We would like to thank the anonymous referee for his careful reviews and constructive comments and suggestions, which help to improve the quality of this manuscript significantly. We will revise the manuscript according to the referee's comments and suggestions. The following is the point-to-point response to the referee's comments.

Summary: The objective of the manuscript is to disentangle the precipitation variability in Asia over the past millennium by analyzing data from climate model simulations driven by different forcing combinations and data from the last Millennium reanalysis Project. This latter data set results from polio data off-line assimilation into simulations with Earth-system models.

The main conclusion of the study is that a citation at multi-annual time stairs in this region displays a typo structure with northern Asia experiencing trial conditions and central and monsoonal Asia experiencing what conditions and vice versa. This structure is detectable in almost all climate simulations in the forcing and in the proxy-driven analysis. The authors conclude that this structure results from internal climate variability and is not associated with external forcing. The conclusion of the analysis is that this type of structure is associated with the Interdecadal Pacific Oscillation and with the impact of their sea surface temperature anomalies. Nevertheless, the authors also detect that this precipitation pattern is affected by the transition between the medieval climate anomaly and the Little Ice Age.

Recommendation:

The manuscript is very well written, the structure is very clear, and the analyses are all meaningful. Therefore, I am recommending the publication, but I do have a few comments that the authors may want to consider.

Main point:

1) The conclusion that the precipitation dipole is not affected by external forcing is not as solid as the authors believe. it is true that this structure appears in all empirical function analyses of almost all simulations regardless of the external forcing. However, it is possible that the precipitation dipole, despite being produced by internal climate variability, might still be affected by the external forcing so that its time variations could be affected by phases of strong or weak volcanism or strong or weak solar output. To some extent, the study leaves this possibility open when the authors found that the time evolution of the precipitation dipole is affected by the Little Ice Age.

The model setup used by the alphas could also be used to ascertain the hypothesis that external forcing also affects the time of evolution of the precipitation dipole, and the ensemble of simulations that the authors have used there are several driven by all forces if the forcing affects the possibilation dipole it can component of the empirical function, namely, the principal component should display some correlation across all simulations driven by all forcings. If the forcing has no impact, then this correlation across the simulations should be very small. Therefore, there is a relatively easy way to

support the initial conclusion of the study.

Response: We agree on your point. We calculated the correlations across the time series of the leading decadal precipitation mode (i.e., the principal components) simulated by CESM-LME 12 all-forcing simulations (Table R1). Except for autocorrelations for each principal component, the other correlations range from -0.06 to 0.35, and only 13.6% correlations are significant at the 95% confidence level. These relatively small correlations indicate the impacts of external forcings on the time variations of the leading decadal precipitation mode are very weak. The several significant correlations suggest that, to a limited extent, the time variations of the leading decadal precipitation mode could be affected by external forcings (e.g., volcanic eruptions and solar radiation) (Ning et al., 2020; Xue et al., 2023). Thus, internal variability played a dominant role in shaping the time variations of the leading decadal precipitation mode. We will add some related discussion in the discussion section of revised manuscript. Thanks very much for your information and suggestion!

Tabel R1. The correlations across the time series of the leading decadal precipitation mode simulated by CESM-LME 12 all-forcing simulations.

Cor	**#002**	**#003**	**#004**	**#005**	**#006**	**#007**	**#008**	**#009**	**#010**	**#011**	**#012**	**#013**
#002	1.00	—	—	—	—	—	—	—	—	—	—	—
#003	0.10	1.00	—	—	—	—	—	—	—	—	—	—
#004	0.14	0.15	1.00	—	—	—	—	—	—	—	—	—
#005	0.17	0.17	0.19	1.00	—	—	—	—	—	—	—	—
#006	0.16	0.14	0.16	0.11	1.00	—	—	—	—	—	—	—
#007	0.16	0.17	0.20	0.21	0.19	1.00	—	—	—	—	—	—
#008	0.20	0.19	0.26*	0.24*	0.18	0.25*	1.00	—	—	—	—	—

#009	0.12	0.14	0.15	0.11	0.08	0.12	0.22*	1.00	—	—	—	—
#010	0.16	0.19	0.26*	0.23*	0.12	0.31*	0.35*	0.08	1.00	—	—	—
#011	0.03	0.19	0.24*	0.16	0.16	0.12	0.17	0.10	0.16	1.00	—	—
#012	-0.06	0.04	0.01	0.02	-0.06	-0.02	-0.02	0.05	0.04	0.04	1.00	—
#013	0.09	0.08	0.15	0.20	0.05	0.16	0.11	0.03	0.14	0.09	0.07	1.00

* denotes significant correlation at the 95% confidence level, except for autocorrelations.

Reference:

Ning, L., Chen, K., Liu, J., Liu, Z., Yan, M., Sun, W., Jin, C., and Shi, Z.: How do volcanic eruptions influence decadal megadroughts over eastern China? J. Climate, 33, 8195–8207, https://doi.org/10.1175/JCLI-D-19-0394.1, 2020.

Xue, J., Ning, L., Liu, Z., Qin, Y., Chen, K., Yan, M., Liu, J., Wang, L., and Li, C.: The combined influences of solar radiation and PDO on precipitation over eastern China during the last millennium, Clim. Dynam., 60, 1137–1150, https://doi.org/10.1007/s00382-022-06372-4, 2023.

Particular points:

2) ‘Additionally, considering the superior performance of the Community Earth System Model (CESM) series in simulating Asian climate (Mishra and Aadhar, 2021; Ning et al., 2020; Xue et al., 2023),’

I would recommend rephrasing the sentence in a more specific way. In which sense is the CESM model superior? Does it produce better spatial patterns of precipitation or temperature or other recent trends, small realistic etc.. The judgements about the general superiority of a model about the models are usually unfair.

Response: Firstly, we apologize for the unfair judgement in the first version of manuscript. We will replace that sentence by “Additionally, to further explore the possible mechanisms underlying the linkage and the potential impacts of different external forcing factors, the Community Earth System Model Last Millennium Ensemble (CESM-LME, Otto-Bliesner et al., 2016) is also utilized because of its good performance in simulating Asian precipitation and summer monsoon (e.g., Hu et al., 2023; Mishra and Aadhar, 2021; Shi et al., 2018) and the availability of multiple samples forced by different forcing factors.”. In the revised sentence, we do not compare the performance of CESM-LME with the performance of other models anymore. The revised sentence emphasizes the good performance of CESM-LME in model evaluation. Thanks very much for your comment and suggestion!

Reference:

Hu, Y., Sun, W., Liu, J., Chen, D., Ning, L., and Peng, Z.: Decadal variability of precipitation over the Tibetan Plateau modulated by the 11-year solar cycle over the past millennium, Front. Earth Sci., 11, https://doi.org/10.3389/feart.2023.1137205, 2023.

Mishra, V. and Aadhar, S.: Famines and likelihood of consecutive megadroughts in India, npj Clim. Atmos. Sci., 4, 59, https://doi.org/10.1038/s41612-021-00219-1, 2021.

Shi, J., Yan, Q., and Wang, H.: Timescale dependence of the relationship between the East Asian summer monsoon strength and precipitation over eastern China in the

last millennium, Clim. Past, 14, 577–591, https://doi.org/10.5194/cp-14-577-2018, 2018.

3) line 166 : measures the supply of soil water to the atmosphere. ‘

Evapotranspiration does not really measure the supply of soil water to the atmosphere but the atmospheric demand of water. This demand might be supplied if the soil is wet enough, but not necessarily

Response: Firstly, we apologize for the wrong statement in the first version of manuscript. We will replace “the supply of soil water to the atmosphere” by “the atmospheric demand of water”. Thanks very much for your information and suggestion!

4) 164 ‘A larger aridity index indicates that relatively more moisture remains in the land, whereas a smaller aridity index represents drier condition’

This definition of the aridity index is real because the reader may assume that a larger ability in the index would indicate trial conditions and vice versa.

Response: In general, it is supposed that a large value of an aridity index would indicate a drier condition. However, a large value of the aridity index used in this study indicates a wetter condition. The aridity index here is defined with reference to Middleton and Thomas (1997), and this aridity index is widely used to produce the map of arid regions (e.g., Huang et al., 2016; Liu et al., 2019). To avoid misunderstanding, we wrote the above explanation (i.e., “A larger aridity index

indicates that…") right after the definition of this aridity index in the first version of manuscript. Thanks very much for your comment!

Reference:

Huang, J., Yu, H., Guan, X., Wang, G., and Guo, R.: Accelerated dryland expansion under climate change, Nat. Clim. Change, 6, 166–171, https://doi.org/10.1038/nclimate2837, 2016

Liu, S., Jiang, D., and Lang, X.: Mid-Holocene drylands: A multi-model analysis using Paleoclimate Modelling Intercomparison Project Phase III (PMIP3) simulations, Holocene, 29, 1425–1438, https://doi.org/10.1177/0959683619854512, 2019.

Middleton, N. J. and Thomas, D. S. G.: World atlas of desertification, 2nd edn, Edward Arnold, London, The United Kingdom, 1997.

5) Their ensemble pattern was also consistent with the reconstruction (Fig. 1b).'

how was the ensemble pattern calculated? is the sample pattern the average of all leading EOF patterns or was it calculated by concatenating all simulations in time ?

Response: The ensemble pattern is the average of all leading EOF patterns simulated by CESM-LME 12 all-forcing simulations. In specific, we first calculated the leading EOF patterns in CESM-LME 12 all-forcing simulations, and then calculated the arithmetic mean of these 12 leading EOF patterns. In the first version of manuscript,

we wrote the sentence “The analyses for the all-forcing simulations and the six subsets of single-forcing simulations were all based on the arithmetic mean of multiple members, which was the final step in the analyses.” (please see lines: 138–140) to explain the calculating processes. Thanks very much for your comment!

6) Conclusions discussion

In the present version of the manuscript, the discussion section comes after the conclusions, which is strange. Usually, the conclusion section is the last section in the manuscript. Also, the discussion section is rather limited. I address just the difference between the Little Ice Age and other periods regarding the precipitation dipole. This is a Small Part of the analysis, and the discussion's main points should be actually devoted to the issues of the precipitation dipole, internal availability, and external forcing.

Response: We agree on your point. As mentioned in the previous response, we will add some discussion about the relative impact of internal variability and external forcings on the time variations of the leading decadal precipitation mode in the revised manuscript. And we will exchange the order for the discussion section and conclusions section. Thanks very much for your comment and suggestion!