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Climate of the Past Discussions

Interactive comment on "Holocene glaciation in the Rwenzori Mountains, Uganda" *by* Margaret S. Jackson et al.

Anonymous Referee #1

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Decision: reject – inappropriate journal.

The manuscript "Holocene glaciation in the Rwenzori Mountains, Uganda" by Jackson et al., presents a new set of Holocene cosmogenic dates (n=12) from 2 valleys in Uganda. In my opinion, this study should not be published in the journal Climate of the Past. The primary reasons for this are (1) it is too regional in significance to be appropriate for COP (note the title- does not really reflect an inference about climate); (2) in my opinion it has a very limited ability to provide any concrete climate inferences, not because of the study design, but because of the number of samples, and the quality of the data that can be provided from the limited chronological constraint provided by these dates.; (3) the main conclusions, while theoretically plausible, are not unambiguously supported by the data, and this is not clear from the abstract or conclusions; (4)

I am concerned that given the reliance on ages that are presented and under review elsewhere (Jackson et al., under review), for the interpretations that are being made in this paper, that really the two papers should have been combined and splitting the manuscripts in two seems unjustified. I explain in more detail below.

The paper presents only 12 dates – a small number to constrain any sort of cosmogenic glacial history, particularly since the authors have several other papers published or currently in review from the same sites. Without seeing the other papers, the apparent justification is that this paper is focused on Holocene variability. The authors thus present some older deglacial ages (e.g., 10-12 kyr BP) that appear to be from the other Jackson et al.,in press paper, some latest Holocene ages (300-500 yr BP, n=4), in another valley 5 boulders on bedrock – not associated with glacial moraines (11-12 kyr (n=2), ∼4 kyr BP n=3) and samples of bedrock in the uppermost cirque from this valley (5-6 kyr, n=3).

The way I would interpret this data is that it does seem that you had an early Holocence deglacial retreat at 11-10 kyr BP. And there is evidence from one site that there was a small standstill or readvance during the Little Ice Age (note that this readvance is seen in other African localities, including Mt Kenya and Kilimajaro, I think. The interpretation of the other boulder ages is ambiguous. The upvalley cirque ages of 5 kyr are the same as the valley boulders. So how do we interpret these boulder ages? They are not associated with any geomorphic features, so they may just reflect material deposited during retreat of the ice, and their age may not have any real meaning (ie perhaps they are simply inherited cosmogenic nuclides. Alternatively, the 5kyr ages in the uppermost cirque may suggest that the valleys were basically ice free by 5 kyr.

From this data they make several inferences:

1- glaciers did not readvance beyond their late Holocene maxima during the early or mid Holocene. This is possible, but given that the record is inherently erosive, it is hard to say anything from the absence of evidence. The old ages in the upper cirque

bedrock do seem to support this inference (that ice was gone by 5 kyr) but then the authors also say this: Line 355 “Although the timing of ice recession and re-nucleation within the cirque cannot be established with the data presented here, the bedrock 10Be concentrations suggest that the cirque remained ice-free for a significant portion of the Holocene Epoch.”

2- Line 436 “our comparison. . . indicates that ice masses did not respond linearly to temperature.” From the really limited data here, I don’t see how you can say this. The delay may be simply a lag in the response rather than a nonlinear adjustment

3- Line 552 conclusion: “Based on a comparison of tropical East African glacial fluctuations with regional climate records, we suggest that temperature acted as the primary control on glacial fluctuations throughout the Holocene”

I have two concerns about this statement. First is that it is hard to establish the relationship between the glacial chronology and temperature reconstructions given the limited constraints. Essentially what we have is that ice retreat started in the early Holocene and was likely complete by 5 kyr (unless there is cosmogenic inheritance in the upper cirque bedrock). The African lake temperature records do show a signal that is consistent with this but it is not the only explanation. For example, several of the precipitation records also show declining values from 11-12 kyr and could be partially responsible for the glacier retreat. Essentially the problem is that we have very little we can say about what happened during the Holocene from these samples. Furthermore, there is no apparent cooling during the Little Ice Age in the temperature records which could account for the glacial readvance at that time.

Its not clear that the South American comparison is all that convincing of a tropics-wide temperature mechanism. Both Africa and South America chronologies suggest that retreat started early and the most extensive subsequent advance was in the latest Holocene. But South American records show evidence of much greater dynamics (presumably associated with rapid retreat) after 5 kyr, whereas at Ruwenzori, the ice

was already nearly gone by that time.

As a final point, I note that the authors did not appropriately reference the literature in making some of their statements. For example:

Abstract Line27: I think it is incorrect to say that “little is known about the response of tropical glaciers”. There is literature from South America for certain, and though I am less familiar, probably in Asia as well.

L411 –Garcin 2007 is not the appropriate reference for the African Humid Period. I suggest referencing some of the early primary literature by Francoise Gasse and other leaders in the field.

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