

Interactive comment on “High accuracy coastal flood mapping for Norway using LiDAR data” by Kristian Breili et al.

Jordan Eamer (Referee)

jordan.eamer@canada.ca

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Reviewer – Jordan Eamer, Geological Survey of Canada

General comments

This is a generally well-written, informative description of a new dataset and suite of tools for coastal management activities for the country of Norway. Thank you for affording me the opportunity to review! The analysis is thorough and description of input data, results, and related uncertainties is sufficient. I, however, would prefer to see this presented as a brief communication, as I believe the major contribution of this work lies more in its presentation of the dataset and availability of management tools and less so in any analyses of coastal risk, adaptations, or impacts. For example, I feel like the

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conclusions section (L450 – 473) can mostly represent the results section without any significant loss of interpretative value, and the remaining lines (to L493) appropriately represents sufficient discussion of uncertainties and overarching themes.

This opinion is not strong enough, however, to merit a major revision or rejection. I believe it's still an important contribution. Additionally, the assigned editor has looked over the manuscript and deemed it appropriate as a research article, so I will defer to their judgement here.

Other general notes: - For the uncertainty analyses:

- o With confidence intervals (or upper/lower limits of uncertainty) expressed for 9 of 10 metrics in Table 7, I'm not sure why there was no utilization of these in the results. At the least, one figure could have shown the difference in inundation extent using an upper and lower limit, and at most, all results could have been expressed as their appropriate ranges incorporating all relevant uncertainties

- o One of the greatest sources of uncertainty as discussed was the bias introduced by engineered structures over water. I'm curious as to why the authors did not attempt to crop out these structures using a coastline mask. Was it because of discussed issues with the coastline not agreeing between datasets?

- o A DEM accuracy of $<0.1\text{m}$ (Table 7) is not really true, is it? That refers to the accuracy of the processed lidar point data, and not the interpolated DEM. As stated in the text, an accuracy of 0.26m is more appropriate. So why is it presented as such in the table, and elsewhere in the text?

- For the figures: o I would like to have seen combination figures – pictures inset, side-by-side, or multi-panel with the representative inundation maps (e.g. 5 & 6, 7 & 8). Larger, too.

- o Clear graphs showing the results from tables 2-6 more clearly would increase the impact of these findings. The bar graphs in Figures 10, 13, 14 are informative, but I

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can't help but feel like more data could be incorporated into larger line graphs for more interpretive power, and showcase the infrastructure challenges facing Norway in the RCP8.5 scenario.

o Figures 11/12 are hard to interpret, too much overlapping data. Perhaps colour-magnitude hexagons might more clearly convey the spatial patterns (e.g. see Figure 2, <https://www.nature.com/articles/s41467-019-10762-4>)

- References are minimal, and several are non-peer reviewed reports. A more thorough examination of the literature, particularly with regards to inundation mapping and DEM analyses/uncertainties, would really benefit this manuscript

Line by line comments as follows: 13 – Adaption and adaptation are used interchangeably throughout the manuscript. Please pick one for readability.

19 – The sentence beginning “The consequences . . .” is awkward. Maybe remove “and many” as well as the “the” before coastal.

24 – is GIA the only component of VLM at play? No tectonics? I ask because I don't know and a cursory look turned up no information. Just curious!

78 – See point above, how this manuscript may be better suited as a short communication, describing the tool and its applications, inviting the reader to go and perform their own analyses.

128 – I recognize that it's an even more complicated variable than those already left out from your analyses, but I would have appreciated some mention of a reduction in sea ice and associated coastal effects on arctic communities. In Canada the highest rates of coastal retreat and impact on communities/infrastructure due to SLR is in arctic areas impacted by a loss of sea ice and associated increased wave activity. . . I'm sure there are some similar effects being witnessed in northern parts of the study area.

161 – is that a definitive statement – every grid cell has at least 2 datapoints? Or is that an average. Also, interpolation method?

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168 – Some discussion of alternatives to the bathtub methods (e.g. modeling approaches using XBeach)?

193 – Again, unless this is a short communication introducing the tool, this kind of discussion isn't really necessary in a scientific paper

202 – See general comments for sections 3 and 4. Generally I think that sections 3.1 and 3.2 could be thinned significantly, particularly if more detailed and interpretive figures and maps are presented. 3.3 is a good section – this is the level of interpretation I'd personally like to see in the results. Sections 4.1 and 4.2 are great – but then none of these uncertainties so carefully outlined are included in the analysis!

421 – “... and future applications of this tool” or something to that effect?

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