Review Comments

This study systematically evaluates the impact of spatial resolution on hourly flood simulation accuracy in large watersheds by integrating distributed hydrological modeling with machine learning–based analysis. The authors employ the GDHF model across multiple spatial resolutions and introduce an improvement index (IMP) framework to quantify performance gains relative to a sub-watershed scheme. By coupling model simulations with XGBoost and partial dependence analysis, the study identifies key controlling factors governing resolution sensitivity and reveals their nonlinear influence on simulation performance. The framework is further strengthened through experiments under varying rainfall station densities, providing insight into the limitations of spatial refinement under data-sparse conditions. The results demonstrate that finer resolutions significantly enhance simulation accuracy in smaller basins, while offering limited gains in large drainage areas, and highlight the dominant role of basin area and rainfall characteristics in determining optimal resolution. Overall, the manuscript presents the methodology that is well designed and aligned with the study objectives, with a clear framework and appropriate integration of hydrological modeling and machine learning. The results effectively address all objectives, providing a coherent evaluation of spatial resolution effects, controlling factors, and rainfall station density impacts. The conclusions are consistent with the results and accurately summarize the key findings without overinterpretation. The paper is well organized; however, some minor issues related to sentence structure and presentation consistency should be addressed to further improve readability and precision, as outlined below.

Thank you very much for taking the time to thoroughly review our manuscript and provide such detailed and constructive comments. We are pleased that you found the methodology well designed and the manuscript well-organized. We will carefully address all the minor issues you raised and make the revisions accordingly. Below, we provide our point-by-point responses.

Minor Comments

- In the Introduction section (lines 50–55), “key characteristic” should be revised to “key characteristics” to match the plural context.

  Thank you for pointing that out. We will correct it in the revised manuscript.

- In the Introduction section (line 85-90), “pronounced topographic relief” is slightly repetitive with “hilly and mountainous terrain” mentioned earlier and could be revised for conciseness, and control areas mean “drainage areas” or “catchment areas”?

  We will remove the phrase “pronounced topographic relief” to avoid redundancy with the earlier description “hilly and mountainous terrain.” Additionally, we will replace the term “control areas” with “drainage areas” for consistency and clarity.

- In the Data and Methods section (line 95-100), “km2·gauge-1” should be formatted using proper superscripts (e.g., $km^2 \cdot gauge^{-1}$) for consistency and clarity.

  Thank you for pointing this out. We will thoroughly check the formatting of all units throughout the manuscript and ensure that superscripts are used correctly (e.g., $km^2 \cdot gauge^{-1}$) for consistency and clarity.

- In the Methods section (line 125-130), “Li et al. (2024” is missing a closing parenthesis and should be corrected to “Li et al. (2024)”.

  We will carefully check the citation format throughout the manuscript and correct any missing parentheses or other formatting issues, including the example you noted.

- In Appendix A (line 470-475), there is a typo in “P(t) epresents”; it should be corrected to “P(t) represents”.

  We will correct “P(t) epresents” to “P(t) represents” in Appendix A, and we will carefully review the entire manuscript to avoid similar errors.

- In Appendix A (around line 515), the equation for Shape (A15) is repeated; one instance should be removed to avoid redundancy.

  Thank you for your detailed review. We will remove the redundant expression.