This manuscript presents an advancement in ecohydrological modeling by improving a coupled carbon-water model to explicitly incorporate CO_2-physiological feedback through water use efficiency. The authors attribute changes in water yield across China to climate, vegetation, and CO_2 drivers, and project a dominant role of CO_2 under the SSP585 scenario. The study is methodologically sound and addresses a pressing need for better attribution frameworks in hydrological-climate-ecological modeling. However, several conceptual, methodological, and presentation issues must be addressed before the manuscript is suitable for publication.

General Comments

1. Many studies have previously explored the attribution of water yield changes to climate and vegetation drivers. The manuscript should include a concise sentence in the introduction to clearly state how this study *specifically* advances beyond existing work. What is the new insight or capability that prior models or attribution methods could not achieve?

2. The authors should explicitly explain why combining the WUE-related CO_2 pathway is necessary in this study. What are the limitations of models that ignore this feedback? Has similar work been done that includes WUE, and if so, how does this model differ? A literature review paragraph in the introduction or methodology section would help justify the novelty and necessity of this approach.

3. The abstract currently reads as a list of findings without a logical flow. It should be restructured to highlight the motivation and gap, the modeling approach (including WUE), the key results (not all numerical), and the main conclusion. The current version is too lengthy and overly descriptive.

4. The manuscript language focuses heavily on reporting numerical results (e.g., spatial patterns, percentages). However, more effort is needed to interpret and discuss the underlying ecohydrological processes, theoretical implications, and model behavior. Avoid a "data-dump" tone; instead, synthesize meaning behind results.

5. The abstract (line 19) states the study analyzes causes of WY changes, but line 74 states the focus is on runoff changes. However, water yield and runoff are not interchangeable. This inconsistency reflects a lack of academic precision and must be corrected throughout the manuscript.

6. Please provide supplementary materials or in-text figures/data validating the accuracy and limitations of the enhanced model that includes WUE. The validation should include metrics like correlation coefficients, RMSE, or NSE for model results with and without WUE. This is essential to assess the credibility of model improvements.

Specific Comments

- Lines 47–49: The first sentence in the introduction requires citation(s) to support the claim being made. Please provide an appropriate reference for the statement.
- Line 115: Please elaborate on how combining the two CO_2 response pathways—stomatal conductance and WUE—leads to more accurate conclusions. What are the respective roles of each pathway? What potential biases or benefits arise from

including both in the model compared to only one? The authors are encouraged to provide evidence or theoretical justification here. Since Figure 4a shows model-observation correlation *with* WUE, please also provide a comparison figure for model *without* WUE. This will allow readers to directly assess the added value of including the WUE mechanism.

- Line 238: The claim that "WY is approximately equal to runoff as long-term soil water storage change is negligible" requires citation. This assumption may not hold true in all hydrological settings. Please provide a reference and clearly define both "WY" and "runoff" in the methods section.
- Line 266: Provide a reference for the relative contribution method used. Additionally, clarify how the "trend" term in the equation is calculated.
- Line 276: Justify why a 5% threshold is used to define significance or relevance. Is this based on statistical significance, literature convention, or empirical experience?
- Figure 3a: The colored points in Figure 3a are difficult to read. Please revise the figure format—for example, by increasing symbol size, improving contrast, or separating results by sub-regions or climate zones.
- Lines 458–471: The model description of the stomatal conductance–WUE mechanism is too vague. Please provide explicit equations or cite previous model descriptions to allow reviewers and readers to assess the model's theoretical soundness and parameterization.
- Figure 8: Correct the x-axis label typo: "relatuve" should be "relative".
- Lines 505–513: The discussion on elasticity versus contribution lacks clarity. The authors argue that vegetation and CO_2 dominate due to their higher spatial heterogeneity, yet no quantitative evidence is provided to support this claim. Please include relevant statistics comparing the spatial variability of NDVI and precipitation to substantiate the argument.