

Comments on: Precipitation as the main driver of Neoglacial fluctuations of Gualas glacier, Northern Patagonian Icefield

General Comments

This is an interesting and very valuable contribution to the literature on glacier and climate change in Patagonia. It uses multiple techniques to assess the fluctuation history of the Gualas glacier and makes inferences from these about the likely climate drivers. Overall it forms a high quality and comprehensive addition to the study sites in Patagonia and is of at least regional significance, given that the authors have reconstructed variations of a major glacier of the NPI throughout much of the Holocene. This has not been achieved before and this helps to answer questions about Southern Hemisphere climate change, and to test competing hypotheses concerning Holocene glacier chronologies (such as the Mercer-type and Aniya-type chronologies).

However, I do note that a related paper has been recently published in *The Holocene* by Fernandez et al (and including Bertrand in the author list). This latter paper is on the same glacier, and uses the same marine core to reconstruct glacier variations and climate change over the Holocene period. I therefore have to ask in what ways is the present manuscript materially different from the paper already published? If the authors can make it clear that the present manuscript adds considerably to *The Holocene* paper, then I think it should be published. As a consequence, the authors need to: 1 more explicitly discuss the findings of the earlier Holocene paper, and, 2 show how the present manuscript adds significantly to the story.

Specific Comments

I have two main comments.

1 at several places in the sediment cores changes in sediment supply or changes in sediment character are interpreted as representing advances or retreats of the Gualas glacier. For instance on page 2951 lines 12-15 the authors suggest that high sediment accumulation rates reflect reworking of freshly exposed glacial sediments by proglacial streams, and therefore that the glacier was undergoing recession at this time. However, other possibilities for increased sedimentation cannot be discounted. It could reflect switching of the fluvial network, the resedimentation of unused sediment stores, increased sediment input from valley-side streams or changes in glacial erosion driven by shifts in climate. The Gualas/Reicher system is highly dynamic and there is clear sedimentary evidence of large drainage events of the Reicher Lake which would have introduced sediments into the catchment to be deposited downstream. Overall, while I agree that paraglacial processes are likely to increase sediment accumulation other options should at least be discounted.

2 as a result, the interpretation of glacier variations from the core sediments probably needs some additional caveats.

Technical corrections (specific points are listed as page and line number).

- Haberle and Lumley (1998) is not referenced
- I could not see that Perdue et al (2007) was cited in the text.
- 2939, 8. Insert 'into' before 'three'.
- 2939, 22. I think that 'demonstrate' is too strong a word.
- 2940, 13. I don't understand this. The last two centuries form part of the Holocene.
- 2940, 15. Harrison et al 2008 used OSL and CRN as well as radiocarbon dating.
- 2940, 29. This is the first time that San Rafael glacier is mentioned. Where is this?
- 2941, 2. Harrison is spelt wrongly.
- 2941, 3. 'valid prior to the last century'the Winchester and Harrison reconstructions looked at nineteenth century recessions.
- 2941, 26. The Glasser et al. (2011) paper looks at a longer time period than Rignot et al (2003).
- 2942, 16. Harrison and Winchester is 1998 not 1988.
- 2947, 12. Delete 'described' and insert 'interpreted as'.
- 2948, 6. Delete 'Lumney' and insert 'Lumley'.
- 2952, 3. How do you know that the moraine is Holocene in age?
- 2952, 4. delete 'high' and insert 'rapid' or another word.
- 2952, 24-26. Could the twelve thin layers represent periodic drainage from Reicher?
- 2953, 8. Part of Gualas is still calving?
- 2954, 2. insert 'hypothesised' before 'record'.
- 2954, 5-8. Also dendrochronology and limited OSL and CRN dating.
- 2956, 2. The glacier is called San Quintin not Sin Quintin.
- 2956, 14 and 19. The authors are 'Lumley and Switsur'.
- 2958, 4. Neukom et al. (2010a) is cited after Neukom et al. (2010b). It should be the other way around.
- 2965. Table 1 core depth column and ages. The ages do not correspond to core depths. This needs to be further discussed.
- 2975. Figure 7. How representative is the data from Gallegos River? The authors should use data from a range of proglacial rivers to compare the sedimentology of the core units.
- 2978. The author is 'Harrison' not 'Harisson'.