

The reviewed manuscript focuses on the local variability of reservoir effects for radiocarbon dating on the Southern Puna Plateau (Argentina) comparing samples from different positions in and around Laguna del Peinado. The authors tackle reservoir effects, an important issue for the investigation of age-depth relationships for lake sediments and provide information about possible error sources.

Through the analysis of seven distinct samples, the authors demonstrate how and to which extent magmatic CO₂ and ancient groundwater effects the ¹⁴C composition and deliver a detailed and well-referenced investigation of possible error sources. In addition, these results are compared to a new sediment core from the lake providing four downcore radiocarbon samples and to a core from a previous study. The overall result of the manuscript is the spatial variability of the samples around but also within the lake, opening new questions about correcting the lake's sediment chronology.

Strengths:

The aim of the manuscript is communicated clearly and the methodology of the study is well-suited to achieve it. The authors use a large number of relevant references and implement them nicely to their own results. Future studies especially at this location as well as from comparable areas will benefit from this manuscript in terms of dating. The manuscript provides all necessary information to comprehend the methods.

Weaknesses:

The overall weakness of the study is mentioned and discussed by the authors themselves: results would have benefitted from more samples, e.g. by having short cores from additional and especially more southern locations of the lake. Nevertheless, the study is well discussed and the arguments seem logic.

Contribution:

The contribution to the field seems significant, especially for studies of comparable locations. However, as the article provides no clear solution for the correction of reservoir effects for downcore samples from this lake, it only serves as a well-discussed summary and estimation about potential sources of error.

Conclusion:

Overall, this manuscript provides an interesting investigation of regional effects on radiocarbon dating and summarizes related information. It delivers a well-structured overview of previous studies from the study area and topics combined with new results. While the article has some limitations with regard to the sample size, it is a valuable addition to the literature of the studied location and to comparable areas providing insights into the interpretation of radiocarbon dates.

The manuscript follows the classical structure in an appropriate balance and is written in a clear and fluent language. I have only minor comments and questions to the manuscript:

Page 1

Line 22: Please check if it would make more sense to use here the term "younger" instead of "lower".

Line 28: The introduction is very well written and the problem investigated and the aim of the study are clearly described. However, I think the manuscript might benefit from a few sentences about reservoir effects in general and/or definitions like the terms "C14-free", "C14-depleted", Please consider adding some sentences.

Page 3

Line 80: I am not familiar with the study area, but as it is written “currently” I asked myself if information is available about the frequency of lake level changes and/or the history of earlier connections of both lake systems. In both cases the authors should add information here.

Lines 85 – 98: The climate patterns are well described, but to follow this paragraph even better, the manuscript would benefit from an addition of the climate patterns to Fig. 1.

Page 6:

Line 139: I have three questions/comments to Table 1:

- (1) I count six question marks in the table, e.g. “Hot spring 4?”. These uncertainties are not mentioned in the text or the Table caption. Question marks should be explained to avoid confusion.
- (2) The first two samples result in two calibrated ages each. It should be explained why this is the case.
- (3) Please explain why not all radiocarbon ages have been calibrated.

Page 9:

Line 172, 174, 180: The authors refer to Figure 4 only. Its orientation becomes clear only in comparison to Figure 1. However, I wish either an indication of e.g. “western hot spring”, a north arrow or maybe a numeration of the hot springs as indicated in Fig. 1 with sample names added to Fig. 4. Otherwise, this paragraph might not be understandable without comparison to Fig. 1. Moreover, Fig. 1 should be referred in addition to Fig. 4.

Page 12:

Line 257: How do the authors proceed with the sediment core and develop the chronology? I would suggest to implement this information here or somewhere later in the manuscript.

Line 263: Are there lithological indications that would support the hypothesis of a hiatus in the sediment core?

Page 16:

Line 380-381: Please check if the published year should be changed to 2022, as indicated on the journal’s homepage