This manuscript investigates how ecosystem primary productivity recovers after experiencing flash droughts using the random forest model and an explainable model. These results reveal the response time of GPP over China and its influencing factors. The topic is of significance to assess flash droughts' ecological impacts, which is probably a concern to the community of hydrologists, ecologists, and policy-makers. However, the study should clarify some comments before it is accepted by *Hydrology and Earth System Sciences*.

Major comments:

1. The abstract pointed the most novel finding is proposing a new method of a machine learning method to study the recovery of GPP to flash droughts. In my opinion, the method is not quite new and has been widely used in analyzing the interactions between soil moisture and vegetation. Whereas the recovery of GPP is less involved in previous studies, this study contributes a lot to provide a perspective on this topic.

2. The metric of GPP recovery from flash droughts used in this study may be influenced by data noises, for example, during a flash drought event that persists for 2 months, negative GPP anomalies only occur for 5 days. Such cases should be excluded in the analysis. The precondition of GPP recovery from flash droughts is that GPP has been negatively influenced by flash droughts. Besides, the terminating point of the recovery process is difficult to detect and should not be recognized at the point where the GPP anomaly is above 0, as there are many noises including whether it has experienced another drought or other extreme, the stable condition may be higher or lower than the normal conditions, etc.

3. Does the declining magnitude of GPP caused by flash droughts influence GPP's recovery time?

4. What are the hydro-meteorological conditions during the recovery stage of GPP? Is there a connection between hydro-meteorological conditions and GPP recovery?

5. The study period is a little short and the available datasets have been updated to 2023 even longer.

Minor comments:

1. L23: “response function functions”

2. L41: “productivity” should be more clear. Maybe “terrestrial ecosystem productivity” is better.

3. L48-54: The phase reviews the previous research about how vegetation recovers from droughts. It seems that they are inconsistent with the recovery of GPP in terms of GPP’s response across different PFTs. Is there any explanation for it?

4. L54:55 & L303:304: Vegetation over humid regions needs more time to recover to its normal condition. As there is more water available over humid regions, why vegetation is more difficult to recover?

5. L57: What is the “background value”?

6. Fig.1 is difficult for readers to understand the metric used in this study. It is better to clarify flash drought and recovery time in Fig.1 more clearly. Perhaps authors can select a case from the observed events.

7. L185: In Fig2.b, should the red line be removed?

8. L199: There is no GPP recovery over northwestern China. Is there no response of GPP to flash droughts? As usual, vegetation is more sensitive to water availability in arid or semi-arid regions than in humid regions. Besides, is the response rate the reverse value of response time? If so, they are presenting the same results.