

September 26, 2020

Dear Prof. Dominic Mazvimavi,

Thank you very much for your letter and for the reviewers' constructive and valuable comments concerning our manuscript entitled "The precipitation variability of wet and dry season at the interannual and interdecadal scales over eastern China (1901–2016): The impacts of the Pacific Ocean" (Manuscript ID: hess-2020-102). In the revised version, we have carefully revised the paper to address all comments, and hope you and the reviewers find the revision satisfactory. Point-to-point responses to reviewers' comments are included in the following pages.

We look forward to hearing from you!

Sincerely yours

Fuqiang Cao

E-mail: wq2006126@126.com

Responses to the Comments of Reviewer 1

This paper attempted to investigate the variability of precipitation in China using a longterm dataset and integrating multiple statistical methods such as PCA/EOF, wavelet analysis, and Bayesian dynamical linear model. However, the results presented in this paper are very well understood in the literature, and the impacts of ENSO and PDO have been studied extensively in existing studies (the authors also introduce some of them in their introduction section). The authors should have done a thorough investigation of the research gap, and the novelty of their current paper should be clearly stated. It seems that the authors thought utilizing April–September as the wet half year (wet season) and October–March as the wet half-year is novel. That is not convincing.

Some similar studies are as follows (there are much more than that):

Ouyang, R., Liu, W., Fu, G., Liu, C., Hu, L., & Wang, H. (2014). Linkages between ENSO/PDO signals and precipitation, streamflow in China during the last 100 years. Hydrol. Earth Syst. Sci, 18(9), 3651-3661.

Yang, Q., Ma, Z., & Xu, B. (2017). Modulation of monthly precipitation patterns over East China by the Pacific Decadal Oscillation. Climatic change, 144(3), 405-417.

Yang, Q., Ma, Z., Fan, X., Yang, Z. L., Xu, Z., & Wu, P. (2017). Decadal modulation of precipitation patterns over eastern China by sea surface temperature anomalies. Journal of Climate, 30(17), 7017-7033.

Xiao, M., Zhang, Q., & Singh, V. P. (2015). Influences of ENSO, NAO, IOD and PDO on seasonal precipitation regimes in the Yangtze River basin, China. International Journal of Climatology, 35(12), 3556-3567.

Response:

Thank you so much for your constructive comments. We have made a substantial revision of the paper to address all the issues.

The research gap and novelty have been highlighted in the revised manuscript as follows.

Most existing studies focusing on the effects of ENSO and PDO on precipitation over eastern China mainly examine the spatial pattern of rainfall during different phases of climate variability modes, while the time-varying linkages between eastern China rainfall and large-scale modes have not been investigated. However, predictability of seasonal rainfall over the East Asia largely depends on the phase and magnitude of the climate variability modes, as well as the relationship between large-scale modes and regional precipitation (Chan and Zhou, 2005; Wang et al., 2020), quantifying these corrections are, therefore, greatly instrumental to developing skillful precipitation forecasting model (Zhang et al., 2014). In this study, we used wavelet analysis and Bayesian dynamical linear model to analyze their time-varying relationships at the century-scale, this may fill the research gap of the century-scale time-varying linkages between climate variability modes and regional rainfall events.

We have added related descriptions and discussions in abstract (lines 41-46), and introduction (lines 132-157), as well as discussion and conclusions (lines 504-518).

Although the rainfall events mainly occur in summer (June-August), the rainy season extends April–September over eastern China, since the rainfall in eastern China is principally concentrated during April–September (Bao 1987; Domroes and Peng 1988; Zhai et al., 2005; Wang et al., 2020). Usage of boreal standard seasons may therefore unavoidably break the natural rainy distribution at the temporal scale, affecting the robustness of the analytical results. Zhai et al. (2005) have investigated trends of precipitation extremes during wet season (April–September) and dry season (October–March) in China, and suggested that utilization of six months as the dry (wet) half year facilitates to characterize the variations in extreme events. While up to now, the issue on whether the ENSO and PDO can contribute to the interannual and interdecadal rainfall variability in major rainy seasons over eastern China remains unclear. In this study, we utilize April–September as the wet half year (wet season) and October–March as the dry half year (dry season), respectively, to fill the gap of detecting robust signals of the time-varying effects of ENSO and PDO on the precipitation variability in eastern China based on long-term datasets.

These are also discussed in the revised manuscript.

References

- Bao, C. L. : Synoptic Meteorology in China. China Ocean Press, 209 pp, 1987.
- Chan, J. C., and Zhou, W.: PDO, ENSO and the early summer monsoon rainfall over south China, *Geophys Res Lett*, 32, L08810, <https://doi.org/10.1029/2004GL022015>, 2005.
- Domroes, M., and G. Peng: The Climate of China. SpringerVerlag, 361 pp, 1988.
- Zhai, P., Zhang, X., Wan, H., and Pan, X.: Trends in total precipitation and frequency of daily precipitation extremes over China, *J Climate*, 18, 1096-1108, <https://doi.org/10.1175/JCLI-3318.1>, 2005.
- Zhang, W., Jin, F. F., and Turner, A.: Increasing autumn drought over southern China associated with ENSO regime shift, *Geophys Res Lett*, 41, 4020-4026, <https://doi.org/10.1002/2014GL060130>, 2014.
- Wang, B., Luo, X., and Liu, J.: How Robust is the Asian Precipitation–ENSO Relationship during the Industrial Warming Period (1901–2017)? *J Climate*, 33, <https://doi.org/10.1175/JCLI-D-19-0630.1>, 2779-2792, 2020.

Responses to the Comments of Reviewer 2

This paper aims to identify the dominant variability modes of precipitation in dry (October- March) and wet seasons over eastern China. Here are some suggestions to improve the manuscript.

Response: Thanks for your careful review and helpful comments. We have carefully revised our paper accordingly and believe that the quality of the revised paper has been greatly improved.

Specific comments:

1. It is suggested to highlight more clearly the novelty of this study in the Introduction Section. As in the current version, it cannot be clearly seen.

Response: Thank you very much for this suggestion. We have changed the section of introduction and highlighted the novelty in comparison with existing studies. For detailed information please see lines 62-97 and lines 132-157 in the revised version.

2. Before introducing different precipitation datasets and different analysis methods, it is suggested to briefly state how the datasets are related, and how using different datasets (methods) serve different analysis purposes.

Response: Thank you very much for your advice. We have added related descriptions of the relationships and utilizations of the rainfall dataset following your suggestion. For detailed information please see lines 174-181 in the revised version.

3. There are some minor mistakes require attention, for instance, L215, symbol 'alpha' cannot be properly displayed.

Response: Thank you so much for pointing out this. We have retyped this symbol in the standard format.

4. L237 ~238 and L791: grammar mistakes.

Response: Many thanks for this suggestion. We have changed this sentence as follows,

“These changes in rainfall confirm that it is reasonable to categorize wet and dry seasons over eastern China.”

We deleted “for” in line 791.

In addition, we also have made a careful proofreading for the revised manuscript. Please see these minor changes in the revised version.