Reviewer Comments for revised Manuscript: " Exploring the Potential Processes Controls for Changes of Precipitation-Runoff Relationships in Non-stationary Environments "

To address the issue that present models assuming stationary conditions may result in incorrect streamflow forecasts, this study established a Driving index for changes in Precipitation-Runoff Relationships (DPRR). It provides possible process explanations for variations in precipitation-runoff relationships (PRR) using quantitative findings from inserting candidate driving factors into a holistic conceptual model. The study investigated the effects of climate forcing, groundwater, vegetation dynamics, and human activities on PRR in a non-stationary environment. This paper is important for hydrology since it provides a new perspective on hydrological processes and theoretical support for the building of long-term hydrological models. The manuscript is well-presented. Furthermore, the authors responded adequately to the prior two reviewers' suggestions, resulting in improvements to the paper's scientific value and study technique.

The study chooses ISR, NTL, and POP as factors to represent the impact of human activities on precipitation-runoff connections, and one factor each to investigate climate, groundwater, and vegetation dynamics. ISR, NTL, and POP are all intimately related in the context of urbanization. High ISR is typically associated with a greater population, higher levels of urbanization, and an increase in NTL. These three aspects interact; for example, population growth stimulates infrastructure expansion, which improves ISR and NTL. The writers are asked to explain why they chose these three elements to indicate human impact. Furthermore, ISR and NTL data are mostly acquired from remote sensing products, whereas POP data are primarily gathered through administrative planning, resulting in limited thorough observations of these data, particularly for distant historical periods. There are discrepancies between the timeframes of these data and other databases. The writers should explain the significance of these inconsistencies.

Within a given period, the driving level of DPRR represents the level of influence exerted by a specific factor on the correlation between precipitation and runoff during the period, while the driving direction of DPRR indicates whether a specific factor has positive or negative effects on the PRR during the period. Does this indicate that factors with a positive driving effect would increase runoff? Furthermore, because the results of DPRR and D-DPRR change over different durations, the influence of numerous factors on PRR remains unknown. In the version, vertical variations in the violin plot reflect the uncertainty in DPRR results. However, where is the uncertainty in D-DPRR data reflected?

Special comments

Line 133: It is recommended to convert the runoff volume of 8.09 billion m^3 to runoff

depth in mm to facilitate comparison with the precipitation amount of 572 mm.

On the Impact of Human Activities on Hydrological Processes: The discussion section should incorporate insights from other models addressing similar topics to enhance the generalizability of the paper's conclusions. It is recommended to consult the following paper for a more comprehensive analysis:[1]Yang, X., Wu, F., Yuan, S., Ren, L., Sheffield, J., Fang, X., ... & Liu, Y. (2024). Quantifying the Impact of Human Activities on Hydrological Drought and Drought Propagation in China Using the PCR-GLOBWB v2. 0 Model. Water Resources Research, 60(1), e2023WR035443. [2] Wu, F., Yang, X., Cui, Z., Ren, L., Jiang, S., Liu, Y., & Yuan, S. (2024). The impact of human activities on blue-green water resources and quantification of water resource scarcity in the Yangtze River Basin. Science of the Total Environment, 909, 168550.

Lines 158-164: The selected datasets are in raster format, while time series data are used in the calculations. There is a lack of processing for the raster data.

Line 233: Verify the description of the value range here. Should this refer to the value range of bandwidth ω?