

Interactive comment on “Little ice age advance and retreat of Glaciar Jorge Montt, Chilean Patagonia, recorded in maps, air photographs and dendrochronology” by A. Rivera et al.

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This is a valuable contribution to the literature and should be published in COP and would significantly add to this special issue. I have a list of suggestions and comments below that primarily fall under the heading of edits and suggestions to remove repetition. I hope that these suggestions make the paper more readable and streamlined.

Other comments refer to the use of the tree-ring data and radiocarbon dating – I suggest that authors report more fully the calibrated dates and better clarify how the C-14 and tree-ring records fit together. The authors need to be consistent when reporting the dates – in the abstract they are calibrated BP and in the text not calibrated – even

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though there are only two dates the authors may want to put in a table with the dates and the calibration along with lab numbers and calibrated dates that they cite from the others studies from Mercer and others.

Specific comments:

Title: Little Ice Age should be capitalized. I suggest deleting the portion of the title “recorded in map, air photographs and dendrochronology”. The techniques (which also includes radiocarbon) can be discussed in the abstract.

Abstract: Page 3132 - ln 3 - subst. “largest” for “main frontal” to “greatest terminal”. ln 5 – This retreat has revealed trees. . . ln 6 delete “of the glacier” and delete “Samples of ” and delete “methods” ln 7 – I am not sure how the dendrochronology and maps show the glacier was at its present position before the LIA? - the radiocarbon dates suggest this? ln 7,8 – delete “before the beginning” ln 11 – subst. “warming” for “changes” ln 13 – “opened a 19.5km-long fiord since 1900, which reaches depths in excess of 390m . The bathymetry is well correlated. . . Introduction: Page 3132 – line 21 – “over 118 glacier covering approximately” delete “and a total ice-covered are of” ln 24 – do the authors mean that the LIA ended between 1650 and 1750 AD?

Page 3133 – ln 1 – delete “positive behavior” change “advancing” to “advances”. ln 2 “delete “well after the end of the LIA” ln 4 ‘ change “such as” to “including” ln 5 – delete “characteristics” ln 7 – delete “and shrink” ln 7,8 – delete “climate variability and” ln 9 – delete “other factors including” ln 10 – substitute “will in turn” for he first “may”

It seems that the paragraph in lines 12-22 should come earlier in the introduction. Lines 25-26 – delete “the famous naturalist, among other members of the crew)”

Page 3134 – line 1 delete “Despite these dramatic” and use “These accounts of PIO XI are rare and relatively little. . . ln 3 – delete “main” and substitute “larges” – tidewater glaciers should be “tidewater” or “iceberg-calving” glaciers. ln 6 – delete “as a conse-

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quence” and use “from” Ln 10 – delete “with an areal thinning” and use “at a” Ln 11 – delete “rates” Lines 12-16 need rewriting “In this paper we present the 20th century changes of Glaciar Jorge Montt based on historical records , aerial photographs and satellite imagery. The main purpose. . . Ln 24 – use “The first” Ln 25 – a reference is needed here. Ln 26 – “have been found, due to” subst. “were made by”

Page 3135 – Ln 1 – substitute “that” for “who” Ln 2-3 – delete “are not very precise, but they contain” and use “have” Ln 6 – substitute “earliest “ for “oldest” Ln 7-8 – Place a period after “Chile” and delete “collecting the first aerial photographs of the region”. Ln 9-10 – delete “The TRIMETROGON aerial survey was” and replace with “and were” combining the two sentences. Ln 11 – place a period after icefields. And start a new sentence with “This imagery” Ln 13 – delete “So-called” Ln 20 – “is” should be “are”

Page 3136 Ln 2 – “are” should be “were” Ln 5 – delete “described above” Ln 6-7 – delete the first sentence Ln 9 – substitute “are” for “were”

Page 3137 Ln 3 – delete “analysed” and “basins” Ln 7-8 – delete “generated after significant glacier retreat in the prior decade”

Ln 14 – delete – “and was” Ln 17 – delete “covered by” and substitute “of” Ln 20 – delete “The available” and combine the first two sentences using “with” Ln 21 – delete “the SRTM data is”

Page 3138 Ln 6-7 – insert “map” between “to” and “the glacier by boat.” Delete the second sentence Ln 16 – substitute “sea” for “salty” Ln 25-26 – delete first sentence Ln 28-29 – use “ice” for “brash ice and icebergs” Ln 7 – substitute “While for “whilst” Ln 8 change “lateral” to “tributary” and delete “only” Ln 9 – Delete “From the outermost perimeter of these trees” and start the sentence with “Samples were collected from the outer several rings for” Ln 16-17 – be clear that this floater is tied to radiocarbon dates? – Rather than “tree-ring” use “ring-width”, delete “of the region” Ln 20 – delete “expert” Ln 22-23 – delete “in preparation for the Chilean position at the arbitration tribunal dealing with” and use “during”

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Page 3139 Ln 1 – delete the “(Ventisquero in Spanish)” unless he called it that? Ln 2 – delete the “located to the south and” Ln 6 – delete “whole” Ln 8-9 – delete the first sentence, the next sentence begin with The USAF TRIMETROGON survey of 194/45 documented that the terminal position of Glacier Jorge Montt had retreat 6.7 km since 1898, a retreat rate of 146m/yr. Ln 17-18 – start sentence “The 1963 Corona image of Glacier Jorge Montt showed a moderate. . . Ln 19 – change “is” to “was” Ln 20 – delete “as seen in the 1945 photo” Ln 21-29 – is this detail needed? At the least it should be streamlined/condensed.

Page 3141 Ln 1-2 – substitute “was” for “is”, change “sea water” to “tidewater” Ln 3 – change “whilst” to “while” Ln 5-29 – this descriptive section again is somewhat dense and could be streamline to include what the authors thought to be the most important points in a few sentences.

I would suggest putting the Bathymetry section in the methods in with the Bathymetric Survey section. Or the Bathymetric Survey section could be included in the Discussion of retreat section to avoid repetition.

Page 3143 Ln 19-21 – the Tree Sample section discusses the radiocarbon dating – how was the calibration done – was it one sigma or two – how did the authors come up with the unique AD dates – does the spread in the dates reflect a C-14 plateau. I would suggest the authors consider using Telford, R.J., Heegaard, E., Birks, H.J.B., 2004. The intercept is a poor estimate of a calibrated radiocarbon age. The Holocene 14, 296–298 or at least report the 250+/-40 date as having other possibilities in addition to the 1650 AD date. In addition the dates along with their lab numbers should be cited.

In addition, in this section it is clear that the two C-14 ages correspond to the wood in the floating chronology but which pieces and do are they from outer rings of trees that were killed at the same time? Or not? These data should also be incorporated in the figure.

Page 3144 Ln 5 – delete “with a high interannual variability” – there I really no basis for

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this statement.

Discussion: I wonder about this polynomial fit – do the authors suggest that previous studies showing linear fits are incorrect – can it be some of the variation in calving rates with water depths is due to changing fiord geometry – ie. widths or dynamic controls?

Page 3146 Ln 1-10 – the authors should cite their figures in this section. Ln 19-5 on page 3147 – this section is speculation and could be removed. Ln 9-20 seems like an add-on and does not really add to the story.

Conclusions: The conclusion section jumps around – I suggest organizing it according to the chronological history – placing all the LIA information in the first paragraph and then this historic retreat and observations on the glaciology.

Figures: Figure 2 – does not really add much to the paper – I suggest removing it.

Figures 1 and 3 could be combined into one figure with two panels.

Figure 5 – does not add too much to the paper and could be removed. The a898 ice margin could be plotted on Figure 4.

Figure 9 implies that very small differences in water depth can lead to significant changes in calving – it seems here is where dynamics would be in control and the glacier would then be less sensitive to water depth changes?

I hope these comments and suggestions are helpful, this is a solid contribution and would benefit from streamlining and removing some of the clutter that takes away from the main point of the paper.

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