General Comments:

The manuscript examines drought propagation while considering the impact of various meteorological factors and watershed characteristics. This study seeks to expand on existing knowledge of drought propagation by including the effects of a changing environment and watershed features. While many studies have focused on drought propagation using stationary drought indices, research like this, which applies non-stationary drought indices in the context of drought propagation, is increasingly important given the challenges posed by climate change. The manuscript is well-structured and clear, making it of interest to the readers of the NHESS Journal. However, I believe it could be significantly improved by addressing the points mentioned below.

Review Comments:

Major comments:

L94: As referring to few other articles, the details of area of basin are somewhat different as compared to the ones mentioned in this article. Also, the existing mountainous area and plain area details do not add up to total area of basin (refer article: https://doi.org/10.1016/j.oreoa.2024.100049.)

L98: Could you kindly clarify whether it is possible for a basin to have an annual mean temperature in the range of 1 to 11°C, while the monthly mean temperature ranges from 17 to 25°C?

L119: How you have handled the grid points? Have you thought of considering the influence of the grids just on the boundary of the catchment?

L176: Is there a specific reason why the Gamma distribution has been chosen for evaluating the Standardized Runoff Index (SRI)? While the Gamma distribution is commonly used for the Standardized Precipitation Index (SPI), the appropriate distribution for SRI can vary depending on the characteristics of the catchment. Are there any previous studies that support the use of the Gamma distribution for modelling runoff in this basin? If so, referencing these studies could help justify the decision to use the Gamma distribution. Try considering other distributions also, to improve the accuracy of the results when assessing drought severity and propagation.

L194: You may consider mentioning that these meteorological variables are used as covariates in the evaluation of the non-stationary hydrological drought index. Additionally, could you include a justification for why large-scale climate factors were chosen as covariates in the evaluation of the non-stationary meteorological index, as well as the rationale for using meteorological variables in assessing the non-stationary hydrological index?

L286: Table7: The AIC, SBC, and GD values for the all the different runoff models in the CDS region can be presented first, with the optimal model highlighted in bold, as done in the case of precipitation (Table 5).

Minor Comments:

L11: What do you mean by "The analysis of **law of drought propagation**"?

L23: Rephrase "Furthermore, watershed characteristics also be factors influencing spatial differences

in drought propagation." Also, one-two lines about watershed characteristics can also be added in abstract if possible.

L58-L59: Rephrase ("Under the influence…complex and urgent.")

L84-L85: Rephrase ("Furthermore…characteristics"), grammatical mistake

L85-L89: Rephrase ("To assess…respectively"), sentence too long. Improving it will enhance readability

L91: Section 2: more citations should be added in paragraph first, second and third (mainly line 94, 99, 109)

L128: The reference to the figure is incorrect. It should be: 'Figure 2 summarizes the steps of the current study.'

L163: Here, α and β represent the shape and scale parameters, respectively, rather than the scale and shape parameters.

L166: It can be mentioned that this approximate conversion is provided by Abramowitz and Irene (1965).

L190: As commented for L163, here, α and β represent the shape and scale parameters, respectively, rather than the scale and location parameter of the gamma distributions.

L256: The reference to the table is wrong. It should be: 'Table 4'

L272: Typo error: Fig.4

L285: There can be other combinations of T, H, and W, such as W and H. Could you please include a statement explaining why only these specific model situations were considered?

L338: Could you elaborate on how and why an increase in temperature may be the primary factor contributing to the increased severity of hydrological droughts in the spring under non-stationary conditions, in contrast to stationary conditions?

L349: Rephrase for better clarity ("This…abundant"). Additionally, it would be helpful to mention the seasons varying with months in the study area section, providing readers with a better understanding of the different seasons in the Luanhe River Basin, China. It would also be beneficial to include some details about the general conditions of precipitation, temperature, and humidity across the various seasons.

L358-L360: Why might temperature (T) and humidity (H) be the primary climate-influencing factors in the upstream and downstream areas, in contrast to the midstream area? It may be helpful to include a brief explanation for a general audience to further clarify this.

L406 and L408: The reference to the figure should be consistent throughout the article, using either 'Fig.' or 'Figure' in both instances.