

Interactive comment on “Millennial meridional dynamics of Indo-Pacific Warm Pool during the last termination” by L. Lo et al.

Anonymous Referee #2

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Lo et al. presented here geochemical datasets on planktonic foraminifera from a new marine sediment core, MD05-2925, retrieved from the Solomon Sea. Using coupled Mg/Ca ratio and $\delta^{18}\text{O}$ from the foram tests, they successfully established records of both thermal (SST) and hydrological (d18Osw-ivc) changes through the last deglaciation at the core site. They found that the SST record resembles the temperature change over Antarctica, whereas the d18Osw-ivc profile follows approximately the temperature variation in Greenland. The observed asynchronous changes between SST and d18Osw-ivc suggest different control mechanisms on variations of IPWP SST and precipitation during the deglaciation.

The authors then grouped 6 marine cores from the North and South of the eastern IPWP, respectively, and came out stacked SST and d18Osw-ivc profiles for both sides

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of the Equator. They found that, surprisingly, the N- and S- stacked SST records are different in timing of initial warming as well as degree of warming during the abrupt events, such as H1 and YD. On the other hand, both the N- and S- stacked d18Osw-ivc records share the same trend of isotopic depletion after $\sim 18\text{ka}$, indicating a broad rainfall increasing in the whole region. The most exciting piece of information resulted from this practice is that Lo and his co-authors were able to use the divergences between the N- and S- stacked records, i.e. the N-S gradients of SST and d18Osw-ivc, to tease out the mechanisms that possibly control IPWP SST and rainfall patterns.

We found that the approach presented in the manuscript is novel, and results are interesting, and we would be happy to recommend publishing the manuscript if the authors can consider the following comments in their revision.

First of all, our main concern is that the reconstructed d18Osw-ivc from the studied marine core MD05-2925 (Fig. 4B) does not look quite similar to the S- stacked profile (Fig. 5C), in either absolute value or trend. For example, Fig. 4B presents the largest magnitude of d18Osw-ivc rising in YD, suggesting a dramatic rainfall decrease. However, Fig. 5C shows a sharp d18Osw-ivc decreasing in YD, suggesting a likely rainfall increase. In fact, the wet YD shown in the stacked d18Osw-ivc curve is not consistent either with the dry H1/YD pattern in Fig. 6.

The authors summarized in Fig. 6 a map of proxy-inferred precipitation in H1/YD, and proposed a precipitation boundary outlined between sites in brown and blue. Out of the three “wet” sites, however, only one (MD28) is a marine record. And, the interpretation of a wetter H1/YD at MD28 was concluded from “sediment thorium isotopic proxy” (page 3405, lines 11-13). But in all the other sites (brown dots), the dry condition was derived from d18Osw. Climate signatures of the two different proxies are possibly comparable. But, the original publication on MD28 core (Shiau et al., 2011, GRL) did report d18Osw data. Then, why not the authors cite MD28 d18Osw data here instead? And, should the record also be included in the S- stack?

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A few other comments, mostly cosmetic:

1. Page 3398, line 13. Meridional SST gradient is actually around 1oC during YD.
2. Page 3398, line 14. "events" and "snapshots" are redundant. Delete one of them.
3. Page 3398, line 15. "... the southern hemispheric branch ..." instead of "... the southern hemispheric convection branch ...".
4. Page 3400, line 16. "...cleaning..." instead of "...clean...".
5. Page 3400, line 17. which equation was used here to derive SST from Mg/Ca ratio?
6. Page 3400, line 23. "..., and data are reported with respect to... (VPDB)." Instead of "..., with respect to...(V-PDB)."
7. Page 3401, line 13. "... the published age models for ..." instead of "...an age model for ...".
8. Page 3401, line 23. in Fig. 3, the numbers of data points for d18O, Mg/Ca and d18O-sw are different. Why?
9. Page 3402, line 13. "... a strong climatic..." instead of "...a strong synchronously climatic...".
10. Page 3402, line 13. "... change of greenhouse gas concentrations ..." instead of "... greenhouse gases ...".
11. Page 3402, line 19. "... the east equatorial Pacific (EEP) ..." instead of "...the east equatorial Pacific...".
12. Page 3402, lines 15-20. This mechanism is very intriguing. However, if it works, how does this current advection ("ocean tunneling") affect 14C age reservoir correction and water salinity at eastern IPWP sites?
13. Page 3402, line 23. Fig. 4a also shows a warming during B/A, despite that it is relatively subtle, ~1oC. Why?

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14. Page 3402, line 25. "A relatively stable ..." instead of "A relative stable ...".
15. Page 3402, line 26. "... from 23.0 to 16.0 ka." instead of "... from 23.0-16.0 ka".
16. Page 3403, lines 3-5. The d18Osw-ivc increase in the Solomon Sea might be partially attributed to a strong evaporation, during to a higher temp. during H1 and YD. But of course, it could be argued that the evaporation effect should be negligible, as a lower salinity was registered in B/A while temp. could increase for about 1oC. Nevertheless, the evaporation effect should be acknowledged in the context.
17. Page 3403, line 6. "... from high-latitude Northern Hemisphere ..." instead of "... from high Northern Hemisphere ...".
18. Page 3403, line 18. "This timing is synchronous with ..." instead of "This timing is synchronously with ...".
19. Page 3403, line 21. "Instead, ...represents..." rather than "Instead of that, ...represent...".
20. Page 3404, line 25. "Observations over ..." instead of "Modern observatory data over...".
21. Page 3406, lines 13-15. This is a rather vague statement. What are the hemispheric climate events? Did the authors refer to temperature changes over Greenland or Antarctica? Authors also mentioned a few times in the text "greenhouse gas concentration". Better to state it clearly as the radiative forcing of atmospheric greenhouse gases.
22. Page 3406, lines 18. "... HC anomalies." instead of "... HC circulation anomaies."
23. Figure 6. "MD65" was labeled twice.

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