

**Author's response to Anonymous Referee #2 interactive comment on “Hydroclimate variability in the low-elevation Atacama Desert over the last 2500 years” by E. M. Gayo et al.**

We thank the reviewer for his/her positive judgments on our study. Referee’s comments and suggestions are very helpful to improve our manuscript. In the revised manuscript, the revision includes the following aspects:

**I- Minor comments**

*Comment 1: My only editorial comment refers to 3177, line 26-27: “over the last 14.6 million of years” should be “over the last 14.6 million years”.*

**Reply:** We have changed “over the last 14.6 million of years” for “over the last 14.6 million years”.

**II- Comments on figures and tables**

*Comment 1: Table 1 Radiocarbon – probability curves would be a helpful visual to accompany provenience and raw data. Alternatively, you might reference Figure 5 within the Table 1 caption to point out the dates in graphical format.*

**Reply:** A summed probability distribution of <sup>14</sup>C-dates would indeed complement the information presented in Table 1. Yet we prefer the second alternative for two main reasons: 1) the summed probability curves are subject to biases throughout the calibration process, in particular those artifacts introduced by the calibration curve itself (e.g.; Michczynski and Michczynski, 2006; Steele, 2010; Williams, 2011). These biases are often addressed by using several standard procedures (see Williams, 2011 recently accepted in JAS) but we believe that their implementation is not a major goal of this study; 2) the addition of a probability curve necessarily implies an extra figure in the revised manuscript, not a practical option as it would increase the fee for its publication. Hence, we have modified the caption for Table 1 as follows: “*Table 1:*

*AMS dates and depositional context for the 22 records used in this study. Calibrated ages in years BP and corresponding confidence intervals at 2 $\sigma$  level are illustrated graphically in Figure 5a.”*

**Comment 2:** *Table 2 plant macrofossil – middle of Table 2: why are there six locations with no data (i.e., QM-3, -14, -16, -18, -22A, -22C)?*

**Reply:** All of these samples contain *Prosopis* sp remains. The apparent lack of data for these samples within the table is due to formatting and alignment errors. So, we have added commas to group those samples that share a fossil taxa.

**Comment 3:** *Figure 4. I like the idea of including each of the images, but at the current scale, they are much too small to be effective. Groups of 2, 3, or 4 would be helpful. Of course, this would require several more figures, but the information would be much more effective and appropriate. As it stands, the figure would be very ineffective in print copies of the manuscript. Readers can zoom with respect to on-line viewing, but is a bit of an inconvenience.*

**Reply:** We agree with the referee that the current size for Figure 4 is not effective and that by splitting this figure into separate files we certainly improve the information regarding the diversity of paleoecological and archeological records preserved at Quebrada Maní. The fee for the publication of this manuscript in *Climate of the Past* journal, however, increases as more figures are added. For that reason, we have revised Figure 4 to include the key photographs for the purpose of this diagram: the QM-16 in situ leaf-litter mound, a floodplain irrigation channel besides of a stone-lined crop field (melga). We have moved the remaining eight pictures -either of paleoecological or archeological vestiges- into a separate supplementary section (Appendix A).

**Comment 4:** *Figure 5. Image should be a bit larger; difficult to read (particularly in print, but see comment on figure 4.).*

**Reply:** We totally agree. Figure 5 is a key figure that highlights the exciting relationship between changes in the ENSO/NAO mean state over centennial timescales (inferred from other proxy-records) and hydroclimate variability at the low-elevation Atacama Desert over the last 2500 years. This figure seeks to evaluate potential causal mechanisms for centennial-scale changes in hydroclimate conditions detected at Quebrada Maní. To break this figure up into two or more figures would not be effective. We thus believe that a more adequate figure was to keep the continuous and high resolution ENSO proxies that span the complete 2500 yrs and exclude the Makou et al. 2010 record from the revised Figure 5. This figure needs to be printed full-scale on an entire page of the Journal.

*Comment 5: Figure 5B. Is it possible to color coordinate lithic concentrations high/low with the red line to which it is linked?*

**Reply:** We have aligned the red arrow that explains changes in lithic concentrations across the Peruvian coast record to its corresponding red line in the revised Figure 5.

*Comment 6: Figure 5C. Should 'dashed horizontal line' be written as 'solid horizontal line'? There is no dashed line present.*

**Reply:** The submitted Figure 5 file has a dashed horizontal line to highlight modern summer sea surface temperature ranges for the Vøring Plateau (Andersson et al., 2003). Nevertheless, this line looks solid in the figure contained within the manuscript that the referee has handled. In order to avoid any issue with this line in printed versions of our manuscript, we changed the dashed horizontal line for a solid one in the revised legend and file of Figure 5.

### **III- References**

Andersson, C., Risebrobakken, B., Jansen, E., and Dahl, S. O. (2003). Late Holocene surface ocean conditions of the Norwegian Sea (Vøring Plateau). *Paleoceanography* **18**, 1044.

Michczynski, A., and Michczynski, D. J. (2006). The effect of PDF peaks' height increase during calibration of radiocarbon date sets. *Geochronometria* **25**, 1–4.

Steele, J. (2010). Radiocarbon dates as data: quantitative strategies for estimating colonization front speeds and event densities. *Journal of Archaeological Science* **37**, 2017-2030.

Williams, A. N. (2011). The use of summed radiocarbon probability distributions in archaeology: A review of methods. *Journal of Archaeological Science* **Accepted**.