Second review of "Coastal retreat rates of high-Arctic rock cliffs on Brøgger peninsula, Svalbard, accelerate during the past decade" by Aga et al. [Preprint egusphere-2023-321], submitted to Esurf

General comments

I express my gratitude to the authors for their dedicated efforts in enhancing this manuscript and for their responsiveness to the reviewer's feedback. While commendable progress has been made overall, certain concerns persist.

The manuscript has been significantly expanded by the authors, contributing to a better understanding of their procedures. However, in specific instances, particularly in the introduction, the additional information extends beyond the study's scope, needlessly elongating the paper without offering substantial benefits. Some sections exhibit an overly expansive writing style, and adopting a more concise approach would enhance overall readability. A comprehensive analysis of the study area and methods would be beneficial to discern which phenomena and methods are pertinent to the paper's main objectives and which are solely relevant for study reproducibility. Consider relocating sections 3.3 and 4.2 to the appendix, accompanied by a short statement in the main text outlining the actions taken and directing readers to the appendix for further details.

In the discussion (chapter 5.1), the authors draw comparisons with previous studies and discuss potential differences. However, this study is not a review, and comparing it to previous research is not its primary objective. The first half of chapter 5.1 can be summarized by stating that the measured retreat rates align with previous studies (+citations). The latter half of the chapter appears speculative without clear direction. The initial discussion chapter should focus on the main results, addressing shortcomings and uncertainties. Additionally, the authors should acknowledge the higher uncertainty in cliff top position compared to measured retreat and clarify how they ensure the measurement reflects actual retreat rather than uncertainty.

While the authors rightfully emphasize the significance of long time-series analysis, especially in the Arctic's high interannual variabilities, the presentation of a one-year dataset of rock-

surface temperatures appears incongruent. Comparing decadal analysis of cliff-top retreat rates with a one-year rock surface temperature dataset may not be appropriate, and the latter adds minimal value to the study. If inclusion is necessary, relocating this dataset to the appendix is recommended, although removal is preferable.

Line numbers below refer to the revised manuscript with tracked changes.

Abstract

Line 9: Consider dividing this lengthy sentence regarding the retreat rates of the north and south-facing coastlines into two sentences for improved readability. Could you also clarify whether you are reporting the standard deviation or the measurement uncertainty (DOA) for each decade? Notably, for the northeast-facing coast, the uncertainty range consistently equals or surpasses the measured change in each decade. This prompts the question of how you can ascertain the presence of any statistically significant change in these instances.

Introduction

Line 23: The inclusion of pan-Arctic erosion rates or rates from Siberia and Alaska in this paper seems irrelevant, given the substantial differences in erosion rates and study areas compared to the site under investigation. It would be more beneficial to omit this added information and instead concentrate on erosion rates from studies that are more comparable in terms of landscapes and methodologies.

Line 40: While Lantuit et al. present values for Nunavut, the basis for these rates is not clearly stated in their paper. In my view, the most noteworthy aspect of their study concerning lithified coasts is the revelation of the considerable gaps in our understanding of Arctic coastal dynamics.

Line 52: What accounts for higher erosion rates on bedrock cliffs covered by unconsolidated sediment, and why are these rates not observed at your study site?

Line 61: Kindly replace "bluff" with "cliff."

Study area

Line 81: Could you provide more detailed information about the beach, such as whether it is a mixed sand and gravel beach, and if there are variations in sediments between the northeast and southwest facing sections? Additionally, a more comprehensive description of the coastal setting, including details on tidal range, fetch, and beach morphology, would enhance clarity.

Line 86: The current wording of this sentence suggests that the raised beach ridges were situated at 45 m.a.s.l. during the Late Weichsel and have been uplifted since then. Could you please clarify this point?

Lines 97 to 105: The discussion of potential driving factors for coastal cliff erosion would be more fitting in the overall discussion section, especially when considering how these factors might change with climate change.

Line 106: "Weather station" was correct; kindly revert the change.

Lines 106 to 117: Please consider condensing this paragraph significantly, focusing only on information directly relevant to your objectives.

Line 114: Replace "found" with "measured."

Line 129: Remove "have been recorded."

Line 131: If the information is not applicable, consider removing it.

Data and methods

Line 164: Could you provide details on the specific methods employed to verify the accuracy of the geo-referencing?

Lines 174-179: Rather than delving into the distinctions between RTK and PPK, a concise statement mentioning that you corrected points using PPK and specifying the associated uncertainty would suffice. Additional details can either be omitted or moved to the appendix.

Line 194: While it's commendable that you explained the calculation of cliff top retreat rates and introduced a proxy for the relationship between cliff top and coastline retreat, it would be beneficial to include information on the local geo-referencing error for the orthoimages used in distance measurements. To enhance local accuracy, consider either geo-referencing one image to another using a method like spline transformation or including a control in the provided data by measuring distances between two stable objects near the cliff in both images and comparing the results.

Line 194: It seems you measured planar distance. Could you please clarify?

Line 195: How have you factored in wave run-up and tides? Figure 4b suggests that wave run-up may play a significant role at your study site when determining the shoreline's position.

Results

Figure 4: Why is there a zero next to the cross-section?

Discussion

Line 401: A comparison with a panarctic retreat rate may be unsuitable for a case study of this nature.

Line 406: The reference to Lantuit et al. 2012 does not appear to contain original data. Please consider citing the original Nunavut study if available or omitting this sentence.

Line 407: Is it appropriate to compare potential driving factors at your local site with those of the entire Canadian archipelago? The scale and spatial homogeneity might present challenges for a meaningful comparison.

Line 451: Could there be an icefoot developing in front of the cliff? If so, do these cyclones influence the retreat rates, or does the icefoot protect the cliff?

Line 480: I would suggest adding 'in the next decades' or 'until the end of the century.' In the long term, the relative sea level fall is expected to increase more than coastal retreat, leading to advancing coastlines.

Lines 515 and following: I respectfully differ with my colleague regarding the discussion of implications for infrastructure at this point. This is neither an objective of the study nor relevant, as there is no infrastructure at risk at your study site. Furthermore, there is no novel data presented on infrastructure at risk that warrants discussion here. It would be more pertinent to focus on your data in the discussion without turning it into a review of other studies.

Data availability

I strongly urge the authors to ensure all data is made accessible. Adhering to FAIR (findable, accessible, interoperable, reusable) data practices is highly recommended. Additionally, please provide comprehensive metadata for the uploaded data. While attempting to comprehend the "Distance_multiple_digitization_of_coastline" file, I encountered difficulty deciphering its contents.