. Please list the equations to calculate the Standardized Runoff Index (SRI).

Response: Thank you for your comment. We added the formula for SRI indicator in the Section 2.5 of the revised manuscript, i.e., Eqs. (32) to (37) in lines 326 to 339.

4. It is unclear that how the probability calculates in equation (22).

Response: We sincerely appreciate your comment. The impact of reservoirs on DFAA probability in a certain period is quantified by subtracting the DFAA probability in that period under the natural scenario from that under the dammed scenario. For instance, the impact of reservoir operation on DFAA during the near future can be assessed by finding the difference between the DFAA probability in the near future under the dammed scenario and that under the natural scenario.

Since this study focuses on DFAA events at the monthly scale, the probability of DFAA events during a specific period is determined by the ratio of months with DFAA events ($|R - SDFAI| > 1$) to the total number of months in that period. More precisely, the proportion of months with DTF events ($R - SDFAI > 1$) to the total number of months represents the probability of DTF events, whereas the proportion of months with FTD events ($R - SDFAI < -1$) to the total number of months indicates the probability of FTD events.

We adjusted this calculation formula in the revised version and added detailed descriptions to enhance their clarity and precision. Please refer to Eqs. (38) to (40) in the revised manuscript.

5. **While the results show changes in indicator probabilities across different scenarios and time scales, the influence of reservoir operations on DFAA remains unclear. Are the operations temporally and spatially variable? Further clarification is necessary to understand the extent and mechanism of reservoir operations.**

Response: Thanks for your comment. The reservoir operation rule utilized in this paper remains consistent over time and space. The Standard Operation Policy hedging model is consistently applied to all reservoirs in LMR Basin. The spatial distribution of reservoirs and their capacities is shown in Figs. 1a and 1c. Reservoirs mainly function as storage pools to mitigate DFAA events by controlling water storage and release. This function differently affects DTF and FTD events. During DTF events, reservoirs can release water during the drought phase and utilize low water levels to accommodate floodwaters later. However, managing FTD events presents challenges for reservoirs, as they must balance flood mitigation in the early phase against drought mitigation in the later phase. Therefore, we also further note in Section 4.2 that incorporating hydrological forecasts will improve the reservoir's ability to mitigate DFAA events.

In the revised manuscript, we added a flowchart for the reservoir operation module, i.e., Fig. 2 and improved the overview of the reservoir module. Please refer to lines 249 to 262 in the revised version, and it reads as follows.

This study extends the THREW model through the development of a reservoir management module that can be incorporated into it. This module contains detailed data on 122 reservoirs in the basin, with operational years ranging from 1965 to 2035. Configuring the module's activation enables the integrated THREW model to simulate natural runoff without considering reservoirs, and dammed runoff with reservoirs considered.

The reservoir operation rules are consistent over time and space, with each reservoir following the same operation rules and starting scheduling according to its respective operational year. The reservoir module conducts daily-scale reservoir operation based on sub-basins. Each reservoir is allocated to the corresponding sub-basin according to its location information. The cumulative reservoir storage over multiple years for each sub-basin is calculated and serves as an input condition for the reservoir module. The module consists of two phases: the initial phase and the normal phase. The constraints of the normal phase are further divided into general and emergency cases. Both cases share the same reservoir operation rules, but their constraints differ, with the emergency case featuring more flexible constraints. The reservoir module's flowchart is depicted in Fig. 2.

6. **Are the reservoirs operations the dominant factor of DFAA events in the Lancang-Mekong River Basin? Please comment it.**

Response: We appreciate your comment. According to our research findings, reservoir operation is not the dominant factor influencing DFAA events in the LMR Basin. In the natural scenario without reservoirs, DFAA will experience notable changes due to climate change, including increased annual DFAA risks under SSP1-2.6 and SSP2-4.5 scenarios, more significant increases in upstream FTD risks, and more pronounced increases in downstream DTF risks, as discussed in Section 3.3. These changes are entirely unaffected by reservoir operations. Furthermore, reservoirs significantly mitigate DFAA events, particularly by effectively reducing annual DTF risks, wet season's FTD risks, lowering the monthly probability peaks of DFAA, and decreasing the number of peak events, as described in Section 3.4. Our analysis indicates that while reservoir operations can effectively reduce the probability of DFAA events under climate change, they are not the primary factor responsible for the increase in DFAA events.

Reviewer #2: This study evaluated the impacts of climate change and reservoir operations on Drought-Flood Abrupt Alternation (DFAA) using five Global Climate Models (GCMs) from the Coupled Model Intercomparison Project Phase 6 (CMIP6) in the Lancang-Mekong River Basin. The authors have contributed to the understanding of future DFAA. But there are still some issues that need to be clarified.

Response: Thank you for your positive feedback and comments to further improve the paper. Please see our detailed responses below.

1. **Line 18: It is recommended to describe the results using the conditions of the emission scenario rather than the version of the scenario.**

Response: We appreciate your comment. In the revised version, we will replace SSP126, SSP245, and SSP585 with low-, medium-, and high-emission scenarios in the abstract section. Furthermore, we will update all references to SSP126, SSP245, and SSP585 with replacements in the revised manuscript using the terms SSP1-2.6, SSP2-4.5, and SSP5-8.5, including those in Figs. 5 to 7.

2. **Line 36: Please supplement which secondary disasters.**

Response: Thanks for your comment. The secondary hazards mentioned primarily include flash floods, landslides, and mudslides. We incorporated this information in lines 35 to 37 of the revised version.

3. **Line 63: How did previous hydrological models simulate DFAA? How has the reservoir module progressed in hydrological models?**

Response: We sincerely appreciate your comment. Existing studies primarily utilize specific indices, such as LDFAI (Long-cycle Drought-Flood Abrupt Alternation Index) and SDFAI (Short-cycle Drought-Flood Abrupt Alternation Index), to quantify DFAA events. These indices leverage precipitation and runoff data to characterize meteorological and hydrological DFAA events. In the revised manuscript, we added a description of the DFAA quantification methods in the introduction section, see lines 38 to 48, which reads as below.

Employing indices to characterize DFAA events is a common quantitative method. Since Wu et al. (2006) proposed the precipitation-based long-cycle drought-flood abrupt alternation index (LDFAI) to quantitatively characterize the long-term DFAA of wet season, LDFAI has been widely adopted (Ren et al., 2023; Shi et al., 2021; Yang et al., 2022; Yang et al., 2019). Zhang et al. (2012) proposed the one-month interval short-cycle drought-flood abrupt alternation index (SDFAI) based on LDFAI to characterize the short-term DFAA of wet season, and expanded the application from precipitation to runoff. SDFAI has been extensively applied in various fields such as hydrology, meteorology, ecology, and agriculture (Zhao et al., 2022; Lei et al., 2022; Yang et al., 2019; Zhang et al., 2019). Song et al. (2023) further refined the

SDFAI index and developed the Revised Short-cycle Drought-Flood Abrupt Alteration Index (R-SDFAI), which is calculated based on the Standardized Runoff Index (SRI) and designed to characterize short-term DFAA.

Additionally, we recognize the scarcity of existing research on DFAA events in the LMR Basin. To address this, we incorporated a discussion on DFAA events in other basins within the introduction section. Please refer to the lines 49 to 56 in the revised manuscript.

It has been observed that the intensity and frequency of DFAA events demonstrate a global increasing trend (Yang et al., 2022; Chen et al., 2024). However, regional differences are notable. Shan et al. (2018) observed that the scope of DFAA events in the Yangtze River mid-lower reaches has expanded since the 1960s, with both frequency and intensity increasing annually. Zhang et al. (2012) found that while droughts and floods in the Huai River Basin have increased, DFAA events have become less frequent. For future projections, Zhao et al. (2022) indicated that DFAA events in the Han River Basin will experience an upward trend in both frequency and intensity. Yang et al. (2019) reported that in the Hetao region, the number and frequency of DFAA events will diminish.

Moreover, we provided an enhanced review of the reservoir module within hydrological models in the lines 75 to 83 of the revised manuscript.

Research has shown that reservoirs play a crucial role in preventing extensive damages during the wet season and in minimizing low-flow occurrences in LMR Basin (Arias et al., 2014; Räsänen et al., 2012; Dang et al., 2024). The integration of a coupled reservoir module within the hydrological model is a widely adopted approach for evaluating reservoir impacts under changing climate. Wang et al. (2017b) utilized this approach to show that reservoir operation can minimize flood intensity and lower flood occurrence rates. Yun et al. (2021a; 2021b) demonstrated that, despite a trade-off in hydroelectric benefits, reservoir management can substantially alleviate extreme drought and wet hydrological events in LMR Basin. These studies collectively indicated that reservoirs represent a practical solution for addressing the impacts of climate change.

4. Line 78: Where is the population data obtained?

Response: We appreciate your query. The population data cited is sourced from Sabo et al., 2017, and Luo et al., 2023. We added these two references to the line 98 of the revised manuscript.

References:

Sabo, J. L., Puhi, A., Holtgrieve, G. W., Elliott, V., Arias, M. E., Ngor, B. P., Räsänen, T. A., Nam, S.: Designing river flows to improve food security futures in the lower Mekong Basin. Science 358 (6368). https://doi.org/10.1126/science.aao1053, 2017.

Luo, X., Luo, X., Ji, X., Ming, W., Wang, L., Xiao, X., Xu, J., Liu, Y., Li, Y.: Meteorological and hydrological droughts in the Lancang-Mekong River Basin: spatiotemporal patterns and propagation. Atmospheric Research 293, 106913. https://doi.org/10.1016/j.atmosres.2023.106913, 2023.

5. Line 100: Are there any other GCMs? Are only these five available, or do these five have better effects?

Response: We appreciate your comment. We selected the five GCMs that are widely applied and demonstrate robust performance in the LMR Basin. Their reliability has been confirmed by studies such as Li et al. 2021, Yun et al. 2021a, and Yun et al. 2021b. We added an explanation in lines 125 to 127 of the modified version, as detailed below.

Five GCMs (Global Climate Models) with wide utilization and proven performance in LMR Basin are applied in this study (Li et al. 2021; Yun et al., 2021a; Yun et al., 2021b), i.e., GFDL-ESM4, IPSL-CM6A-LR, MPI-ESM1-2-HR, MRI-ESM2-0, and UKESM1-0-LL.

References:

Li, Y., Lu, H., Yang, K., Wang, W., Tang, Q., Khem, S., Yang, F., Huang, Y.: Meteorological and hydrological droughts in Mekong River Basin and surrounding areas under climate change. J. Hydrol.: Reg. Stud. 36, 100873. https://doi.org/10.1016/j.ejrh.2021.100873, 2021.

Yun, X., Tang, Q., Li, J., Lu, H., Zhang, L., Chen, D: Can reservoir regulation mitigate future climate change induced hydrological extremes in the Lancang-Mekong River Basin? Sci. Total Environ. 785. https://doi.org/10.1016/j.scitotenv.2021.147322, 2021a.

Yun, X., Tang, Q., Sun, S., & Wang, J.: Reducing climate change induced flood at the cost of hydropower in the Lancang-Mekong River Basin. Geophysical Research Letters, 48, e2021GL094243. https://doi.org/10.1029/2021GL094243, 2021b.

6. Section 2.2: There need usage instructions for the data. For instance, if the precipitation and temperature of ERA5 are used to correct GCMs, then what is the potential evapotranspiration used for?

Response: Thank you for your comment. The evapotranspiration data of ERA5_Land dataset are utilized to derive the evapotranspiration data in the future period. The method proposed by Van Pelt et al. (2009) is implemented for this purpose. The calculation formula of the method has been included in Eq. (3) of the revised version.

Reference:

Van Pelt, S. C., Kabat, P., ter Maat, H. W., van den Hurk, B. J. J. M., and Weerts, A. H.: Discharge simulations performed with a hydrological model using bias

corrected regional climate model input, Hydrol. Earth Syst. Sci., 13, 2387–2397, https://doi.org/10.5194/hess-13-2387-2009, 2009.

7. **Section 2.3: As the core method of this section, the main formulas of MBG should be listed.**

Response: We appreciate your suggestion. We incorporated the two most critical formulas of the MBCn (Multivariate Bias Correction via N-dimensional Probability Density Function Transform) method in the revised manuscript: random orthogonal rotation and quantile delta mapping, as shown in Eqs. (1) and (2) on lines 164 to 185 of the revised manuscript.

8. **Section 2.4: Why are Formula 3 and Formula 8 repeated? Can so many simple formulas be explained in the main text? The principle of reservoir allocation is suggested to be shown in a schematic diagram because these formulas are both numerous and simple.**

Response: Thanks for your comment. In the revised manuscript we removed Eq. (8) of the previous manuscript and retained Eq. (3) of the previous manuscript, i.e., Eq. (9) in the revised manuscript. Additionally, we incorporated a flowchart illustrating reservoir scheduling, designated as Fig. 2, as shown below.

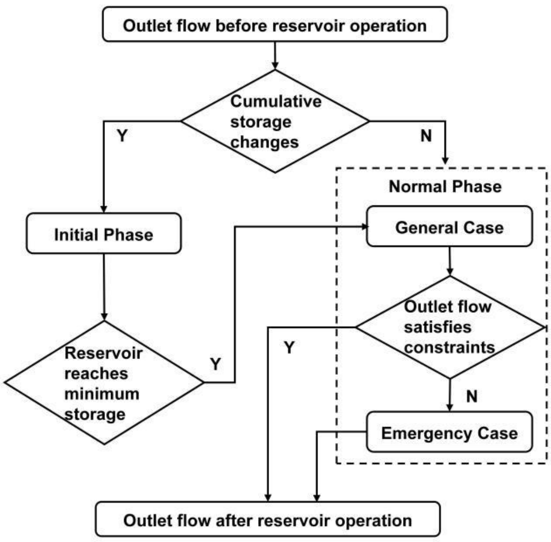

Figure 2: Flowchart of the constructed reservoir module.

9. **Line 145: For the complex physical mechanisms in the model, there are no formulas at all? What are the equilibrium equations, geometrical relationships, and constitutive relationships in the model? The Nash efficiency coefficient is relatively less necessary to present.**

Response: We appreciate your suggestion. In the revised manuscript, we enhanced the description of the THREW model and incorporated the fundamental mass balance, momentum balance, and heat balance equations underlying the THREW model, which are presented as Eqs. (4) to (6) in the revised version. Please refer to Section 2.4 of the revised version. Additionally, to ensure the completeness of the formula presentation, we preserved the description of the NSE formula.

10. **Section 2.4: The GCM model is spatially distributed grid data, and the reservoir here is a lumped water distribution. How can a simple lumped water distribution be regulated regionally?**

Response: Thanks for your comment. The THREW model performs spatial basin delineation based on Representative Elementary Watershed (REW). Within the LMR Basin, the THREW model delineates 651 REWs units and conducts runoff simulations based on these REW. The reservoir module also employs REW format for reservoir operation. For GCM data, to meet the needs of hydrological simulation in the THREW model, we downscale the GCM data from grid scale to REW scale and utilize the downscale GCM data as meteorological input for the model. We added a description of GCM downscaling in lines 345 to 347 of Section 2.6, in the revised version. It reads as follows.

The meteorological data from five selected GCMs under three SSPs are downscaled from grid scale to REW scale and served as meteorological inputs for the THREW model.

11. **Line 215: I thought that the five GCMs used for simulation could mutually test the reliability, but here the average value was directly used without analyzing the sensitivity of the five models. GCMs' errors are not complementary. Some may be more accurate, while others have larger errors. A simple average value is of no help to the research.**

Response: We appreciate your comment. Our rationale for averaging the outputs of five GCMs is to reduce the uncertainty stemming from individual GCM simulations. We apologize that our explanation of this approach was incomplete in the initial manuscript. In the revised manuscript, we provided more detailed explanation of this aspect in Section 2.6. Furthermore, we concur with your point that relying solely on the average value is inadequate. To address this, we incorporated an analysis of the range of GCM outputs, emphasizing the variability among different GCM in the revised version. For further details, please refer to lines 368 to 377 in the revised manuscript, which reads as follows.

As each GCM possesses unique structure and assumptions, projections of climate change by a single GCM inherently possess uncertainties, which in turn introduce uncertainties in the simulation of hydrological outcomes (Kingston et al., 2011; Thompson et al., 2014). Thus, averaging across multiple GCMs is a crucial approach, as it minimizes model biases, eliminates outliers, reduces uncertainties, and ensures more robust and universally applicable outcomes (Lauri et al., 2012; Hoang et al., 2016; Hecht et al., 2019; Wang et al., 2024; Yun et al., 2021b). This method has been extensively employed in prior studies (Dong et al., 2022; Li et al., 2021; Wang et al., 2022; Yun et al., 2021a). Therefore, this research determines the average DFAA probability from five GCMs to lessen the uncertainty in their predictions and assesses the fluctuation in these probabilities across the models to demonstrate their variability.

Moreover, we revised Figs. 5 and 6, as well as the descriptions in Sections 3.3 and 3.4, to better depict the variability in GCM outputs. The updated figures are listed below and corresponding text are included in the revised manuscript for your reference.

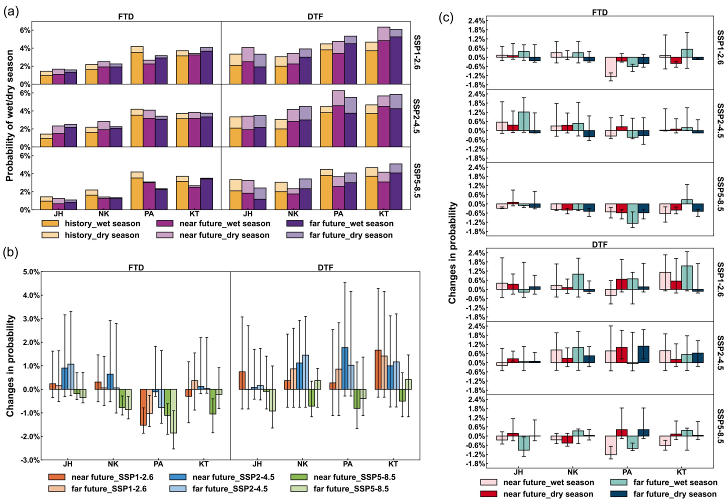

Figure 5: DFAA under natural scenario. Here, JH, NK, PA, and KT respectively denote JingHong, Nong Khai, Pakse, and Kratie stations. (a) Seasonal probability of DFAA averaged across five GCMs during history (1980-2014), near future (2021-2060) and far future (2061-2100) periods, as well as under three SSPs. The annual probability is half of the sum of wet and dry season probabilities. (b) The annual change in DFAA probability averaged across five GCMs and their ranges in the near and far future periods with respect to history period under three SSPs. (c) The seasonal change in DFAA probability averaged across five GCMs and their ranges in the near and far future periods with respect to history period during wet and dry seasons under three SSPs.

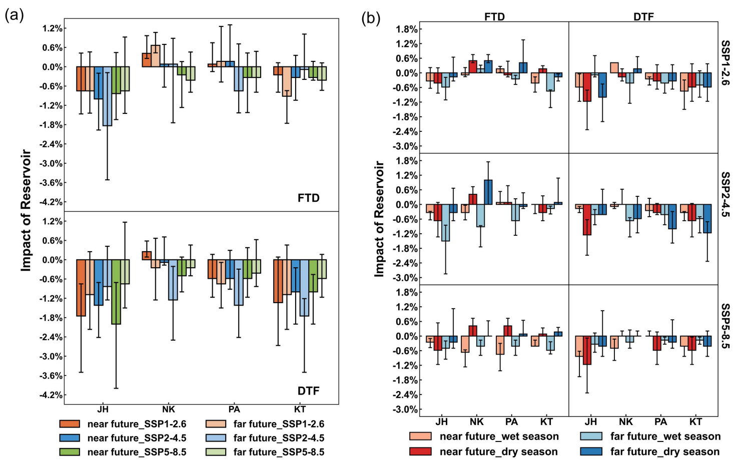

Figure 6: Reservoir impacts on DFAA during near future (2021-2060) and far future (2061-2100) under three SSPs. Here, JH, NK, PA, and KT denote JingHong, Nong Khai, Pakse, and Kratie stations,

respectively. (a) The annual reservoir impacts averaged across five GCMs and their ranges. (b) The seasonal reservoir impacts in wet and dry seasons averaged across five GCMs and their ranges.

12. **Line 214: According to the abstract, "Reservoir operations reduce DFAA's intensity." It should be getting the intensity of the DFAA, why there is a probability, and how to quantify intensity.**

Response: Thanks for your comment. In this work, we assess the risk of DFAA events by calculating their probability, but do not consider their intensity. We sincerely apologize for the inaccuracy terminology used in the abstract section. We have corrected it in the revised manuscript and would like to share our sincere appreciation for your correction.

13. **Please pay attention to the garbled characters that appear in lines 156, 242, and 243.**

Response: Thank you for your reminder. We have fixed this issue in the revised manuscript.

14. **When many formulas are piled up and there are no corresponding textual descriptions, it is very difficult to know what the logic between them is. Here, it is necessary to select the most important ones from these formulas for listing and then describe the logic of the formulas. Furthermore, what's these methods' regional applicability? What are their advantages and limitations?**

Response: Thank you for your suggestion. We adjusted the displayed equations in the revised manuscript, added logical relationships between formulas, and focused on their explanation and illustration.

15. **Section 3.1: Since the study originally used ERA5 for correction, it doesn't mean that being closer to ERA5 is accurate. ERA5 also has errors. It can only be said that after correction, the GCM is closer to ERA5, and this cannot be used as an accurate basis here. Even this subsection can be transformed into a description of the spatiotemporal distribution of climate data.**

Response: We appreciate your suggestion. In the revised manuscript, we modified the presentation in lines 380 to 385 of Section 3.1, and emphasized that the accuracy of CMIP6 data is grounded in a comparison with the ERA5_Land data. The revisions in section 3.1 are listed below.

From both regional and seasonal perspectives, the uncorrected raw CMIP6 data exhibits significant discrepancies with ERA5_Land data during history period (1980-2014). When compared with ERA5_Land data for history period, the uncorrected raw CMIP6 data reveals an average annual precipitation bias of 1800 mm and an average daily temperature of 12 (Figs. 3b and 3e). These notable inconsistencies underscore that hydrological modeling using uncorrected raw CMIP6 data would incur considerable inaccuracies.

Moreover, we would like to note that correcting future meteorological data by reanalysis datasets or remote sensing datasets is a common practice. In the existing studies, for example, Hoang et al. (2016) utilized WATCH forcing data and APHRODITE datasets to correct the precipitation and temperature of GCM data. Ly et al. (2023) applied Global Precipitation Climatology Centre (GPCC) to correct the precipitation in the GCM data. Wang et al. (2021) employed precipitation data from the Climate Prediction Center (CPC) to correct the GCM data. Yun et al. (2021a) and (2021b) used the Global Meteorological Forcing (GMFD) dataset to correct ISMIP3b data. Therefore, we think it is reasonable to apply the ERA5 data to correct the bias of each GCM in the CMIP6 data.

References:

Hoang, L. P., Lauri, H., Kummu, M., Koponen, J., van Vliet, M. T. H., Supit, I., Leemans, R., Kabat, P., and Ludwig, F.: Mekong River flow and hydrological extremes under climate change, Hydrol. Earth Syst. Sci., 20, 3027–3041, https://doi.org/10.5194/hess-20-3027-2016, 2016.

Ly, S., Sayama, T. & Try, S.: Integrated impact assessment of climate change and hydropower operation on streamflow and inundation in the lower Mekong Basin. Prog Earth Planet Sci 10, 55. https://doi.org/10.1186/s40645-023-00586-8, 2023.

Wang, S., Zhang, L., She, D., Wang, G., Zhang, Q.: Future projections of flooding characteristics in the Lancang-Mekong River Basin under climate change. J. Hydrol. 602. https://doi.org/10.1016/j.jhydrol.2021.126778, 2021.

Yun, X., Tang, Q., Li, J., Lu, H., Zhang, L., Chen, D: Can reservoir regulation mitigate future climate change induced hydrological extremes in the Lancang-Mekong River Basin? Sci. Total Environ. 785. https://doi.org/10.1016/j.scitotenv.2021.147322, 2021a.

Yun, X., Tang, Q., Sun, S., & Wang, J.: Reducing climate change induced flood at the cost of hydropower in the Lancang-Mekong River Basin. Geophysical Research Letters, 48, e2021GL094243. https://doi.org/10.1029/2021GL094243, 2021b.

16. Section 3.2: The absence of reservoirs before 2009 and the existence of reservoirs after 2010 should be very important background. When the coupled reservoir module is used for DFAA simulation, it should be simulated in segments. For those after 2010, additional reservoirs should be added. What will the situation of reservoirs be like in future scenarios? This needs to be explained in the summary and subsequent sections of the DFAA results.

Response: Thanks for your comment. We would like to point out that the statement regarding "the absence of reservoirs before 2009 and the existence of reservoirs after

2010" is a general concept. However, in reality, reservoir construction and operation commenced prior to 2009 (Zhang et al., 2023). The earliest reservoirs in the reservoir data we utilize were constructed in 1965 and the latest in 2035. We considered the annual change of the reservoir storage in the reservoir module. For each new reservoir, its operation is initially conducted based on the operation rules during the initial phase. Once its storage reaches the minimum constraint, the new reservoir enters the normal phase and follows the rules of normal phase. The reservoir operation in future periods will also follow these patterns. We added the description in Section 2.4 of the revised manuscript that each reservoir starts scheduling based on their operational year in the reservoir module, as detailed below.

This module contains detailed data on 122 reservoirs in the basin, with operational years ranging from 1965 to 2035. ...... The reservoir operation rules are consistent over time and space, with each reservoir following the same operation rules and starting scheduling according to its respective operational year.

Reference:

Zhang, K., Morovati, K., Tian, F., Yu, L., Liu, B., Olivares, M.A.: Regional contributions of climate change and human activities to altered flow of the Lancang-Mekong river. J. Hydrol.: Reg. Stud. 50, 101535. https://doi.org/10.1016/j.ejrh.2023.101535, 2023.

17. Section 3.3: Shouldn't this probability be compared with the occurrence of a single disaster before? The probability can be calculated based on the time within a year.

Response: Thanks for your comment. Currently, there is a paucity of detailed statistics on individual flood and drought events in the LMR Basin, which presents challenges in determining the probability of DFAA events by the single disaster.

Moreover, we adopt $|\mathrm{R-SDFAI}| > 1$ as the criterion for the occurrence of DFAA events, which means that DFAA events we identify are at least rapid transitions between mild hydrological drought events (standard runoff index (SRI) < -1) and a mild hydrological wet events (standard runoff index (SRI) > 1) (Song et al., 2023). We enhanced this part in lines 340 to 342 of the revised manuscript, as detailed below.

The threshold for R-SDFAI to recognize DFAA events is ± 1, which indicates that the identified DFAA event is at least an abrupt transition between a mild hydrological drought event (SRI < -1) and a mild hydrological wet event (SRI > 1) (Song et al., 2023).

Reference:

Song, X., Lei, X., Ma, R., Hou, J., Liu, W.: Spatiotemporal variation and multivariate controls of short-cycle drought–flood abrupt alteration: A case in the Qinling-Daba Mountains of China. International Journal of Climatology, 43(10), 4756–4769, https://doi.org/10.1002/joc.8115, 2023.

18. **Section 3.4: How will the future reservoir operation information be obtained?**

Response: We appreciate your comment. The reservoir dataset we collected includes future planned reservoirs, the latest of which will operate from 2035. It is noted that the reservoir storage is scheduled to increase significantly in the future period and the capacity of tributary reservoirs during this period is sizable, especially in downstream reservoirs, as shown in Fig. 1c.

19. **The discussion section should use more literature to support the causes and reliability of the results. Here, for example, in the first part of the discussion, except for the first sentence, which is cited, the rest is all about explaining the results.**

Response: Thank you for your suggestion. We provided additional discussions on different characteristics of DTF and FTD, and incorporated existing relevant studies in lines of 534 to 539 of the revised manuscript. We hope this addition could further substantiate our arguments, and it reads as follows.

The distinct characteristics of DTF and FTD events have been identified by previous research. Shi et al. (2021) found that FTD events are predominant in the Wei River Basin. Wang et al. (2023) projected that in the Poyang Lake Basin, the temporal spread of DTF events will expand in future, while that of FTD events will constrict. Ren et al. (2023) found that under SSP1-2.6 and SSP2-4.5 scenarios, the Huang-Huai-Hai River Basin will experience more DTF events, but under SSP3-7.0 and SSP5-8.5 scenarios, it will experience more FTD events.

20. **The second part of the discussion talked about the reservoir's ability to respond to DFAA. Here, in addition to considering the changes in the water volume of the reservoir, it is also necessary to consider how long the reservoir operation occurred before or after the disaster. The occurrence time of reservoir operation will have a timely impact on the specific disaster.**

Response: Thanks for your comment. In Section 4.2, our primary focus is on the role of hydrological forecasting in enhancing the reservoir's ability to manage DFAA events. The differing control reservoirs exhibit over DTF and FTD risks is primarily due to the reservoir's limited ability to fully regulate when encountering unforeseen inflows, as described in Section 4.1. Hence, we suggest combining hydrological forecasting to strengthen the reservoir's mitigation functions in Section 4.2.

Within the reservoir module, the occurrence time of reservoir operation remains unchanged. After its construction, the reservoir is subject to daily scheduling based on the incoming river flow. Nonetheless, when hydrological forecasts are factored in, the scheduling approach of the reservoir is altered according to the forecast information. We added a more detailed discussion on this aspect in the revised version at lines 566 to 574, as detailed below.

Hydrological forecasts provide insights into runoff and disaster situations, enabling the adaptation of reservoirs' current and future operational procedures. This adjustment can maximize reservoirs' water management efficiency, effectively counteracting flood-induced drought (FTD) and drought-induced flood (DTF). For instance, when a flood is occurring and hydrological forecasts predict an impending drought, reservoirs' operational methods should be modified to both reserve adequate storage capacity for the next flood event and maximize water retention to counteract the subsequent drought. Likewise, if hydrological forecasts indicate that a flood will strike after the current drought, reservoir management will transition from maximizing water storage to ensuring water availability during the drought while also setting aside adequate storage capacity for the upcoming flood event.

21. **The discussion in the third part also rarely cites literature, and the utilization of the resilient storage should not be the focus of the discussion in this article. The focus is on the influence of the reservoir in the process of disaster simulation.**

Response: We appreciate your comment. We have supplemented the literature references in Section 4.3, which reads as follows.

...... This finding emphasizes a strong connection between reservoir storage and its mitigation potential on DFAA. It aligns with Ehsani et al. (2017), who suggested that expanding dam dimensions can offset the vulnerability of water resources to climate uncertainties, and Feng et al. (2024), whose study highlighted the effectiveness of large reservoirs in mitigating drought and flood risks. ...... The existing research has pointed out that the mitigating effect of reservoirs on extreme hydrological events is independent of their main purpose. Even when their main purpose isn't directly tied to mitigating such events, they can still offer significant benefits (Brunner, 2021a; Ho et al., 2025). ......

Additionally, given the identified alignment between reservoir mitigation effects and storage capacity distribution, what we would like to emphasize in Section 4.3 is that irrigation reservoirs, alongside hydroelectric reservoirs, play a crucial role in diminishing the likelihood of DFAA events and mitigating flood and drought pressures in the LMR Basin. Notably, the total storage of these irrigation reservoirs is considerable. This insight is vital for policymakers and stakeholders, as it contributes to the development of the coordinated system for hydroelectric and irrigation reservoirs across the entire basin and promotes joint flood and drought mitigation initiatives.

22. **In addition, the bar charts and line charts from Figure 4 to Figure 6 are all numbers that can be presented in a table, and the richness of the accompanying figures should be increased.**

Response: Thanks for your comment. We updated these two figures (Figs. 5 and 6 in the revised version) in the revised manuscript. These revised figures present the average values of five GCMs alongside the ranges of their calculation results. Moreover, we provided additional details about the variability among GCMs in Sections 3.3 and 3.4 of the revised manuscript. The updated figures are as follows.

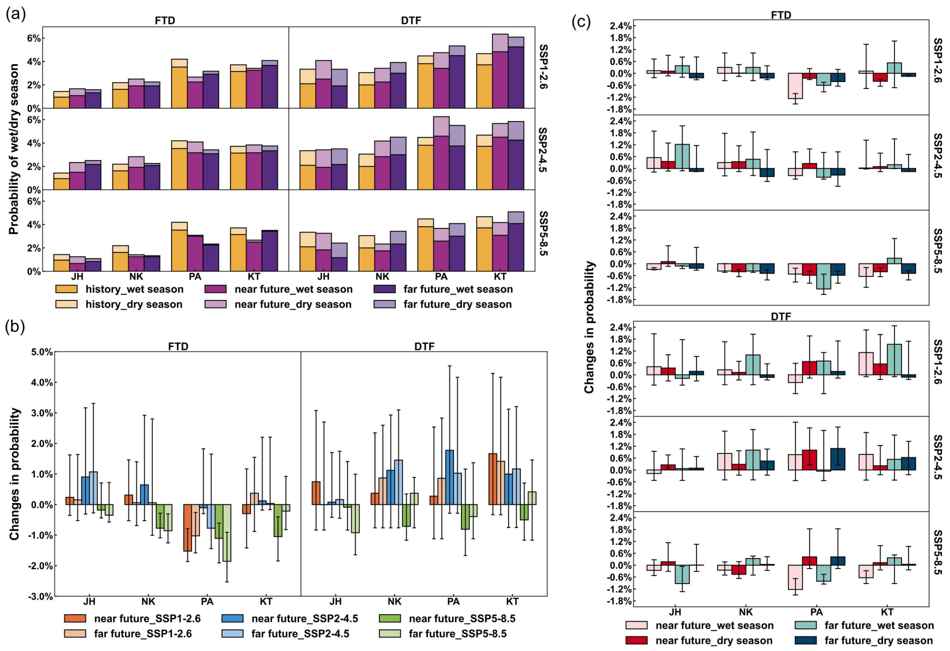

Figure 5: DFAA under natural scenario. Here, JH, NK, PA, and KT respectively denote JingHong, Nong Khai, Pakse, and Kratie stations. (a) Seasonal probability of DFAA averaged across five GCMs during history (1980-2014), near future (2021-2060) and far future (2061-2100) periods, as well as under three SSPs. The annual probability is half of the sum of wet and dry season probabilities. (b) The annual change in DFAA probability averaged across five GCMs and their ranges in the near and far future periods with respect to history period under three SSPs. (c) The seasonal change in DFAA probability averaged across five GCMs and their ranges in the near and far future periods with respect to history period during wet and dry seasons under three SSPs.

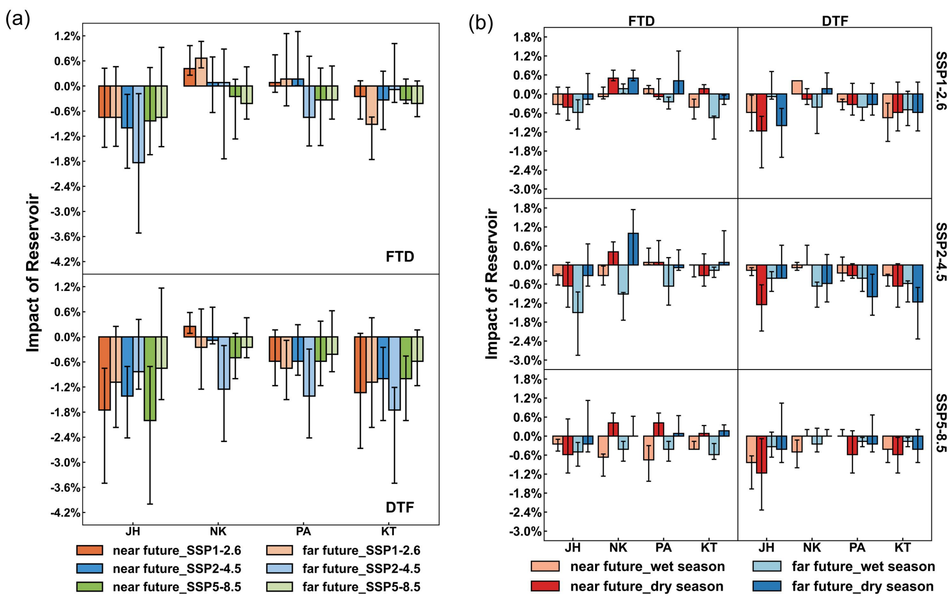

Figure 6: Reservoir impacts on DFAA during near future (2021-2060) and far future (2061-2100) under three SSPs. Here, JH, NK, PA, and KT denote JingHong, Nong Khai, Pakse, and Kratie stations, respectively. (a) The annual reservoir impacts averaged across five GCMs and their ranges. (b) The seasonal reservoir impacts in wet and dry seasons averaged across five GCMs and their ranges.