

We thank the editor for their feedback. All our responses are in blue text below.

I am pleased to accept your manuscript for publication in The Cryosphere subject to the following minor revisions

1. Please replace references to ENSO as a 'short-term' climate mode with 'interannual' climate mode.

We have replaced the ENSO references with interannual instead of short-term on Lines 10, 83, 100, 131, 214, 286, 328, and 344.

2. For ease of reading, please reduce the number of abbreviations where possible. For example Cordillera Vilcanota (CV) and region of interest (ROI) are only used twice in the whole manuscript and do not need to be defined as an abbreviation.

Yes, there are many abbreviations, and unfortunately many are unavoidable. As suggested, we have removed the ROI and CV acronyms on Lines 30, 120, 135, and 137. We also removed ECMWF from lines 98 and 168, SRTM on 126, and GEE from lines 118, 356, and 37#.

3. Please provide additional information about how the agreement with manual digitisation and the $\pm 3\%$ error estimate was assessed (based on how many/which image comparisons, etc).

Line 161-164. We have clarified the range of error came from comparing TA and SCA computed with our automated methods with values from manually digitized values from 10 yearly images, and we list the specific years of the imagery used.

4. If I understood correctly, you identified El Niño and La Niña events based on single monthly values of the ONI index, however traditionally they are defined based on the five consecutive 3-month running mean of SST anomalies in the Niño 3.4 region exceeding the threshold of $\pm 0.5^\circ\text{C}$ (see <https://www.ncei.noaa.gov/access/monitoring/enso/sst>). Please justify, assess, and discuss the impact of your approach.

We chose to evaluate the ONI on a month-to-month basis as we were correlating our results back each month to better evaluate the response the QIC exhibited from strong El Niños and La Niñas. By setting the threshold at 1 instead of 0.5 we focus on the stronger El Niño events that have noticeably impacted the ice cap over time. For example, there are smaller El Niño events (2002, 2004, 2006, 2018/2019) that do not feature an ONI index over 1.0. While still considered El Niño events they are not as aggressive and did not produce the stark changes that we observed in the 1998 and 2016 El Niños. Clarifying language has been added to Lines 176 - 181.

5. For clarity and ease of reading, please provide a consistent end date of your study throughout the manuscript. The 2023 El Niño event is considered and frequently discussed, however in Section 3 you refer to "the observation period (1985 to 2022)."

Line 186, we have changed the beginning of section 3 to read 'Between 1985-2022' instead of 'the observation period.' We added 'this observation' to the following sentence to clarify this as well (Line 187). We explain in section 3.2 beginning on Line 221 that the 2023 measurement is included as an insight into El Niño since the measurement occurred during an ongoing event. We add clarifying

language on Line 193-195 as well regarding the linear regression results and removal of El Niño years.

6. Line 197-199: where can the reader see the agreement between ERA5-Land and station data?

Line 202 - We have provided the correlation coefficient in the text now to clarify the dataset agreements. This statement was originally added because a reviewer asked if we could explain why we chose to use 550 and not surface temperature or another pressure level, etc. The station data is available in the Bradley et al, 2009 reference and ERA5 Data is publicly available.

7. Line 223-225: "We found that in both the 1997–1999 and 2015–2017 periods..." I still find this sentence hard to follow, please simplify and clarify if possible

Line 230 - 234 - We have altered this sentence to read 'We found that during both the 1997–1999 and 2015–2017 periods, the lowest SCA occurred during the mid-September observations of El Niño year (1998 and 2016), after a decline in SCA that began from the previous year's September measurement (1997 and 2015). The ENSO indices are most strongly correlated with the QIC's ELA, SCA, and median elevation as they best represent the changing ice distribution and mass.'

8. Line 226-228: please move to the text justifying only discussing the ONI index to the methods section 2.5

We have moved this text to the methods section, it is now on Line 181-182.