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Re: [Paper ID #essd-2022-49] British Antarctic Survey's Aerogeophysical Data: Releasing 25 Years of Airborne Gravity, Magnetic, and Radar Datasets over Antarctica by A.F. Fremand, J.B. Bodart, *et al.*

Dear Editor,

We would like to thank both reviewers for very insightful and constructive reviews of our manuscript, as well as the editorial team for handling the review process.

We are very pleased to see that both reviewers recognised the importance and usefulness of our dataset and manuscript, as well as the time invested in standardising and publishing the data following the FAIR principles. Both reviewers have provided us with some excellent comments, which have undoubtedly improved the quality of our manuscript.

In the following response letter, we begin by addressing the comments from Reviewers #1, followed by those made by Reviewer #2. We have formatted the comments of each reviewer in italics, and have indented our responses in red below each comment.

Attached to this response letter are two versions of the manuscript, one with changes highlighted in red ('ESSD_dataPaper_BAS_resubmit_highlighted') and the final updated version with all changes incorporated but not highlighted ('ESSD_dataPaper_BAS_resubmit'). We have also provided the original Supplementary Information document ('ESSD_SI_BAS_final') which is unchanged from the first iteration of this manuscript.

We look forward to hearing your decision and stand-by in the meantime with any queries you might have.

With best wishes,

Julien Bodart (on behalf of all co-authors)

Reviewer #1:

General comments

This article summarises the main findings of 28 years of aerogeophysical data surveys over Antarctica. It also describes the data acquisition and instrumentation for each of the 24 airborne geophysical surveys, and the data processing applied to the 64 datasets accompanying this article. The authors of the paper also outline the format of the data and the publishing strategy they adopted following the FAIR data principles. They also present a new data portal to download the aerogeophysical data and interactive open access tutorials for displaying and checking the quality of the data. In addition, the authors also discuss the potential for extracting englacial stratigraphy from radar data, and the potential re-use of the BAS aerogeophysical data.

The dataset provided in this compilation is a valuable contribution to the Antarctic scientific community and should prove an extremely useful resource for further exploring the Antarctic Ice Sheet and the underlying geology, for example mapping the internal stratigraphy of the Antarctic Ice sheet (e.g., AntArchitecture). The dataset provided is freely available in a friendly, and easy to use interface aiming to reach a wider community of specialists and non-specialists. Thanks to the authors for their hard work and all the great job they have done in compiling and publishing the aerogeophysical data from BAS surveys. These data are very valuable to any ice sheet/shelf modeller, and therefore should be published.

We would like to thank Reviewer #1 for their positive comments on our manuscript and for their thorough review, which has improved this manuscript.

There are a few minor comments and suggestions that might help improve the manuscript and the accompanying user guide, such as: citing references in chronological order, shortening long sentences, and being consistent with the proper use of “reflectors” and “reflections”. In addition, I suggest double check the tutorial provided in Matlab and Python as some minor errors were found in Matlab.

Thank you. We respond to each of the minor comments in the section below.

Line-by-line comments

Introduction

L73: I think it should be “subglacial geology” or “geology underlying the ice”, not both

Agreed, we have removed “underlying the ice” in Line 72.

L75-76: References in chronological order. Please cite references in chronological order throughout the manuscript as well

All in-text references have been re-formatted in chronological order. For the reference list, the ESSD reference guide recommends alphabetical order, as already done in the initial version of our manuscript, and so this remains unchanged.

L84-88: Personally, I think 47 words is a bit too long. Please consider shortening the length of this sentence and other sentences throughout the manuscript (more than 50 words in some sentences). Longer sentences make it harder to follow the main idea

We believe that this sentence makes sense in its original form and have thus decided against changing it. However, we have amended other longer sentences within our manuscript with this comment in mind (e.g. see Lines 97-103; Lines 268-272; and Section 5 more widely). Thank you.

L95: I think it should read "... (hereafter abbreviated to WAIS and EAIS, respectively) ..." include a comma after EAIS

Agreed and amended.

L116-117: maybe it would read better "(...) data have been relatively inaccessible to the wider scientific communities (...)"

Agreed and amended.

L142: I'm not sure if the "Figures 2-3 demonstrate (...)" the data have been used progressively; I think the figures show products derived from the aerogeophysical surveys instead

We agree with this point. The sentence in Lines 145-147 was changed as follow:

"Figures 2-3 present the wide-ranging datasets of gravity and magnetic anomalies, bed elevation and ice thickness, and 2-D radar profiles ensuing from the surveys discussed in sections 2.1. and 2.2."

L268: Weddell Sea Rift "System" (include System)

Agreed and amended.

L270: I think the sentence "(...) a new digital elevation model of the bed underlying the ice streams of the (...)" would read better as "(...) a new digital elevation model of the subglacial topography around the (...)"

Agreed and amended.

L277: Delete "(...), the product of (...)"

Agreed and amended.

L284-289: It is a bit hard to follow this sentence. Please consider shortening or improving punctuation

We agree with this point. We have therefore re-arranged sentences between Lines 295-301 as follow:

"The 2015-16 PolarGAP survey was a major international collaboration funded by the European Space Agency (ESA) and led by BAS, Technical University of Denmark, Norwegian Polar Institute and the National Science Foundation to fill a gap in global gravity surveying that the European Space Agency GOCE (Gravity field and steady-state Ocean Circulation Explorer) satellite network was unable to cover. Alongside the large swath of gravity surveying, opportunistic magnetic and radar data were also acquired over the South Pole and parts of

Support Force, Foundation, and Recovery ice streams using a further upgraded radar system, PASIN-2 (see Section 3.1.3).”

L293: please consider enumerating the examples after “...such as”, I think it would help the reader to follow the examples

Agreed and amended.

L326: it reads “(...) and ed picks respectively.” I think a comma is missing “(...) and ed picks, respectively.”

Agreed and amended.

L347: In this case, maybe the word “Usually” is more suitable than the word “Generally”

Agreed and amended.

L377-378: “When in standard swath mode, all antennae are configured in H orientation with the starboard and belly antennae also in H orientation” is there any reference you could cite maybe?

One of the key aim of this paper, besides describing the data release, is to summarise all data acquisition and processing done thus far and fill the gap in the information available. Indeed, prior to this manuscript, this information was found in several published and un-published materials, including internal survey reports. Therefore, some information specific to the radar system acquisition/processing is only summarised publically for the first time here, and prior published manuscripts are not available. When this information is already published (e.g. Corr et al., 2007), we provide references to these previous studies. The example highlighted here by Reviewer #1 is from previously un-published material, and so is provided here publically for the first time.

L381-383: reference?

Please see the above comment/response regarding previously un-published materials.

L436: I think adding commas to the sentence “...ADC cards rather than a digitising scope allowed phase...” so it would read as “...ADC cards, rather than a digitising scope, allowed phase...”

Agreed and amended.

L440-447: It would be useful if you could provide a reference for PASIN1 and PASIN2

Please see above comment/response regarding previously un-published materials. For PASIN-1, we have added an additional mention of the “Corr et al. (2007)” reference in Lines 452 and 465. For PASIN-2, details regarding the radar system and its acquisition were previously un-published, and thus this paper may be regarded as the first summary of the upgraded radar system.

L457: in the sentence “...mixed antenna gain path for areas where ice is heavily

disrupted where the starboard signal can be...” is the second “where” the word you wanted to use? Maybe the word “and” is more suitable (?)

Agreed and amended.

L459: please consider enumerating the “minor modifications”, so the sentence would read “...reduce noise and improve system operations, including: (1) low-pass filters in the RF switches, (2)...”

Agreed and amended.

L467-471: are there any references you could cite?

Please see above comment/response regarding previously un-published materials.

L523: is there any key reference for the definition?

Yes, agreed. We have added the “Hackney and Featherstone (2003)” reference which was already included in our initial manuscript and which discusses this point in depth.

L532: I think it reads better as “Additional processing may include the use of masks...”

Agreed and amended.

L568-569: Maybe change “see Table 3” to “see hyperlinks provided in Table 3”

We believe that the reference to Table 3 was clear enough and have decided not to follow this suggested change.

L579: the PASIN system was(?) designed to retain...

Agreed and amended.

L584: I think it reads better “The second step included...” instead of “Following on from this first step,...”

Agreed and amended.

L589: Maybe including a semicolon and a comma, make the sentence easier to follow (?) “...a moving-average window filter used; however, no Synthetic...”

Agreed and amended.

L596: include a comma after “however”

Agreed and amended.

L603: I think is easy to follow as “over West Antarctica. Figure 6a shows...”

Agreed and amended. Note that ‘Figure 6a’ became ‘Figures 6c’ based on a comment from Reviewer #1 below.

L607-608: Maybe use “. In contrast” instead of “however” (?)

Agreed and amended.

L622: delete “Note that”

Agreed and amended.

L625: is there a missing word after “...such as...”?

Agreed – this was a typo. The words ‘such as’ were removed from this sentence.

L626: maybe “Additional techniques, to prevent misinterpretation of the ice thickness, have also...” reads better (?)

We believe that the current sentence is clear enough and have thus decided not to follow the suggested change.

L627: delete “and thus may affect ice thickness estimates”. Also, consider adding “it has been” after “..., as...” so it reads “, as it has been previously...”

We have deleted “and thus may affect ice thickness estimates” but have kept the following sentence as original.

L631-632: Is “reflector” the word you want to use, or maybe “reflection”? Also, please consider deleting “...on from the processing the...” and “the last step was to “pick” the”, so it reads “Following radar data processing, bed and ice surface reflections were picked”

Agreed and amended. “Reflection”, as suggested, was chosen as a better alternative to “reflector”. This was also changed throughout the manuscript in response to the minor comment of Reviewer #1 at the start of their review (see also below).

L632: delete “It is worth stating that”

This was replaced by ‘We note that [...]’.

L638: delete “. This was”

Agreed and amended.

L639: “reflector” or “reflection”?

Agreed and amended.

L641: “reflector” or “reflection”?

Agreed and amended.

L643-650: please consider rephrasing this paragraph

Agree – please see comment/response below

L661-664: Please consider rephrasing this paragraph, it's hard to follow

We agree with that the opening of these two paragraphs was confusing. We have therefore re-worded and simplified the structure of the paragraph in Lines 677-685, as follow:

“To estimate ice thickness and hence obtain the bed elevation, the location of the surface reflection in the radar data must be known accurately. However, since the PASIN system does not resolve the ice surface well due to errors in the phase centre of the pulse through the firn layer, the surface reflection in the radargram was only rarely used on its own to calculate the ice surface. Usually, range-to-surface from coincident on board-acquired lidar, or alternatively if lidar was not available (i.e., due to clouds or ground clearance higher than 750 m), using the aircraft’s radar altimeter or surface elevation from an accurate Digital Elevation Model (DEM) (i.e. REMA 8-m DEM for latest surveys; Howat et al., 2019), was used to calculate a “theoretical” surface pick, as follows:”.

We have also replaced any mentions of the words ‘radar data’ for ‘radargram’ in Lines 686-694 to clarify that we are here discussing the surface pick on the radargram, and not the ‘theoretical pick’ from the lidar data. We hope this is clearer now.

L666: “reflector” or “reflection”?

We have removed this to fit the modifications from the above two comments

L788: the link does not work when clicking from the document

We apologise for this issue. This was caused by a problem with our servers in February 2022, which affected the entire BAS data catalogue. This was resolved promptly and all links now work as expected.

L799: maybe “aim” is more suitable than “end goal”

We like the use of “end goal” and have thus kept the original sentence as it was.

L852-853: add “lateral” to “...(laterally) continuous...”. How a well-preserved and lateral continuous englacial layer suggests changes in past ice-flow conditions?

Apologies for the confusion. The word “that” was missing between “[...] and suggest” and “changes in past ice-flow conditions [...]”. We meant that these changes (i.e. ice-flow, divide migration, basal melting) are limited in areas where englacial layers are continuous. We have placed the word ‘limited’ higher in the sentence in response to this and another comment from Reviewer #2.

Regarding the use of the word ‘lateral’ when mentioning englacial layers: We are not convinced that adding ‘lateral’ here or in other sections of the paper adds clarity to the sentences or concept of “continuous englacial layering”. The use of the word “lateral” may confuse readers due to its common use in glaciology with relation to ice flow (i.e. lateral vs. longitudinal stress gradients). Previous studies (e.g. Karlsson et al., 2012; 2018; Bingham et al., 2015; Winter et al., 2015) that investigate continuous englacial layering do not use this

specificity when referring to the continuity of englacial layers. We have therefore kept the original sentences without the addition of the word “lateral”.

L857: include “lateral” to “...quantifying the (lateral) continuity of englacial...”

This sentence has been removed in response to comments from Reviewer #2.

L858: include “it” to “...conditions, and (it) can also be used...”

This sentence has been removed in response to comments from Reviewer #2.

L860: include “new” to “...(new) acquisition strategies.”

This sentence has been removed in response to comments from Reviewer #2.

L861: include “lateral” to “...for mapping the (lateral) continuity...”

This sentence has been removed in response to comments from Reviewer #2.

L867: include “lateral” to “...in assessing layer (lateral) continuity.”

See response to above comment for Lines 852-853.

L870: include “lateral” to “...indicate high (lateral) continuity.”

See response to above comment for Lines 852-853.

L887-888: maybe you could be a little more specific about “surface noise”

Agreed. We have replaced ‘surface noise’ with “due to the inability of the PASIN system to resolve continuous layers in the upper portion of the ice column [...]”.

L889: Consider including some references about the echo-free zone (?). For example: Drews et al., 2009 (doi: 10.5194/tc-3-195-2009) or Drewry and Meldrum, 1978 (doi: 10.1017/S0032247400018271).

Agreed. We have added the ‘Drews et al. (2009)’ reference to the reference list.

L895: Which version of BedMachine (Antarctica?) did you use?

We have used version 2. This is now added to the caption. We have also replaced the reference given in this sentence to the actual dataset reference (i.e. Morlighem, 2020); instead of the paper accompanying the dataset (Morlighem et al., 2020).

L907: Add “lateral” before “continuity”

See response to above comment for Lines 852-853.

L925: I think the region is called Ellsworth Subglacial Highlands (not “Mountains”)

Agreed and amended.

L942: Please cite references in chronological order

All in-text references were re-ordered chronologically in response to Reviewer #1's initial comment. Thank you.

L943-946: Please consider rephrasing this sentence, it is hard to follow as it is.

This sentence has been removed in response to comments from Reviewer #2.

L953: "...these data..." instead of "...this data"

This sentence has been removed in response to comments from Reviewer #2.

L957: Change "...this data..." to "...these data..."

This sentence has been removed in response to comments from Reviewer #2.

L958: Delete "such"

This sentence has been removed in response to comments from Reviewer #2.

L1010: Delete "Lastly, and"

Agreed and amended.

L1016: Consider change from "Combined, these will likely..." to "These data combined..."

We like the current phrasing and have thus kept the original sentence as it was.

L1035: Change the word "can" to "could"

Agreed and amended.

L1039: Add the word "and" before "thus"

We have not added the word "and" as it would not make sense grammatically, but have added a comma between "full form" and "thus".

Figure 1: I think it would be better to use the International System of Units and derived units for the scale bar, i.e. m or km. It would also keep consistency with other figures on the manuscript (e.g., distance axis). I would also suggest removing the blue background of the figure (and keeping consistency with other figures in the manuscript), and to consider including a graphic legend next to the figure.

Thank you for these comments. We have changed the scale bar from miles to kilometres, as suggested. We have also added a figure legend on the right hand-side of the figure, and have updated the caption to make it consistent with the order of the legend items. Regarding the blue background, we have decided to leave the figure in its original form as our aim was to be

consistent with the data portal interface, which has the same blue background as Figures 1 and 2.

Figure 3: to keep consistency with other figures of Antarctica in the text, I would suggest removing the blue background to the Antarctic image. Perhaps, it would be useful to include a vertical scale in the echograms.

As per our above response to the comment on Figure 1, we have decided to keep the blue background in Figures 1 and 3. We have added vertical and horizontal scales at the bottom right of each radargram (the vertical white bars represent ~1 km in depth and the horizontal white bars represent ~3 km in length). The caption of Figure 3 was also updated to reflect this change.

Figure 4: It is hard to read what is written inside each box. Could you please increase the font size?

Agreed, thank you. We have increased the font size inside the boxes.

Figure 6: Please consider labelling all the panels (outside the echogram) and refer to the labels instead of "the top panels. Also, consider including the time in one of the yaxis to keep consistency (i.e., Figure 7).

Agreed, thank you. We have now added labels (a-e) to all subplots in Figure 6 and adapted the caption and any mention of Figure 6 in the text. We have also added a secondary y-axis to provide values in radar time, as per Figure 7.

Figure 8. Please label the polygons. Also, consider having two separate figures showing the ice surface velocity and the ILCI. I think it would also be useful to include an ice thickness map in this figure.

We agree with the point made here and in the following comment that we could have made the ice-flow velocity map more obvious in the original figure. We have changed the colour scheme of the velocity map to show it more clearly against the ILCI results. We have also added a label for each polygon to refer readers to the next figure, which shows a closer-up view of the ILCI results for several key areas of interest. In addition, we have also added the location of several deep ice-cores located close to the BAS radar lines to connect with the point made in Lines 969-974.

We did not add an additional figure for ice thickness as this is already showed in Figure 2 for all the BAS radar flight lines and since ice-flow has a much stronger influence on layer continuity than ice-thickness, we opted to show the former over the latter. Additionally, and as highlighted by Reviewer #2, the aim of this section is primarily to showcase the potential re-usability of the data, not add a substantial new analysis to the manuscript which we feel would be the case if we added extra figures as suggested here.

Figure 9: there are no labels for the rectangles in Figure 8. I can't really distinguish the ice surface velocity below the ILCI.

We have modified Figure 9 based on comments made here and in the above comment on Figure 8, particularly in reference to the colour scale for the ice-velocity basemap and the

labels for the rectangles in Figure 8 and 9. We believe that this is much clearer now, thank you.

Table 2: great table, very useful. Are there any key references for each radar system you could cite maybe?

Please see our response in relation to an earlier comment regarding previously un-published materials. Since this table is in the section where we describe the radar systems (and attach any references when these exist; see Section 3.1.3), we believe that this is sufficient and have thus not added any references in Table 2.

Table 3: The hyperlinks (<http://data.bas.ac.uk...>) as they are written at the moment are broken.

Please see our earlier response to a similar comment regarding hyperlinks. All links are now back in full working order. Thank you.

Technical comments

Please check the Matlab code for reading the radar netcdf file

It reads

```
xlabel('Fast Time Sample Number', fontSize = 10) % set axis title
```

```
ylabel('Amplitude (dB)', fontSize = 10) % set axis title
```

it should read

```
xlabel('Fast Time Sample Number', 'FontSize', 10) % set axis title
```

```
ylabel('Amplitude (dB)', 'FontSize', 10) % set axis title
```

Please check the Python codes are ok.

Thank you for raising this small error, which affected the font size of the Y label in two of our figures for the MATLAB tutorial. This mistake has now been fixed and all other codes have been checked for similar errors.

Regarding the new platform for downloading data. The only potential complication I can think about at this point is the interface to select and download the data. Is not super easy to download a segment of interest. I had to navigate through several segments before I could actually select the segment I was intending to download. Some additional difficulties happened when more than one dataset was activated in the visualisation of the data. For example, there is a pop-up window that does not show what is selected with the cursor, it shows random segments of the dataset. Additionally, I think it would be useful if you could include an option to download a complete line by selecting the segments manually and then clicking a “download” button maybe (?)– if there is already an option like this I missed it, in which case it would be great to make it a bit more evident. It would save some time for the users.

We appreciate the feedback on the data portal. From your description, it is not clear whether you were using the “pop-up window” option which appears when one hovers over a segment, or the ‘Table’ option that contains all the segments from each survey and which can be activated by clicking on the ‘Table’ logo next to a specific survey in the drop-down menu under, for example, the ‘AeroRadar’ menu. Having run several test on the portal following your comment, we did not find the issues that you have raised in your review.

We believe that the platform is a major improvement in terms of enhancing the interactivity of the data, whilst at the same time enabling users to identify and download data in a much more efficient way than before. However, one current limitation is that whilst the data is shown as individual segments of 25 or 50-km in the portal (see Sect. 4.3 of manuscript), the data can only be downloaded by flight line (which are, on average, ~250 km long). This is because it would be too expensive (storage-wise) to break the segments into individual 25 or 50-km NetCDF files and store these via the BAS data catalogue.

However, from your comment above, it seems that our portal is already doing what you wish it did, which is “to download a complete line by selecting the segments manually and then clicking a ‘download’ button”. As we explain in the data portal user guide, which can be found on the GitHub repository or on the Jupyter Book interface, one can download the NetCDF file pertaining to a segment of interest by clicking the ‘View’ button next to ‘NetCDF’ or ‘SEG’ in the pop-up window of the specific segment. This download instantly the file for the specific flightline that the segment belongs onto your device in one click.

In order to avoid any further confusion, we have also produced a video that provides an introduction to the data portal, including instructions on how to download the data. This video is stored on the Jupyter book interface (https://antarctica.github.io/PDC_GeophysicsBook) alongside the PDF user guide.

Reviewer #2:

General comments

This is a very welcome paper/manual/documentation of the BAS aerogeophysical system & the open release of an astonishing amount of aerogeophysical data acquired over multiple decades. On behalf of the scientific community I would like to say thank you, and pay testimony to the considerable work and effort that is represented by, and outlined in, this paper. This important paper and data release are vitally important for understanding ice sheet dynamics and change, and the scientific community can now use these data. I found it particularly useful to see all the different surveys reviewed, and key references provided for those surveys, in one single document. It is also very useful to see the technical aspects and set up of the PASIN radar system so comprehensively documented formally for the first time (aside from the slightly difficult to access ‘Terra Antarctica’ report from 2006). Documentation of the evolution of the BAS aerogeophysical system since 1994 is also useful.

We would like to thank Reviewer #2, Neil Ross, for his positive comments regarding our paper and the associated data release. One of our key aims with this data paper, aside from describing the datasets was to also provide a resource that combines both the acquisition and processing methods in one single document, and so we are grateful to see this being recognised by Reviewer #2.

1. This ‘data paper’ is all encompassing and highly informative, and thereby provides a very useful ‘one-stop-shop’ for those working with and analysing BAS aerogeophysical datasets. At times, this all-encompassing nature has its disadvantages however, resulting in a very long and at times slightly unwieldy manuscript. I therefore wonder whether there were ways to streamline it a little. Perhaps sections 4 & 5 could be reduced in length? Section 5 presents an interesting case study/exemplar of the use of the data facilitated by the open data release, but it does tend to imbalance the closing stages of the paper towards the radar dataset, particularly since magnetic and gravity examples are not given.

Thank you. We agree with the point made, however due to the varying nature of the datasets described here (i.e. gravity, magnetic, radar) and the evolving acquisition and processing techniques used over two decades, it is extremely challenging to keep each section concise without omitting important points. However, we agree that sections 4 and 5 of the manuscript could have been more concise in the original document, and have thus attempted to shorten them based on the excellent line-by-line comments provided by Reviewer #2. Section 5 in particular has been considerably shortened and re-focused to ensure it appeals to as wide of an audience as possible without losing its core meaning. We come back to these changes in the line-by-line comments below.

2. There is a need to be consistent with recognition/acknowledgement of external partners when reviewing all the surveys. There is somewhat strange non-UK bias when detailing external collaborations (e.g. contrast the description of the IMAFI survey in lines 261-276 with ICEGRAV and PolarGAP surveys in 277-282 & 284-289). I think it would be good to acknowledge the involvement of UK non-BAS institutions a little more. Even if individual collaborators/Pis are not referred to by name, then there should be parity of acknowledgement (e.g. why UTIG, Technical University of Denmark, but not the University of Edinburgh, Bristol etc.?). This suggestion is about consistency of approach really. It may also be appropriate and fitting to recognise Richard Hindmarsh's scientific contribution to the IMAGE-GRADES survey.

Thank you for this comment. We agree that there was a non-intentional bias towards international partners when discussing the surveys in Section 2 and more widely across the manuscript. Recognising the importance of UK-based institutions in the acquisition of some surveys, we have therefore added acknowledgments and/or mentions regarding such institutions where appropriate throughout Section 2 and the wider manuscript (see examples Line: 173; Lines: 268-270; Lines: 313-317; Line: 1105).

We have also added a mention of Richard Hindmarsh's contribution in the GRADES survey in the Acknowledgments. Thank you for suggesting this addition.

3. Picking uncertainty: the section on radar bed picking might need to be a bit more open about potential errors associated with different pickers. Different people, often not radar experts, picked radar data using standard protocols and systems. Individual calls need to be made however, and these can be difficult to make (as I picked the IMAFI dataset whilst a postdoc I should know!). My understanding is that some pickers were not experienced radar users or researchers so different surveys may have different errors.

We agree with the point made here, although we recognise that this is a common issue across different radar data providers. However, to address this point, we have added an additional paragraph relating to this issue in Section 3.2.3 (see line-by-line comments below for more details); as well as a few sentences regarding uncertainty in bed elevations which can reflect issues in the picking procedure.

4. Are small-scale opportunistic/targeted surveys missing from the data release? I'm thinking of surveys like that of Flask Glacier (<https://doi.org/10.3189/2013AoG63A603>) and surveys over the ice rises of the Weddell Sea (I'm aware of ice rise survey flights undertaken in the 2010/11 season on behalf of Richard Hindmarsh). It might be worth a 'mopping up' paragraph in section 2.2 to capture opportunistic/targeted surveys.

The Flask survey was briefly mentioned in Section 3.2.3 (Lines 647-650) of our manuscript. However, the underlying data was not been included in our data release as we focused

mainly on larger-scale surveys with clear scientific objectives. This is also the case for the flight lines flown over the Weddell Sea Ice Rises, which were flown independently and opportunistically by BAS for individual researchers. It is worth noting that these flight lines represent very small profiles over specifically targeted areas in comparison with the much larger surveys shown in Table 1 and 3.

We provide a much more extensive response to this point in a similar comment made in the line-by-line section below.

5. Section 5: I think it is important to re-frame section 5 to make it clear that it is an exemplar case study to avoid radar-dataset bias. I also think that section 5 could be considerably condensed. The whole point of section 5 is to demonstrate the validity/usefulness of releasing the data openly. What is the 'added-value' provided by the release? This is the priority of this section, rather than the admittedly interesting findings etc. of the ILCI analysis. I therefore suggest that section 5 be reworked to make this demonstration clearer (see minor comments relating to section 5 below for more details). It may also be worthwhile flagging the potential application of AI on this 'big data' dataset in section 5.

We think Reviewer #2 is here referring to Section 5.1, as Section 5 does encompass suggestions for how the gravity and magnetic data released here can be used further (e.g. in future editions of the gridded gravity product; see Figure 10), although admittedly to a much smaller extent. This point made, we agree that Section 5 and more specifically, Section 5.1, had a much narrower focus and bias towards the radar data in the original version of our manuscript. This is primarily due to the wealth of additional data coming from the release of the full 2-D radar data, in comparison with point-based measurements from the gravity and magnetic data. However, we agree with the suggestion that this section could be more condensed, and that the main aim of this section is to provide a case-study to encourage further data re-use, as opposed to providing a new analysis.

With the help of Reviewer #2's line-by-line comments, we believe that this issue is now resolved and would like to thank him for providing insightful comments and suggestions which improved this section significantly. We refer the Editor to these line-by-line comments for examples of changes brought to this section.

Line-by-line comments

Line 36 – “not openly available” rather than “unpublished in full”?

Agreed and amended.

Line 37 – how about more generic language? i.e. rather than “gravity inversions, bed-reflectivity....”, what about “geological and glaciological applications”?

Agreed. We have added 'glaciological and geophysical applications'.

Line 52 – rather than “fully processed”, “online radar dataset”?

We replaced 'processed' with 'published' in response to this comment.

Line 67 – it is not just bedrock beneath the ice. Could be sediment or water.

Agreed. We have replaced 'bedrock' with 'basal properties'. The sentence (Lines: 65-67) now reads:

'[...] conduct studies of englacial and basal properties of the ice [...]

Line 68 – ice sheet 'bed' is not necessarily an accessible term to non-glaciologists. Define this term?

Agreed. We have replaced 'bed with 'bedrock topography'.

Line 72 – Napoleoni et al 2020 would be an appropriate recent reference here as it used BBAS data. I note it is referenced elsewhere in the manuscript, so is not an additional reference.

Agreed and added.

Line 87 – “modern digital aerogeophysical surveying”?

Agreed and added.

Line 89 – typo “aerogeophysics”

Agreed and amended.

Line 91 – “...have played a vital role....”

Agreed and amended.

Lines 97-103 – a very long sentence. Split in two?

Agreed and amended.

Line 115 – “...for understanding...”?

Agreed and amended.

Line 117 – no need for “As a result,....”. Start sentence with “This lack...”?

Agreed and amended.

Section 2.1 – it might be useful to make it clear at the start of this section that the data release for 1994-2004 does not include processed RES data.

Agreed. We have added the following in Lines: 142-143:

'[...] and for which the fully processed radar data is not published as part of this data release (see Table 1, Section 5.3) [...]

Line 163 – is there a reference for TORUS? I understand that it is not a survey that was really worked up, but there is an AGU abstract that could potentially be referenced (<https://ui.adsabs.harvard.edu/abs/2003AGUFM.C31B0402J/abstract>). Possibly also <https://doi.org/10.3189/002214308784409125> ? Might also be worth inserting a line about the

scientific aims of the TORUS survey to be consistent with the descriptions of the other surveys in this paragraph?

Thank you for raising this point. As highlighted by Reviewer #2, the data from this particular survey has indeed not been worked on as much as for other surveys. However, we agree that adding a line about the scientific aims of the study would be in alignment with the current structure of the paragraph, and have thus modified the specific sentence referred Lines: 162-166 as follow:

'In 2001-02, an additional survey was flown as part of the TORUS (Targeting ice-stream Onset Regions and Under-ice Systems) initiative to assess the factors controlling the dynamics of the Rutford Ice Stream using gravity, magnetic and radar instruments over a high-resolution grid spacing of ~10-km (Vaughan et al., 2008).'

We have also added the Vaughan et al. (2008) paper mentioned in the comment as a reference in Table 1 for the TORUS 2001-02 survey, although we note that this specific paper only makes use of the data without explicitly acknowledging that it comes from the TORUS survey.

Line 178 – Is “coverage” the correct term here? How about “areal extent” instead?

Agreed and amended.

Line 185 – I don't think “teconomic” is the correct term here? “Tectonic”?

This was a typo and has been amended. Thank you.

Lines 190-192 – is it worth inserting PASIN 1 and PASIN 2 in this sentence to explain the separation of 2004-2015 and 2015-2020?

Agreed and amended in Lines: 193-195 as follow:

'We describe the findings from these surveys into two sub-sections (Section 2.2.1 for surveys between 2004-2015; Section 2.2.2 for surveys between 2015-20) to reflect the acquisition of data prior to and following the upgrade of the PASIN system (see Section 3.1.3).'

Table 1 – is Evans Ice Stream ‘WAIS’? Some might argue it is APIS. Same applies to Dufek, is it really WAIS or is it EAIS?

We agree with this point, however we note that most studies using the Evans Ice Stream data (i.e. Jones et al., 2002; Sykes et al., 2009; Ashmore et al., 2014) all refer to Evans Ice Stream as part of West Antarctica; hence why we also referred to it as part of the WAIS. This is also the case for the Dufek Massif survey.

However, to still address this, we have added ‘/APIS’ and ‘/EAIS’ in the Region column of Table 1 for Evans and Dufek surveys respectively.

Table 1 & section 2.2.1 – made me wonder whether some ‘opportunistically-acquired’ PASIN datasets might be missing from table 1 and the data release. I'm thinking specifically about Crane/Flask Glacier (<https://doi.org/10.3189/2013AoG63A603>) and Weddell Sea ice rise surveys undertaken in 2010-11. There may be others. If these are not included in the data release then it might be useful to

make it clear in this manuscript that the data release does not include occasional small-scale opportunistically-acquired datasets like these.

Thank you for raising this important point. Firstly, it is important to note that these datasets are indeed very small scale and often composed of only a handful of flight lines (2x for Flask Glacier; 1x for Weddell Sea ice rise) opportunistically (and independently) flown following major surveys such as after the 2010-11 IMAFI survey. Secondly, we do not suggest in the paper that we have released all of BAS aerogeophysical data acquired since 1994, as it is indeed possible that independent and small-scale flight lines were flown with specific survey objectives in mind, and which were not part of the larger surveys shown in Table 1.

Unless specifically mentioned in the metadata sheet for each dataset, we have not included opportunistically flown data when these were not part of a larger survey, as this would take a significant amount of time to locate these individual segments and identify the metadata associated with the acquisition and processing done, as well as the survey objectives. At times, flights were opportunistically flown but formed part of a larger survey (i.e. the Thwaites 2019-20 survey mainly flown over Thwaites Glacier but with flight lines extending over to Rutford Ice Stream, or the BBAS 2004-05 survey mainly flown over Pine Island/Ellsworth Lakes but with an opportunistic flight line connecting the main grid with the Sky Blu field camp), which were included in our data release.

Individual flights like the Flask Glacier study or Weddell Ice Rise are typically flown for very specific scientific questions and as highlighted by Reviewer #2 are often flown for individual scientists without being part of a larger funding grant. This therefore falls under the willingness of the scientists to share their data with us at the PDC, for which we have a formal procedure in place, however this was previously lacking.

As the primary objective of developing the BAS aerogeophysical data portal and this publication was to ensure timely release of the maximum amount of legacy geophysical data, such small-scale surveys were not included. Indeed, each survey takes almost the same amount of time to standardise and publish, whether this is for a handful of flight lines or for a larger survey such as those included here. However, we will continue to update the data portal with such legacy datasets as time allows. We also note that if researchers have an interest in, and specific knowledge of, legacy data holdings, they can contact the PDC for assistance in recovering the underlying data.

To make this clear however, we follow Reviewer #2's suggestion and have added the following sentence in Lines: 729-732:

'We note that individual profiles opportunistically acquired following larger aerogeophysical surveys (i.e. flightlines over Flask Glacier; Farinotti et al., 2013) are not included in this data release unless specifically mentioned in the metadata for each survey (see Table 3) . Such small-scale datasets will be added to the data portal in future releases.'

Table 1 – could table rows be colour filled to visually distinguish PASIN1 and PASIN2 surveys?

This is a good point, however we believe that this change will be lost during the formatting of the paper by the Copernicus Proofing team and have thus not made this change.

Lines 228-238 – it would be worth explaining here that the data released here is approximately one half of the overall AGAP project RES data. The US data AGAP data are archived and available elsewhere already (e.g. CReSIS data website).

Agreed, thank you. The data from the US-acquired data is indeed already archived on the USAP-DC datastore (e.g. <https://doi.org/10.1594/IEDA/313685> for the radar data) and via the Lamont-Doherty website (<https://pgg.ldeo.columbia.edu/data/agap-gambit>), which our metadata sheet already redirects to. To address this in the paper, we have added the following sentence in the caption of Table 1:

⁽¹⁾ For AGAP, the data release only consists of the BAS-acquired data, which represents approximately half of the total (~120,000 km) survey coverage from the whole AGAP expedition (see Section 2.2.1).'

We have also added a sentence in the caption of Table 3, which provides the DOI to access the US-acquired data from the AGAP survey.

Line 258 – “collaborative projects” – collaborative with who? Information is provided for the ICEGRAV survey, but not IMAFI.

We agree with this point, which reflects one of the general comment made at the start of this review regarding acknowledgment to other national institutions around the UK who also acquired data with BAS. The sentence now reads (Lines: 268-270):

‘The 2010-11 IMAFI project was a UK initiative between BAS and the Universities of Edinburgh, York, Aberdeen and Exeter.’

We have also acknowledge the contribution of UK (and non-BAS) institutions in other parts of the paper (e.g. Lines: 313-316 for the FISS surveys).

Line 261 – “test” rather than “assess”? This project was definitely hypothesis-driven.

Agreed and amended.

Line 284-289 – a rather long unwieldy sentence. I recommend splitting in two.

Agreed and amended in response to Reviewer #1’s comment.

Lines 305-308 – Some detail on outlet glaciers/ice streams surveyed is missing here. Academy Glacier, Bailey and Slessor ice streams, and Support Force Glacier were surveyed. The survey lines over Bungenstock Ice Rise (whilst welcome) were opportunistic and a low priority target compared to the surveys of these outlet glaciers/ice streams.

Agreed and amended (see Lines: 320-321).

Line 360 – “All BAS aerogeophysical...” (i.e. delete ‘of’).

Agreed and amended.

Figure 5 – requires annotation of antennas and magnetometers on Figure 5a.

We have added annotations showing the location of the Magnetic, Radar, Gravity, and lidar instruments on the BAS aircraft shown in Figure 5a. We have also updated the caption as follow:

'The annotations show the location of the radar (R), magnetic (M), and gravity and lidar (G + L) instruments on board the aircraft.'

Figure 5 caption (and elsewhere in text body) – “antennae” or “antennas”? I'll leave that up to the authors and copy editors to decide on. I note lines 444-448 have a mixture of usage.

Thank you for this comment. According to the Oxford Dictionary, 'antennae' refers to the protuberances found on the heads of insects; thus we have changed all instances of the word 'antennae' in the text to 'antennas'.

Line 425-428 – I'm not sure “...acquire logarithmic detected waveforms to complex coherent acquisition.” quite makes sense. Is there a missing word (e.g. “...to facilitate complex...”)?

Yes, thank you for highlighting this. We have added the word 'accommodate'.

Line 432 – Typo “aiborne”

Agreed and amended.

Line 435 – “”...modern methods of digitisation...”?

Agreed and amended.

Line 448 – “configured” not “configure”

Agreed and amended.

Lines 439-452 – Quite a bit of this paragraph seems to be repetition of figure caption 5?

Agreed. The repetitive information was deleted from the text as it was already provided in the figure caption. Thank you.

Line 458 and elsewhere in this section – Make it clear that the radar system is PASIN-2.

Agreed and amended.

Line 462 – “Data” from PASIN-1 or PASIN-2 or both?

Both. We have made this distinction clear in Line: 476.

Line 466 – Missing MHz (x2) “10-MHz” and 13-MHz”

Amended.

Line 469 – “The radar...” PASIN2?

Amended to include both PASIN-1 and PASIN-2 vertical resolutions.

Line 487 – “...of the PASIN 1 & 2 systems is...”

Agreed and amended.

Line 487-492 – why are these parameters important enough to warrant text body description? Is this not simply repetition of the information provided in the table?

Agreed and removed.

Line 497 – Trimble not Timble (x2)

Agreed and amended.

Line 508-513 – I appreciate that these LiDAR data are ‘released’ as part of the along-track measurements, but in at least 1 survey (IMAFI) & probably more, swath data were acquired. Are there plans to process and release these data in future?

Thank you for this point. Since 2010-11 (i.e. IMAFI), the aircraft is indeed equipped with a lidar system with swath capabilities. Prior to 2010 (and also exceptionally for the 2011-12 ICEGRAV survey), the lidar was a single-point lidar system that only provided data at nadir. As part of our data release, we provide this single-point value along the centre line for all surveys, however the swath radar data has not yet been released. This is partly because we do not have the required software or a dedicated processing flow available in-house, and the cost associated with a commercial company doing this for us is relatively high with respect to the funding available for each survey. This means that not all of the swath data acquired to date has been processed (this includes the IMAFI survey mentioned by Reviewer #2).

We may look into releasing this data in the future, however we note that good quality satellite swath altimetry is available for most of the Antarctic Ice Sheet at high spatial and temporal resolution already, which means this data is of less priority compared to the other data released here.

We have added a sentence in Lines: 531-533 to clarify that although swath data was acquired from 2010 onwards, the lidar data provided here is only for the centre line, as follows:

‘From 2010 onwards, the lidar onboard the Twin Otter was capable of obtaining swath lidar data, although only the single-point data along the centre line is provided as part of this data release.’

Line 532-535 – This sentence is a bit complex. Perhaps split after “been applied” to read “...been applied. This includes the use of...”

Agreed and amended based on Reviewer #1 comment.

Line 556 – “...important geophysical signatures...”?

Agreed and amended.

Line 559 – “Magnetic data were then....”

Agreed and amended

Line 560 – “noises” or “noise”?

Agreed and amended

Line 566 – “shows” rather than “provides an insight of”?

Agreed and amended

Line 573 – “referred to as” rather than “just referred as”?

Agreed and amended

Line 588-590 – not strictly true as written as SAR techniques were later applied to a subset of the data (Heliere et al. 2007). Perhaps re-word to avoid confusion, explaining that the released data & Vaughan et al. 2006 not SAR processed? It would be useful to revisit the BBAS data and re-process with SAR techniques, followed by re-picking & release. The importance of the survey area (i.e. Pine Island Glacier/Thwaites) may warrant this, though admittedly it is a big job which is well outside the scope of this data release & manuscript.

Thank you for this comment. We have added the word ‘initially’ in this sentence to make this clearer. We agree that it would be extremely useful to reprocess the BBAS data with modern processing techniques, however we note in the paper that parts of this survey has already been reprocessed with SAR techniques by Chu et al. (2020).

Line 592-593 – Is this statement 100% correct? I didn’t think that the 2006/7 IMAGE-Grades survey data were SAR processed (Maybe also the Wilkes Basin survey?). Perhaps I have this wrong however.

Yes, the GRADES-IMAGE and the WISE-ISODYN data were processed using unfocused SAR processing, as described in the original documentation from Corr et al. (2007; Terra Antarctica Report). This SAR processing has evolved over the years, as we described in Section 3.2.3, partly through the work of Heliere et al. (2007).

Line 600-601- this sentence would benefit from a reference. Would Castelletti et al. 2019 be appropriate here? <https://doi.org/10.1017/jog.2019.72>

Thank you for pointing us to this reference. We have added it in on Line: 621, alongside another reference from Peters et al. (2007; <https://doi.org/10.1109/TGRS.2007.897416>) which also discusses the effect of different SAR processing techniques for bed reflectivity and layer slopes.

Line 625 – Castelletti reference may be appropriate here too?

Agreed and added.

Line 628-630 – Which survey was the Flask Glacier from? This is perhaps an example of the targeted/opportunistic surveys that I discuss in major comments above. Would be good to explain if

this was part of one of the released survey datasets (Table 1) or is something else, even possibly not released here.

As stated in the above comment/response, we have added a sentence relating to opportunistic and independently flown flight lines such as those over Flask Glacier in Lines: 729-732 (see line-by-line comment above).

Line 632-635 – A sentence that is probably worth splitting in two. Also needs a little clarification by what is meant by “institutes”.

Agreed. We have shortened and re-organised the sentence based on Reviewer #1’s comment, and have replaced the word ‘institutes’ for ‘radar data providers’ throughout the text to reflect the diversity of organisations and individuals who acquire and process the radar data over Antarctica.

Line 636 – Opens with “we”, but I suspect that this is not appropriate here. “The BAS approach is to pick...” might be better. I’m aware that many people worked as ‘pickers’ (including myself) to pick the bed for these surveys, and at least some of these were not necessarily people with significant radioglaciology experience beforehand. It might be worth reflecting this in the text.

We agree that this is a valid point worth mentioning in the paper and which refers to one of Reviewer #2’s main comment above. We have therefore added the following at the end of this paragraph on Lines: 663-666:

‘We note, however, that this method has evolved over the years, and that its success is inherently reliant on the radioglaciological experience of the human picker to quality-check the results from the semi-automatic picker and manually re-pick the data if necessary.’

We have also added a few sentences after this line (Lines: 666-676), which reports typical crossover errors that can be partially associated with the picking procedure (see response to comment below).

We have also changed ‘We picked [...]’ at the start of the paragraph for ‘The BAS approach to picking the bed was to use [...]’

Line 638 – “...manual re-picking...”?

The word ‘manual’ is already provided in the sentence and applies to both ‘checks’ and ‘re-picking’, so we have left the sentence as it was in the original document.

Line 659 – provide an example/reference for an ‘older survey’ like this.

Despite what was originally written, the acquisition of the lidar data was not exactly based on a specific survey or time period, but rather on whether lidar was available at all (i.e. considering meteorological conditions, issues with the system, etc); and so it is much more accurate to say that this applies to any time when the lidar is not running.

As a result, this sentence now reads:

‘If lidar was not available to calculate range-to-ground, [...]’.

Line 674-678 – provide a range of typical crossover errors from the surveys here? I’m aware that Ross et al. 2012 <https://www.nature.com/articles/ngeo1468> includes separate RMS errors for smooth and rough topography, so could be useful in this regard. Aside from crossover errors have BAS ever undertaken any other error assessment on picking of the bed from the radar datasets (e.g. comparison of picks by different pickers etc.)?

Thank you for suggesting this. We agree that providing a range of values for the errors in ice thickness/bed elevation would be fitting here, although we note that this information is typically available in the metadata sheets for each survey. Additionally, a sentence was already included on this (see Lines: 674-678 of the original manuscript), though without providing actual values. We do not report surface elevation errors as these tend to be smaller than the wavelength of the PASIN radar in ice (< ~1 m).

We added the following at Lines 666-676:

‘The uncertainty associated with the picking procedure can be partially approximated by calculating the Root-Mean-Square error (RMS) of the bed elevations at crossover points across the survey area. Although these errors are site-specific and can depend on factors such as varying bed topography and roughness, larger errors may reflect uncertainties in data processing or analysis (i.e. picking in this case). Areas of more extreme topography typically show the highest crossover errors, likely associated with off-axis reflections and entrained debris close to subglacial cliffs, which make deciding on the correct bed pick challenging. In isolated cases, such errors can exceed several hundred meters. In contrast, regions dominated by smooth and flat bed typically show lower crossover errors, on the order of several meters only. Survey wide RMS errors are typically reported in each survey’s metadata (see Table 3) and average ~9 to 22 m depending on the survey (see Rippin et al., 2003; Vaughan et al., 2006; Ross et al., 2012; Jeffry et al., 2018).’

Regarding a wider error assessment of the picks from our datasets: we are not aware that such work has taken place, although we refer the Reviewer to the Bedmap2 (and upcoming Bedmap3) datasets led by BAS which already assess the uncertainty in radar bed elevation picks (including all those from BAS) prior to the interpolation of the bed elevation and ice thickness grids.

Table 3 caption – should the data held at CReSIS be linked to a DOI?

To our knowledge, CReSIS does not provide a DOI for its data, so we can only provide the URL where the data is deposited.

Line 739 – “...exported and made available...”?

Agreed. We have added the words ‘and published’.

Lines 765-776 – lots of repetition of figure caption information here (e.g. “highlighted in blue”). I recommend careful editing to remove unnecessary repetition.

Agreed. We have removed most of the repetitive information from the text, and added any missing details into the caption.

Line 811-812 – “The portal interactively showcases....”?

Agreed and amended.

Line 845-846 – I suggest swapping “geophysical data” in here, rather than “radar data”. The radar data are simply being used here as an exemplar on behalf of the entire dataset released and described. It would be good to reduce the potential view of section 5 being radar-biased, and instead be inclusive of all the data types (but without a case study exemplar for each).

We agree with this point, and thank the reviewer for their suggestion. We have replaced the words ‘radar data’ for ‘aerogeophysical data’ and have attempted to carefully rebalance the focus of this section onto all aerogeophysical data, with a sub-focus on the radar data necessary for Section 5.1.

Lines 850-878 – Can this section be considerably shortened?

Agreed. We have significantly cut down this section as a result. Please see response to comments below.

Line 852 – move “limited” to earlier in the sentence? E.g. “...suggest limited changes...”?

Agreed and amended.

Line 852-854 - took me a while to fully comprehend so some form of rewording probably necessary.

Hopefully the change in the position of the word ‘limited’ makes this sentence clearer.

Lines 879-883 – A lot of the text here can be reduced by simply inserting “between 2004-2020” in the first sentence, and referring to table 1. Then the second sentence listing all the surveys can be deleted?

Agreed and amended.

Lines 904-907 – be specific about the differences between AGAP and BBAS surveys? i.e. one was SAR processed, the other was not.

We believe that the answers provided above to Reviewer #2’s comment are sufficient for this addition to not be necessary here, particularly since we refer to this difference in the sentence prior to this one (see Line: 920 and in Section 3.2.3 more specifically).

To better re-inforce the message from this sentence however, we have replaced ‘AGAP’ by ‘POLARGAP’ as we believe the contrast in year of acquisition between the two surveys (10 years) and the evolution in acquisition and processing methods (see Section 3.4.3) is greater than for the BBAS-AGAP comparison.

Line 908 – The end of this paragraph presents an opportunity to reinforce the important message of section 5, i.e. to demonstrate the validity and usefulness of releasing the whole dataset openly (i.e. that this sort of metadata level analysis can be undertaken on a continent-scale, and that new and developing techniques and approaches (e.g. AI etc.) can be applied). That then mitigates the potential radar data bias that comes across with section 5 at present.

We agree with this point, and have added a paragraph in Lines: 896-899, as follow:

‘Enabled by the comprehensive release of large swaths of fully standardised and open-access aerogeophysical data described in this paper, we aim to demonstrate that much more information can be extracted from these data on a regional- to continental-scale, which would not have otherwise been possible before.’

This point is again reinforced in the Conclusion section in Lines: 1051-1056 where we also mention Artificial Intelligence, as follow:

‘We note that the analysis shown in Section 5.1 is only possible because the data has been comprehensively standardised and made open-access. Whilst we acknowledge that this type of work may suffer from a lack of funding opportunities, the results presented here would suggests that re-modernising already acquired data may be as important as acquiring new data. It also enables their use in emerging fields such as artificial intelligence which rely on large amounts of standardised data.’

Lines 916-923 – lots of geographic locations referred to in this paragraph. These need annotated on a figure.

Agreed. Labels were added to Figure 9 with this comment in mind.

Line 939 – where it says “further exploited in the future” make the case that this is only possible because these data have now been so comprehensively and openly released. There’s an important argument and case to be made here as there is still work to be done across the scientific community (and funders) about the importance of undertaking and funding the work necessary to facilitate data release. The authors have an important and high-profile opportunity here and my recommendation is to reinforce this case here strongly.

Again, we strongly agree with this point and have added a few sentence on Lines: 896-899 and Lines: 1051-1056 (see our answer to the above comment).

Line 942 – at the risk of recommending citing my own work, an appropriate reference to cite here could be Ross et al. TC 2020 <https://tc.copernicus.org/articles/14/2103/2020/tc-14-2103-2020.html>

Agreed and added.

Lines 943-952 - I suggest these lines be removed. They are very radar data-/glaciology-specific, and I think it dilutes the broader geophysical importance of the entire dataset a little. The ILCI analysis of the radar data should be a representative of the entire dataset demonstrating why open data is so important. It’s an excellent example, it probably just needs to be presented in a slightly different way.

Thank you for this comment. We agree that some sentences in this section were perhaps too specific with respect to the audience we are trying to reach, and have thus removed and combined them into a much more concise paragraph. We have also significantly shortened the following paragraph (Lines: 953-958 in the original document) and merged it with the previous paragraph (Lines: 938-952 of the original document).

Line 956 – Napoleoni et al 2020 <https://tc.copernicus.org/articles/14/4507/2020/tc-14-4507-2020.html> would be appropriate here. It is referenced elsewhere in the manuscript so is not an additional reference.

This sentence has now been removed due to changes to Section 5.1 (see response to comment above).

Lines 991-995 – this sentence is unnecessary. Just insert appropriate references in line 989-991.

We do not agree that this sentence is unnecessary. It links with Figure 10 and provide examples to support the point made in Lines: 983-990. We have therefore decided to keep this as per the original document.

Line 1000-1005 – it wasn't totally clear that there is a current plan to release the 1994-2004 RES data from the text here. Is there one?

Thank you for your comment. This is very much funding dependent, and as stated in the text, will require much more work to bring these datasets up to modern data standards. We believe that the fact this sentence is already in the 'Future Work' Section of the paper is clear enough and have not added any further clarification.

Line 1009 – reference Castelletti et al. again here?

Agreed and added.

Line 1008-1009 – it might be worth inserting a comment here that were data to be re-processed with new approaches then the aerogeophysical data platform could be used or adapted to release those data openly.

We already make this point in the following paragraph (Lines: 1024-1026 and Lines: 1033-1035) and have thus not made any changes to this sentence.

Line 1011 – Is there a plan to release these raw radar data files to the community?

At present, we do not plan to release the raw data due to the size of the files, particularly since the new PASIN-2 system acquires up to 3TB of raw data in a single 4-hr flight (see Line: 483). Additionally, significant assistance would be required to guide users on how to use the data, which would be beyond the current capacity of the aerogeophysics team at BAS.

Line 1025 – 2D radar data released 2004 onwards only.

Agreed. We have added this distinction for the bed pick and the 2-D radar data.

Line 1044 – RINGS and AntArchitecture action groups: are there DOIs or references that can be linked to here? 10-20 years from now readers may wonder what these action groups were without this.

We agree with this point. However due to the relatively recent inception of the RINGS and AntArchitecture groups as official SCAR Action Groups, little published material (that is with an official DOI) is available yet which can serve as valid references. We have added a sentence that describes the main motivations of both projects in Lines: 964-967 and Lines: 1065-1066 respectively.