

Interactive comment on “Climate history of the Southern Hemisphere Westerlies belt during the last glacial-interglacial transition revealed from lake water oxygen isotope reconstruction of Laguna Potrok Aike (52° S, Argentina)” by J. Zhu et al.

Anonymous Referee #2

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This paper addresses the climate interpretation of a high resolution ca. 25,000 year long $\delta^{18}\text{O}$ of lake water reconstruction. The description of the site, reconstruction methodology and regional climate are described here and in other papers already published by the group. Overall the manuscript is well presented and figures clear. Hence should be published. My main concern about the paper is that given that the climatic interpretation of the results is not straightforward, different scenarios a given, and the end the message does not come across very clearly. Clarifications in the interpretation

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need to be addressed before publication. The climatic setting and the forcings on the lake show some variability, so that there is no one clear interpretation for a same $\delta^{18}\text{O}$ value. I might have misunderstood some of the reasoning, so please clarify. Discussion The discussion of the results is separated in 3 stages. 1. Glacial period: here the main discussion is how/why the mean $\delta^{18}\text{O}$ values are only 3‰ lower than at present, the authors present 2 different scenarios: 1. $\delta^{18}\text{O}$ of meteoric water and groundwater markedly lower than present: depleted $\delta^{18}\text{O}$ by colder temperatures would then imply that evaporative enrichment has to be even stronger than at present → SHW were stronger during the LGM? I would state this hypothesis clearly at the end of line 25 of page 2436. Page 2437, Line 16: “higher-than-expected” change to “higher than present”? Line 25: I don’t understand this sentence: “In fact, paleoclimate studies from sites between 30 and 45S in southwestern South America have implied much higher precipitation during the Glacial compared to the present”. If your evidence requires stronger winds at 52S during the glacial, and other studies suggest stronger winds at 30-45S, then the SHW became a LOT wider? Please clarify what exactly you want to say here. (ii) Moderate change in $\delta^{18}\text{O}$ of source water compared to the present Here the idea is that the SHW were shifted equatorwards, hence balance of easterly and westerly air masses at study site changes. page 2438, line 2: “If the SHW is located” change “is” to “are”. Question: why is it assumed that the temperature / $\delta^{18}\text{O}$ relationship from Punta Arenas does not hold for precipitation from Atlantic origin? Page 2438, lines 9-27: I don’t understand the argument here. The discussion about permafrost and its effect on the hydrological balance of the lake is also valid for hypothesis (i), or not? 2. Deglaciation: this discussion seems clear enough. Are these interpretation consistent with Moreno et al, 2012? (Deglacial changes of the southern margin of the southern westerly winds revealed by terrestrial records from SW Patagonia (52_S)) Conclusions: Why are the SHW not mentioned in the summary for the glacial part of the record? Was the conclusion not that the SHW where further equatorwards? Other comments Page 2421, line 17: what do the authors mean by “variable precipitation”? Low correlation is also probably related to the low elevation of the Andes at 52S? Ab-

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stract: The description of the results could be done in a clearer way. I understand that the authors describe 3 stages: glacial, deglaciation and Holocene, but at this point little interpretation of the evolution/changes of SHW is provided, as you would expect from the title! Figures: Figure 1a: include position of Punta Arenas. Could you also include topography to see the Andes?

Figure 2: the color scales in both panels are not exactly the same, which makes the reading difficult. If you are only interested in the westerlies then I would just plot $u > 4\text{m/s}$ (or something like this). This would help the discussion on the latitudes at which the SHW are significant.

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