

Review by editor :Point by point

Dear Efraim Brill and co-authors,

Thank you for submitting the revised version of your manuscript.

While your manuscript has improved, a few points, mostly related to the Levant climate at the LIG and the information provided by proxy records, still need clarification. Please find below some details.

Thank you very much for your careful review of the revised manuscript. We appreciate the time and effort you devoted to evaluating our work. Your comments, together with those of the reviewers, addressed key aspects of the Levant hydroclimate during the Last Interglacial and helped us further improve the clarity and quality of the manuscript.

P2, L. 46: Define LIG at first occurrence and then use throughout.

Response: We have defined the abbreviation at its first occurrence by writing “Last Interglacial (LIG)” and now use the abbreviation consistently throughout the manuscript.

P2, L. 47: It would make more sense to compare the LIG with pre-industrial. This should be complemented with the main features of the LIG climate compared to the pre-industrial to provide more context to your study.

Response: To improve clarity, we removed the comparison with glacial periods and now explicitly compare the Last Interglacial only to the Pre-Industrial (PI) period.

P2, L. 48-51: These sentences need to be clarified. First, you mention the climate of the whole Levant (“dry”), then you contrast this with paleo-records suggesting “relatively wet” conditions. This is confusing. I note that the compilation of proxy records from Scussolini et al., 2019 mostly suggests wetter conditions compared to the pre-industrial (but overall the climate could still be “relatively dry”) with PMIP4 simulations suggesting a very minor increase in summer rainfall (Otto-Bliesner et al., 2021).

In addition, L. 52 “contrasting with the generally arid climate” without any citations contrasts with the long list of paleo-records suggesting wetter conditions at the LIG compared to PI. Please clarify.

Response: We revised this paragraph to clarify *when* and *where* wetter conditions occurred during the Last Interglacial. The text now explicitly states that increased precipitation was limited to the peak of the LIG and was spatially confined to the southern Levant, while the broader region remained generally arid. We further clarify that these wetter conditions are discussed relative to the Pre-Industrial (PI) period. It now reads as follows:

“During the LIG, the Levant was characterized by a generally dry climate overall (Torfstein et al., 2015, 2013; Kushnir et al., 2024). However, proxy-based reconstructions indicate that during the peak of the LIG (~127–122 ka), the southern Levant experienced relatively wetter conditions compared to the Pre-Industrial period, despite remaining dry in absolute terms (Torfstein et al., 2015; Torfstein, 2024). These wetter conditions were characterized by short-lived but high-intensity rainfall events and were spatially confined to the southern Levant, in contrast to the generally arid conditions prevailing across much of the region throughout the LIG.”

P15, L. 321: There is no evidence in your manuscript for a “hyper-arid climate” at the LIG in the Levant. Please provide some evidence and references. Similarly, please provide more details and references for “phases of moisture intrusion from the south”.

Response: We revised the text to clarify that the Last Interglacial was generally hyper-arid in the Levant, whereas its peak (MIS 5e) featured episodic wet phases. This clarification is now supported by additional references (Torfstein, 2019; Torfstein, 2024) and by explicit discussion of southern moisture contributions and enhanced weathering linked to high-intensity rainfall events. It now reads as follows:

“Proxy records indicate that the LIG was generally hyper-arid in the Levant; however, during its peak (MIS 5e), episodic wet phases occurred, driven by moisture intrusions from southern sources (Torfstein, 2019, 2024).”

L. 325: Do the proxy records provide evidence for seasonal changes in hydroclimate? This was not made previously evident in the manuscript.

Response: Thank you for this comment. While a few recent proxy-based studies attempt to resolve seasonal hydroclimatic changes (e.g., Tierney et al., 2022), such evidence remains limited and often inconclusive, reflecting the difficulty of robustly reconstructing seasonality from paleoclimate archives. Proxy records therefore generally provide limited direct evidence for seasonal hydroclimatic changes, and seasonality is typically inferred indirectly rather than explicitly reconstructed.

In the Levant, proxy-based interpretations of increased precipitation during the Last Interglacial peak often invoke enhanced southern moisture contributions, commonly linked to an intensified African Summer Monsoon. In this study, we suggest that these proxy signals may also be consistent with increased activity of Red Sea Trough systems, which transport moisture from southern sources and produce high-intensity rainfall events, predominantly during the autumn-spring seasons.

Our results thus provide a dynamical framework that complements proxy interpretations by offering an alternative mechanism for southern moisture input without requiring direct seasonal resolution in the proxy records.

L. 334-335: please provide references.

Response: We have added references to the relevant proxy and modeling studies already discussed in the manuscript to clarify this point. It now reads as follows:

“This study examined the hydroclimate conditions in the Levant during the LIG peak, focusing on the characteristics of weather types and the drivers of moisture balance. Drawing on previous proxy-based reconstructions (Torfstein et al., 2015; Torfstein, 2019; Kiro et al., 2020) and climate model simulations (Otto-Bliesner et al., 2021; Shi et al., 2020) from the 4th phase of the Paleo-climate Model Inter-comparison Project (PMIP4).”

Figure 1: Thank you for including the location of the proxy records discussed in the manuscript. Also including the qualitative change in hydroclimate (wetter/drier/no change) suggested for each of the proxy record at the LIG peak would further help with understanding your manuscript and would help you clarify the Introduction and Discussion.

Response:

“Thank you for this suggestion. The sites shown in Figure 1 represent the key proxy locations discussed in the manuscript, and all of them indicate wetter conditions during the LIG peak. Additional proxy records from the broader region also show a similar pattern of increased precipitation during this interval, further supporting the qualitative signal presented in the figure.

We note that questions regarding the source of the moisture or the intensity of rainfall events would require different types of proxy information, but the focus here is limited to the direction of hydroclimatic change (wetter/drier), for which the available records show consistent evidence of wetter conditions.”

Looking forward receiving your revised manuscript.