

Authors' response for Anonymous Referee #1

1. setting:

Thank you very much for your suggestion. Your suggestion about the setting is very helpful for me to revise my paper. Most studies apply rainfall and previous discharges with different time steps and combinations as inputs. But as you said, if we put the discharge in the input, the relationship between it and the output would affect the analysis of the effect of different types of rainfall on the results. So in the new version, I removed the discharge from the inputs. I think what you mentioned about using LSTM as an individual model and regional model is a very interesting aspect. In the new version, I added the number of catchments to 10. I compared the difference between LSTM as an individual model trained separately for each catchment and as a regional model trained at the same time for multiple catchments.

2 Method:

Thanks for the suggestion. I have gone into more detail in the data section.

As can be seen in Figure 1, instead of using the catchment mean rainfall data (see the top of Figure 1b), we extract the rainfall of all hydrologic response units in the catchment to form a vector. The bottom of Figure 1b shows that the catchment has 8 hydrologic response units from which we extract the corresponding 8 rainfall data to form a vector of size 8. Since the values in this vector represent rainfall information at different locations in the catchment, our assumption is that the vector is rainfall data with spatial distribution information.

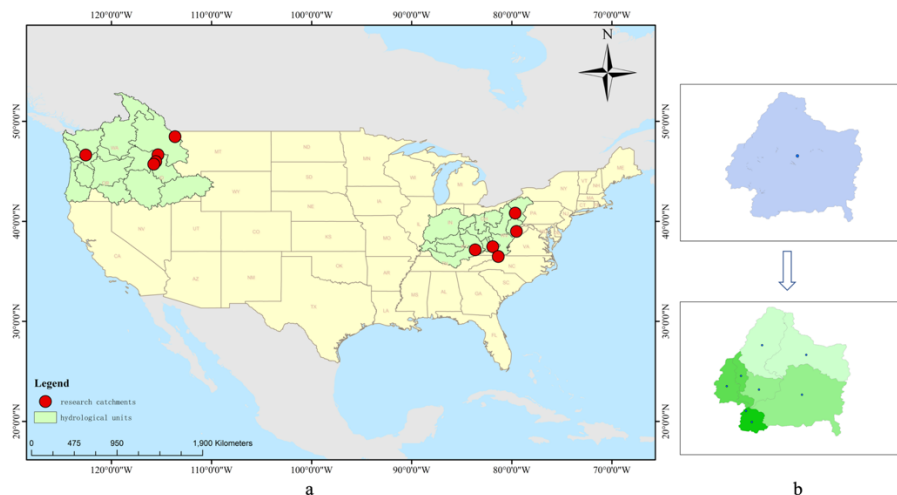


Figure1. a: Ten catchments and their locations in the State; b: Examples of spatially distributed rainfall data in this study

3 Results:

Thanks for the suggestion. I modified the number of digits in the result to two digits. For Experiment 1, I compared the results of different types of rainfall data when LSTM was used as individual model for one-time step output; For Experiment 2, I compared the results of different types of rainfall data when LSTM was used as regional model for one-time step output; In three experiments, we compare the effect of different types of rainfall types on individual model as well as regional model when simulating n time steps output.

Authors' response for Anonymous Referee #2

1. Thanks for the suggestion. I modified the number of digits in the result to two digits.
2. I have added basic information about the catchment in Methods and Dataset.
- 3-5. Thank you for the suggestion. I changed the data splitting to a 70-2-10 split for each catchment.
Thank you for the suggestion. For better analysis and comparison, I increase the number of catchments to 10. In data and method, I provide the statistics of each catchment. In the new version of the conclusions, I compare the results in various ways.
6. In our conclusion, we also obtained similar results to other studies that a longer look back window leads to better results, e.g., 365 days. I think it is very interesting to analyze the relationship between the basic properties of the watershed and the look-back window based on these conclusions.
7. 180 and 365 days as look-back windows are often used in other studies that apply deep learning models to the field of hydrology—considering the advantages of LSTM models, as data-driven models, which discover the changing patterns of time series data. We can assume that 180 and 365 days as look-back windows help the model learn the correlation between long series of rainfall, runoff, and other factors. Data-driven models can handle longer windows, which can provide more information. How to choose look-back windows is a question that needs to be further investigated. This is the reason why we compare different windows in the paper.
8. I have added basic information about the catchment in Methods and Dataset.
9. Thank you for the suggestion. In the new version, with the addition of more catchments, I have added new comparison plots instead of just flow processes. For the flow process plots, I kept the comparisons between models with the most significant differences in results.
10. Thank you for the reminder. All the variables and functions are explained in the corresponding places.
11. It should be “rain gauge” or “rain station.” Thank you for the suggestion.
12. It should be “activation function.” Thank you for the suggestion.