Thank you for your thorough review and professional feedback on our manuscript. We greatly appreciate your praise for our work, as well as your constructive comments highlighting areas for improvement. We have carefully considered each of your suggestions, and in response, we will revise the manuscript point by point, as per your recommendations, to enhance the overall quality of the paper.

Below is our point-by-point response to your comments and our detailed plans for revision.

Comment 1:

The authors have also investigated the value of high-resolution data for hydrological simulations in another manuscript submitted to this journal. I believe it is necessary to further elaborate on the background, objectives, and the similarities and differences in content and results between this study and the previous one. This will provide readers with a deeper understanding of the topics addressed in this paper.

Response:

Thank you for your suggestion. We recognize that our current description of the objectives and novelty of the study is insufficient. This research extends our previous work, with two main objectives: first, to explore the impact of data resolution on hydrological simulations across different climate regions and models, aiming to derive generalizable patterns; and second, to further investigate the transferability of model parameters across different time scales, based on our understanding of the effects of high-resolution data on model performance.

The impact of high-resolution data on hydrological model performance remains unclear, with studies yielding inconsistent results. While some research suggests improvements with higher temporal resolution (Kobold & Brilly, 2006; Jeong et al., 2011), others, like Huang et al. (2019), found only marginal effects from increased spatial resolution, and some studies (Kannan et al., 2006; Ficchì et al., 2016) even reported performance degradation at finer time scales. Our previous research in southern China showed that high-resolution data does not always improve model performance. Nevertheless, we and other related studies acknowledged that further studies across different climate regions and models are necessary to validate and extend the generality of these findings. This research builds upon this background, aiming to provide new perspectives and data for this field.

We believe that the novelty of this study lies in the following aspects:

1. Evaluating the value of high-resolution data in a new climatic region. We specifically chose northern China as the study area because its climate and runoff generation characteristics differ significantly from those of southern China (Fan et al., 2019; Domrös et al., 2012), which we had previously focused on. Furthermore, other studies exploring the impact of data resolution have not yet considered this kind of climatic region.

2. New findings on the impact of data resolution on hydrological modeling in Northern China. Compared to prior studies, our findings reveal that in northern Chinese catchments, increasing data resolution has a more pronounced effect on reducing peak flow errors. Specifically, for hourly flow simulations, NSE (Nash-Sutcliffe Efficiency) showed no significant improvement when the resolution exceeded 6 hours, whereas REP (Relative Error of Peak Flow) only ceased to improve

significantly when the resolution exceeded 3 hours. In southern Chinese catchments, however, the threshold for both NSE and REP was 6 hours. This difference likely arises from variations in runoff-generation characteristics between catchments in different climatic zones.

3. Investigation on transferability of model parameters across various data resolutions and computational time steps. As you pointed out, discovering that model parameters are not transferable when computational time steps change is one of the key novel aspects of this study. Here, we have firstly investigated the value of high-resolution data using a novel model in a new climatic region. The results confirm that our findings align broadly with previous studies and those of other researchers. This supports the generality of the conclusion that "improvements in simulation accuracy become negligible once data resolution surpasses a certain threshold." Building on this understanding, we further broadened the scope of the study to explore the transferability of model parameters, aiming to provide guidance on selecting appropriate computational time steps in environments with lower data resolution. Specifically, we examined the transferability of model parameters under varying data resolutions and computational time steps. The results indicate that parameters remain transferable with changes in data resolution but lose this property when computational time steps change. Based on this finding, we recommend that even in the absence of high-resolution data, hydrological models should be constructed and calibrated using smaller computational time steps whenever possible.

In the revised manuscript, we will update the wording in the introduction and discussion sections to provide readers with a deeper understanding of the topics addressed in this paper.

Comment 2:

Figure 1 shows that among the seven catchments studied in this paper, two are not independent. The THK station is located upstream of the ZJF station, and there is also an upstream BHP station, which is not mentioned in the main text. The methodology used to address such nested catchments should be clarified in the manuscript.

Response:

Thank you for pointing out the issue. We neglected to introduce the approach for handling this nested watershed. The Baihe watershed contains four hydrological stations: Xitaizi (XTZ), Tanghekou (THK), Zhangjiafen (ZJF), and Baihepu (BHP). ZJF is the outlet of the Baihe River, while XTZ is the outlet of the small experimental catchment of Xitaizi, and its influence on the flow at ZJF is negligible. THK is located at the outlet of the Tanghe River, a tributary of the Baihe River. Since the flow data for THK is relatively complete, the upstream basin of THK is treated as an independent study catchment. There is a reservoir within the Baihe watershed, called the Baihepu Reservoir. To eliminate human interference and the accumulation of simulation errors, this study treats the catchment area between the Baihepu Reservoir, THK, and ZJF as an independent catchment. The measured outflow from the Baihepu Reservoir and the measured flow at THK are used as known boundary conditions in the hydrological model to simulate the flow at ZJF.

In the revised manuscript, we will include the following description:

Considering the presence of the Baihepu (BHP) Reservoir in the Baihe watershed, and to exclude human interference and the accumulation of simulation errors, this study treats the catchment area between the Baihepu Reservoir, THK, and ZJF as an independent catchment. The measured outflow from the Baihepu Reservoir and the measured flow at THK are used as known boundary conditions in the hydrological model to simulate the flow at ZJF.

Comment 3:

In lines 305–306, the authors mention " In all catchments except for XTZ, when parameters calibrated with a specific data resolution were transferred to other resolutions, simulation accuracy improved as the resolution of the data used increased." However, the reasons behind the observed anomalies in this catchment have not been explained. Although the manuscript includes a discussion of another watershed anomaly, I suggest that the authors also provide some explanation or discussion of the observed anomalous behavior in the XTZ catchment to improve the comprehensiveness of the analysis.

Response:

Thank you for your suggestion. In the original manuscript, we only explained the observed anomalies using one catchment as an example. Similar anomalies were also observed at other sites (such as THK and ZJF), but these anomalies appeared when the data used for model calibration had a resolution of 24h or 12h. In the case of the XTZ catchment, however, these anomalies were evident across most time resolutions.

We analyzed the variation in model parameters with respect to the resolution of the data used for each catchment and found that the majority of parameters did not show significant changes with varying data resolutions, which supports the transferability of the parameters. However, some parameters showed notable changes, which can explain the differences in model performance after parameter transfer. Our analysis revealed that parameters related to the convergence and routing process, such as Lag1 (the lag time for surface runoff) and Muskingum parameters, exhibited considerable variability with changes in time resolution. Among these, the variation in Lag1 was most pronounced at sites like XTZ, THK, and ZJF, with values changing within the 5h-15h range. In contrast, for other catchments, this parameter was generally below 5 hours. This suggests that, despite the relatively small size of the XTZ catchment, its dense vegetation and high infiltration capacity result in a slow rainfall-runoff response. In such catchments, even when using coarser time-resolution data, the model can yield good NSE values (though REP may be poor). This anomaly is consistent with the explanation we provided for the THK site in the original manuscript. We will emphasize the explanation for the observed anomaly in the XTZ catchment in the revised version of the manuscript.

Reference:

Domrös M, Peng G. The climate of China[M]. Springer Science & Business Media, 2012.

Fan J, Wu L, Zhang F, et al. Evaluation and development of empirical models for estimating daily and monthly mean daily diffuse horizontal solar radiation for different climatic regions of China[J]. Renewable and Sustainable Energy Reviews, 2019, 105: 168-186.

Huang Y, András Bárdossy, Zhang K .Sensitivity of hydrological models to temporal and spatial resolutions of rainfall data[J].Hydrology and Earth System Sciences, 2019, 23(6):2647-2663.DOI:10.5194/hess-23-2647-2019.

Jeong J, Kannan N, Arnold J G, et al. Development of sub-daily erosion and sediment transport algorithms for SWAT[J]. Transactions of the ASABE, 2011, 54(5): 1685-1691.

Kobold, M. and Brilly, M.: The use of HBV model for flash flood forecasting, Nat. Hazards Earth Syst. Sci., 6, 407–417, https://doi.org/10.5194/nhess-6-407-2006, 2006.

Ficchì A, Perrin C, Andréassian V. Impact of temporal resolution of inputs on hydrological model performance: An analysis based on 2400 flood events[J]. Journal of hydrology, 2016, 538: 454-470.

Kannan N, White S M, Fred W, et al. Sensitivity analysis and identification of the best evapotranspiration and runoff options for hydrological modelling in SWAT-2000 [J]. Journal of Hydrology, 2006,332(3/4):456-466.