

## ***Interactive comment on “Changes of the tropical glaciers throughout Peru between 2000 and 2016 – Mass balance and area fluctuations” by Thorsten Seehaus et al.***

**Duncan J. Quincey (Referee)**

d.j.quincey@leeds.ac.uk

Received and published: 26 April 2019

This manuscript presents geodetic mass balance calculations and glacier area fluctuations for Peruvian glaciers for the period 2000-2016. The methods are robust, and the key findings are substantial – specifically that area and mass have reduced considerably over this time period, with a notable increase in the rate of loss during the latter years (2013-2016). A particular highlight is the comprehensive discussion of the study findings in the context of previous work. Despite its density, a clear path is navigable throughout and the argument is strong. The analysis is also very honest about where problems in the current work may lie. The only area where I think the authors

C1

need to think again is in the suggestion of the strong El Niño event of 2015 as the primary reason for the rapid change in area and mass loss rates. It may be just about conceivable that changes in temperature/precipitation/humidity could impact mass balance almost immediately, but the magnitude of the change is (too) substantial for this to be the only factor, and the idea that a warm and dry event could also impact on glacier area to such a degree, within a single year, cannot hold. This requires some further investigation/consideration/analysis. Otherwise, I am very much in favour of seeing this manuscript published, and only have the following minor suggestions (by line number) to make.

10: debris-covered extents were also derived by coherence mapping according to the text?

30: ‘already crossed...’

39: ‘GLOF incidents...’ or ‘GLOF threats...’?

102: ‘continuous...’

113: here and elsewhere check your cross-referencing to different sections. This one should be Section 4 (I think) – others later in the manuscript refer to sections 8, 9 and 10 that don’t exist

122-123: more negative because of the lack of accumulation is what I think you mean here... but the previous sentence that refers to reduced ablation is contradictory to a more negative mass balance, so this needs clarification

173: use the correct GLIMS reference that comes with the download... .

266: ‘example’ not ‘exemplary’

275: missing power on first km

280: use of exemplary twice (though it should again be ‘example’ I think

C2

315: 'temporary' not 'temporal'

349: Coropuna?

386-393: though interesting, this paragraph is only partially relevant here and could probably be cut

395: 'The most extreme surface lowering...'

Figure 3: caption should read 'example' not 'exemplary', but moreover I'm not sure what the value of the figure is since we can see most of this in Figure 1?

Figure 7: this caption needs some work I think. It took an age to work out that the red bars were vs the blue bars. How about 'Hypsometric distribution of measured glacier area with elevation (red) and total glacier area with elevation (blue), with mean  $dh/dt$  values in each elevation interval (blue dots)...'?

---

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-289>, 2019.