

Reviewer #2

Deforestation can significantly affect the climate by altering both biogeochemical and biogeophysical processes, and can also affect the drought processes across the world. While various studies have explored how deforestation affects temperature and precipitation, its impact on drought remains less explored. Based on the output from the Land Use Model Intercomparison Project (LUMIP), this study investigated the global and regional response of drought to idealized deforestation. The study presents many intriguing findings, offering a global perspective on the relationship between vegetation changes and drought, while also providing new insights. The overall structure of the article is well-organized, with clear logic and distinct layers. Here are my comments:

Thanks for the appreciation of our work and the useful feedback to improve the quality of the manuscript. We addressed them as described in the answers below.

This study provides many novel findings, such as “deforestation causing wetter conditions in dry regions” and “the northern hemisphere's dry regions see increased wetter conditions, particularly in autumn”. It would be even better if some mechanistic explanations could be added in the abstract.

Yes, we will add some mechanistic explanations in the revision.

Line 34: Provide the full name of “SPEI03”.

Added.

Lines 129-140: This paragraph is a bit too lengthy. You can simplify this paragraph by focusing on directly stating the scientific questions that need to be addressed while avoiding unnecessary details. Keep the language concise and clear, allowing the reader to quickly grasp the core issue.

We deleted some explanation sentence to make our scientific questions clearer and more attractive to readers.

Line 156: Add the study period in this section.

We mentioned the study period in Section 2.4.

Lines 188-189: Why was this interpolation method chosen? Do different interpolation methods significantly affect the results?

Bilinear interpolation is a commonly used method for adjusting differing resolutions to a uniform grid in multi-model comparisons and analyses. This approach is generally appropriate for most model output variables. Different interpolation methods are unlikely to significantly impact the key results of our study. In regions with complex topography, some border artifacts or buffers may appear, though these are expected to be minimal.

Lines 191-192: Many drought indices are available; could you explain some reasons for choosing the SPEI?

The SPEI accounts for the combined effects of precipitation and potential evapotranspiration (PET), allowing for the analysis of drought impacts across different timescales, such as 3 months or 24 months. This enables us to assess drought responses to forest changes from short-term to long-term perspectives. Therefore, we chose SPEI for our study. We added the explanation in section 2.5.

Lines 222-225: What do the short-term, mid-term, and long-term mean? Why do you select two mid-terms?

One of the key goals of our study is to investigate the drought response to deforestation across various timescales. To achieve this, we calculated the SPEI at different time scales. Based on the standard drought duration definitions, where short-term droughts last a few weeks or months, and long-term droughts can persist for years. We defined short-term drought as 3 months, mid-term drought as 6 and 12 months, and long-term drought as 24 months. Our analysis primarily focuses on short-term (3 months) and long-term (24 months) drought impacts.

Figure 1: Combining precipitation changes with temperature changes is not intuitive enough. It is recommended to separate the two and create two subplots.

Here, we aim to present a basic concept of the differing responses of precipitation and temperature to forest change. The impacts on water deficits and drought conditions may vary across climate zones. We intend to use a simple figure with brief explanations to illustrate the relationship. Therefore, we wish to retain this figure. Further details on the temperature and precipitation responses to forest change in different models are provided in the supplementary material (Figure S6).

Line 335: The font style of the titles needs to be consistent.

We have checked throughout the manuscript and modified the font style.

Line 336: The indentation format of the paragraphs also needs to remain consistent.

Yes, we have checked and modified throughout the manuscript.

It is recommended to analyze the impact of deforestation on the spatiotemporal dynamics of drought in future studies.

Thank you for the suggestion. In fact, we already have plans to explore the spatiotemporal dynamics of drought responses to forest change, aiming to deepen our understanding of the biogeophysical effects of forest change across various spatiotemporal scales.