

Interactive comment on “Recent acceleration of ice loss in the Northern Patagonia Icefield based on an updated decennial evolution” by P. López and G. Casassa

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Lopez and Cassasa (2011) provide a valuable and quite comprehensive review of the response of North Patagonia Icefield (NPI) to climate change over the last decade compared to 1975–2000 and a comparison of glacier thinning from 1975–2000 versus 2000–2005. The paper is a substantial addition and improvement in terms of comprehensive coverage from Rivera et al (2007). This paper will be a valuable contribution on glacier response to climate changes from one of Earth’s larger alpine glacier icefield’s. For now the paper must be rewritten for clarity and conciseness, so the key methods and data results are better emphasized. I have divided my comments into three sec-

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tions, key issues, suggested rewrites, and minor items. The most important item is an expanded examination of the variation in thinning with elevation on several glaciers to document the important similarities and differences in changes along a longitudinal profile, such as is exhibited for the ice sheet as a whole in Figure 8. This is a more important parameter than the detailed mapping and discussion of length changes that are documented using the final 6 figures, and several pages of text. The studies most important finding is the lack of thinning above 1150 masl and the increase in rate of thinning below 800 masl during the 2000-2005 period.

Key Issues

3337-13: The distribution of NPI thinning is well illustrated overall in Figure 8. In the same figure or an additional figure, it would be valuable to illustrate the extent of thinning with elevation for a few key glaciers discussed. Is the thinning a consistent pattern with elevation? Does the thinning extend higher on east or west NPI glaciers? Is thinning more consistent for the 1975-2005 or for the 1975-2000, 2000-2005 periods? Colonia, Gualas and Steffen Glacier would be the obvious choices for detailed profile of thinning with elevation. The data set is much larger and robust than Rivera et al, (2007) and the resulting figure should be similar to the Figure 4 from that paper, but I would expect much less scatter.

3339-26: An examination of Landsat imagery from June 6, 2009 and June 8, 2010 provide a view of the winter TSL on NPI, is the statement of winter snowline valid?

3346-14: The glacier thinning is primarily confined to the ablation zone, given the slight thickening above the ELA this suggests a temperature forcing and not a precipitation signal driving the thinning.

Table 10 and 11: Both list latitude and longitude. Instead of this redundancy in one of the tables add a column to denote calving or no calving, also a column to denote elevation range of thinning or terminus elevation.

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Figure 9 is unnecessary; given Figure 11a only changes the units

Figure 12 and 14: Use only one of these as only the units are changed.

Figure 19 and 20 should be reversed in order to be consistent with other glaciers.

Suggested Rewrites: These are samples, but not the only sections that require this type of attention.

3324-19 to 28: The abstract devotes too much time to frontal changes-suggested rewrite. "Between 2001 and 2011 Gualas, Reichert and Steffen Glacier on the west side of NPI retreated more than 1.6 km. The most significant retreat observed on the eastern side was experienced by Colonia Glacier of 1 km."

3358-23-3339: Keep all units to percentages, suggested rewrite. Given the size differences among the glaciers of the NPI, the surface changes must be therefore interpreted in terms of their original area in 2001, as shown in Fig. 14. The largest shrinkage has been experienced by HPN-1 Glacier with a loss of 3.2%, followed by Steffen Glacier at 2.8 %. Gualas, Reichert and Fraenkel glaciers lost 2.4% and Strindberg Glacier 2 %. All the mentioned glaciers are located on the western side of the NPI Fig. 14. On the eastern side of the NPI, the highest shrinkage was observed for Pissis at 1.9 %, followed by Cristal 1.5 % and Colonia 1.1 %. The rest of the glaciers located on the eastern side of the NPI experienced a surface reduction of less than 1% in the 10-yr period. In Fig. 14, the percentage of surface reduction of the period 1979–2001 is compared to that calculated for the period 2001–2011. The most striking feature is the enhanced shrinkage experienced by Steffen Glacier which lost 2.8% of its surface during 2001–2011 compared to 2.6% between 1979 and 2001. Gualas Glacier increased its rate of shrinking as well from 0.14% in 1979–2001 to 0.28% in 2001–2011. The rate of shrinkage of San Rafael Glacier San Quintin, Soler and Pared Sur, declined from 1979-20001 compared to 2001-2011. Reichert , Acodado, and Benito maintained the same rate of loss.

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Table 5-7 combined:

Period Dh o Records Total Dh Records Ablation Dh Records

1975-2005 -0.95 27.5 93283 -0.73 407746 -1.7 239130

2000-2005 0.2 24.2 93696 -0.81 348544 -2.36 198063

1975-2000 -1.36 24.8 94020 -1.12 800985 -2.64 340817

Minor Items:

3324-4: Do not use yr 2000.

3324-15: Don not use yr after 2005

3324-6: Split into two sentences

3324-9: Replace majority with a %.

3326-10: Decreasing runoff with glacier retreat is a seasonal issue. Annual runoff still mostly dependent on annual precipitation, only melt season runoff will decline substantially.

3327-3: Can the precipitation gradient be quantified in some fashion.

3327-22: Replace big with large.

3327-23: Remove, as well.

3327-25: characterization of

3329-2: Replace elaborated with

3331-24: replace taking with taken.

3333-13: Is the change in bias with elevation worth documenting?

3336-22: The mean ablation area thinning rate of NPI glaciers from 1975-2005 is

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shown in Fig. 7

3326-24: Of the 24 glaciers, 13 thinned between.

3336-26: Replace highest with greatest or largest

3337-14: remove indicating

3343-18: Replace it with is

3343-26: What authors?

Interactive comment on The Cryosphere Discuss., 5, 3323, 2011.

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