Earth Syst. Sci. Data Discuss., author comment AC2
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Reply on RC2

Christopher D. Stringer et al.

Author comment on "Contemporary (2016–2020) land cover across major proglacial regions in West Antarctica and the McMurdo Dry Valleys" by Christopher D. Stringer et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-250-AC2, 2022

Thank you very much for taking the time to review our manuscript and for suggesting that resubmission may be possible. We have provided some individual responses to the issues you have raised and note that many of these are similar to those provided by Reviewer 1, so there may be some overlap in the two responses.

Comment 1: The authors argue that since the Antarctic is changing faster than other land surfaces, there is a need for land cover datasets specific to Antarctica. So, they choose 6 regions and use Landsat image between 2016-2020 to do this classification. The bands chosen are such that the classification could be expanded to include earlier years in the future. However, they only provide a static map using these limited years of observations. The study would be much more complete if they provided the land cover maps from 1976 to 2020. Otherwise, the work seems preliminary to the point that there would be no use of this dataset till the annually varying dataset is released.

Response 1: We acknowledge that a time series of land classifications would be interesting. However, the contemporary land cover map is a useful and sought-after product in its own right; especially given recent datasets that have produced global land cover classifications have failed to include Antarctica. This dataset will be widely relevant for ecologists, sedimentologists and climatologists, to name a few (see also response to reviewer 1).

Comment 2: The changes in land cover in Antarctica has significant seasonal components that is impacted by ENSO oscillations and other factors. As such, I am unsure how useful an annual land cover map is for analysis of ice cover loss.

Response 2: We agree that determining ice cover loss from such land cover maps would be problematic, but this was not the intention of our data set. A time series of land cover maps would be interesting to judge quantify changes in vegetation, lake formation and hydrology, rather than ice cover loss.

Comment 3: The 6 regions represent a tiny fraction of Antarctica; and as such, the study does not really address the main motivation of the work, which is the need for a continental scale land cover dataset for Antarctica.

Response 3: We acknowledge that these regions are only a small fraction of the total continent. However, they include the two largest proglacial areas of Antarctica (Dry

Valleys and Ulu Peninsula of James Ross Island). There are very few existing datasets that provide land cover data for Antarctica, and existing datasets tend to focus on even smaller sub-regions. Existing global land cover inventories typically do not include Antarctica; therefore, these data are truly novel. The regions excluded from this analysis are nunataks or ice, with a small number of proglacial regions excluded due to cloud cover in imagery. We would be happy to make use of existing ice and bare rock datasets to produce a more complete map of Antarctica.

Comment 4: K-means is a really simple method and the field has advanced in terms of classification methods. More importantly, since they already use finer resolution labelled data for validation, it would be much more useful to use supervised learning, which generally performs better than unsupervised methods.

Response 4: We appreciate that K-means is a simple methodology, and we did explore the use of other methods (supervised learning techniques). However, we decided K-means was the most appropriate methodology and believe our outputs to be robust. Despite its simplicity, K-means is a tried and trusted methodology that is easy to accuracy assess, and an appropriate methodology given the lack of consistent and independent training data across Antarctica. We decided that the best approach was to use expert judgement to interpret clusters, rather than to train a supervised learning method with unreliable training data.

Comment 5: Why were the number of clusters chosen through trial and error instead of using commonly used elbow methods?

Response 5: Our approach was to use K-means as a way of producing clusters from which we could interpret land cover. We found trial and error was suitable for determining this, as the breaks were clear enough to decide manually. The final product has still been accuracy assessed and shows a good accuracy level.

Comment 6: There are missing figures.

Response 6: I would like to apologise for the references to fig. 7 (line 306) and fig. 8 (line 312). These were included in error. These should refer to figures 5 and 6 respectively; all figures are present in the manuscript. This can be easily amended.

Yours sincerely,

Christopher Stringer (on behalf of all co-authors).