Comment # 1

We thank the independent reviewer for the comments. The comments are all valuable and extremely helpful for revising and improving our paper, as well as the important guiding significance to our research. We have studied comments carefully and have made corrections accordingly, which we hope meet with approval. The main corrections in the paper and the response to the reviewer's comment are as follows:

1. I suggest refining the title to make it clearer and more concise.

***R*: Thank you for your suggestion. We really appreciate your efforts in reviewing our manuscript. We have revised it as:**

"Assessing Recovery Time of Ecosystems in China: Insights into Flash Drought Impacts on Gross Primary Productivity"

2. Please include a sensitivity analysis that uses different thresholds as recovery conditions.

***R*: We have conducted a sensitivity analysis using 80%, 90%, 100%, and 110% recovery to the original state as the threshold, and the results showed no significant differences. Following the recommendations of current literature [Wang et al., 2023; Yang et al., 2023; Zhang et al., 2020a], we used the return of GPP anomaly to positive anomalies as an indicator of recovery is a widely accepted method in studies of this kind. This approach has been validated in multiple studies and has been shown to reliably capture the recovery trend of GPP. The recovery time to return to the original state at recovery thresholds of 80%, 90%, 100%, and 110% is shown in the figure below (also can see in Supplementary materials Figure S4). The sentence in the revised manuscript as the following (Lines 199-201):**

"By employing various recovery thresholds (80%, 90%, 100%, and 110% of the original state), we confirmed although the recovery time of some grid pixels can vary, the overall spatial pattern of recovery time remains consistent regardless of the threshold (Fig.S4)."

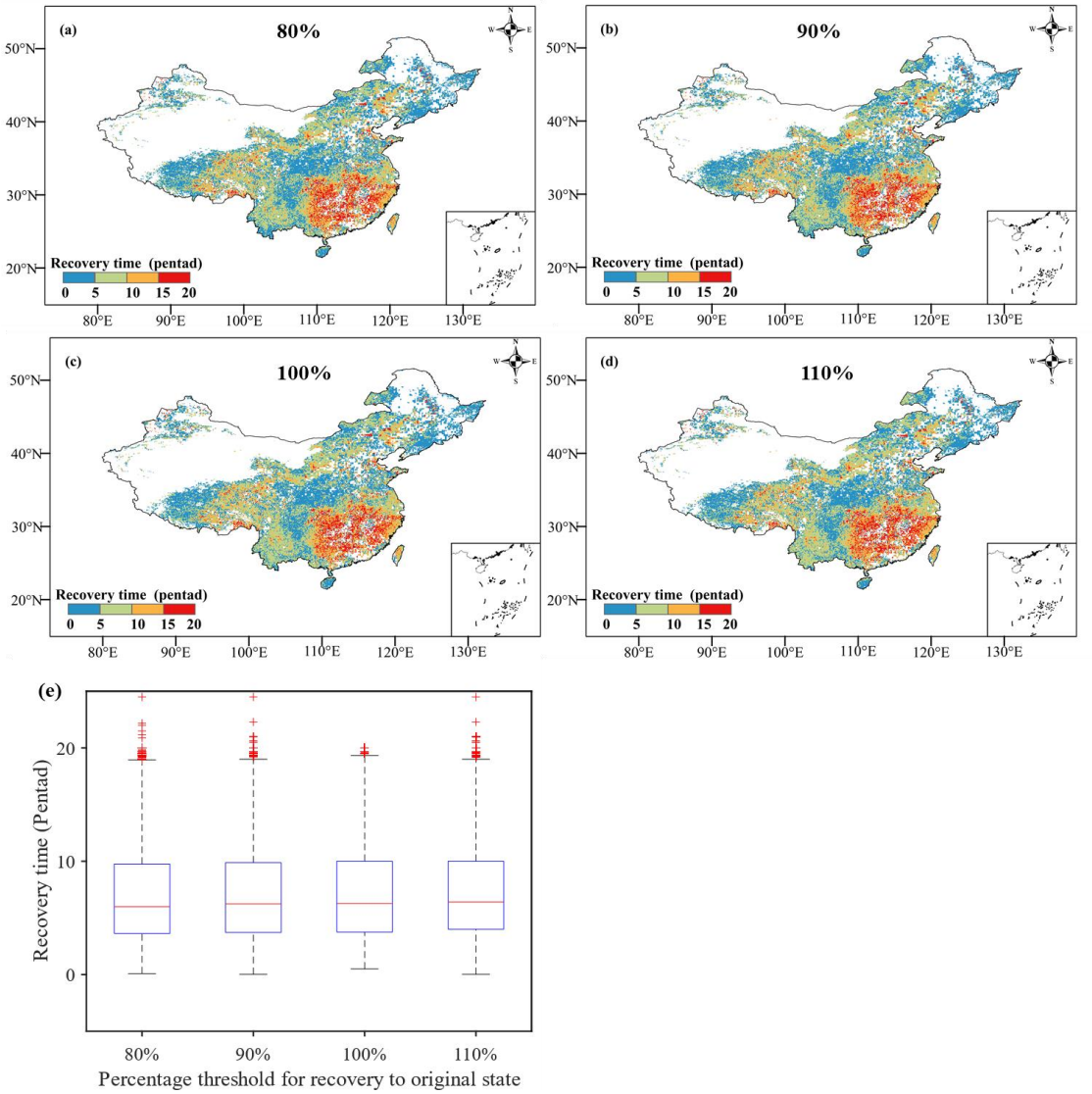

Figure S4. Recovery time to original state at 80%(a), 90%(b), 100%(c), and 110%(d) recovery thresholds. Box plots of recovery time under different recovery thresholds (e). The box plots display the maximum, upper quartile, median, lower quartile, and minimum values of the recovery time distribution.

3. In Figure 1, please remove any cases not included in the analysis of GPP recovery.

***R*: Thank you for your suggestion. We have updated Figure 1 to remove any cases not included in the GPP recovery analysis, ensuring alignment with the analysis scope. The section on flash drought identification is described in detail using textual explanations (Lines 129-132):**

"The identification of flash droughts should meet the following criteria: soil moisture (SM) must decrease from above the 40th percentile to below the 20th

percentile within a 5-day period, with an average rate of decline per pentad not less than the 5th percentile. A flash drought terminates if the declining SM rises back to the 20th percentile. The duration of a flash drought event must be at least 4 pentads (20 days) (Yuan et al., 2019, Zhang et al., 2020a).”

The updated Figure 1 is shown below:

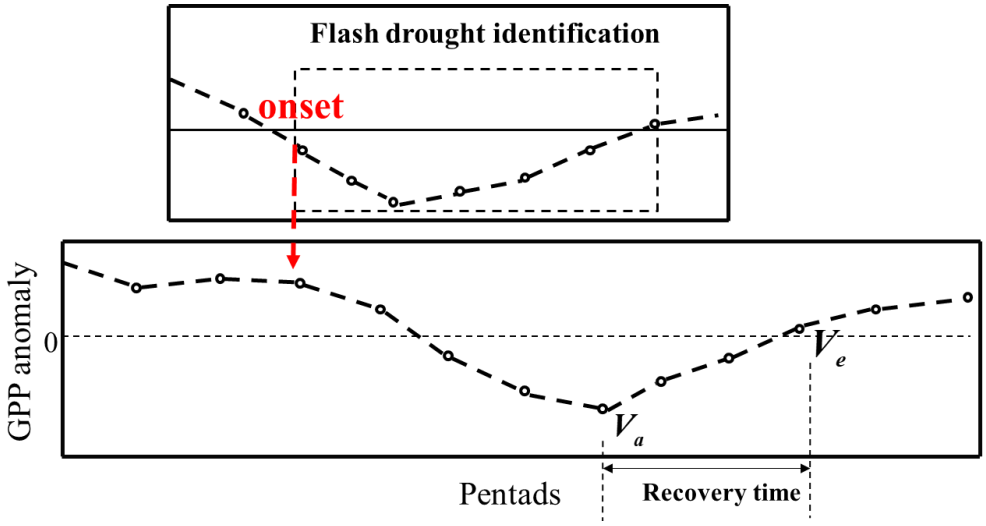

Figure 1. The identification of recovery time. GPP anomaly is detrended vegetation production index on a time series, 0 is defined as the threshold of a negative anomaly. Below the dashed line represents that vegetation production is in a negative abnormal state. We quantify recovery time as: the recovery time begins when the vegetation production loss reaches the maximum and ends when the detrended vegetation production index is above 0.

References:

Wang, H., Zhu, Q., Wang, Y., et al., 2023. Spatio-temporal characteristics and driving factors of flash drought recovery: From the perspective of soil moisture and GPP changes. *Weather and Climate Extremes*. 42: 100605.

Yuan, X., Wang, L., Wu, P., Ji, P., Sheffield, J., Zhang, M., 2019. Anthropogenic shift towards higher risk of flash drought over China. *Nat. Commun*. 10 (1).

Yang, L., Wang, W., Wei, J., 2023. Assessing the response of vegetation photosynthesis to flash drought events based on a new identification framework. *Agricultural and Forest Meteorology*. 339: 109545.

Zhang, M., Yuan, X., 2020a. Rapid reduction in ecosystem productivity caused by flash droughts based on decade-long FLUXNET observations. *Hydrology and Earth System Sciences*. 24(11): 5579-5593.