Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2020-393-AC2, 2021

Open Access Earth System Science Data Discussions

Interactive comment on "A detailed radiostratigraphic data set for the central East Antarctic Plateau spanning the last half million years" *by* Marie G. P. Cavitte et al.

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Received and published: 5 July 2021

Response to RC2 comments on the submitted paper *A detailed radiostratigraphic data set for the central East Antarctic Plateau spanning the last half million years*

We thank the reviewer for his detailed and constructive comments which have helped clarify our manuscript, as well as improve our figures for the readers. We have responded to all comments and have modified the paper accordingly, our point-by-point

answers follow. Review comments are in bold italics while our answers are not.

Please note that Fig. 8 was moved up in the manuscript following Reviewer 3's suggestion. It now features as Fig. 4 and all subsequent Figs have been renumbered.

Answers to RC2

Minor comments:

Section 2.2.1: The processing methods for the HiCARS data presented in this section is important but the order of the sentences and paragraphs is confusing (see my line-by-line comments). Additionally, the order of the table is not sequential and the naming of these tables is not consistent between the text and the actual table numbering. There is also no mention of Table 1 in the text, although as pointed below, the authors could perhaps shift this table to the supplementary materials as it is of lesser importance compared with Table 2.
Answer: (Note that Section 2.2.1 is now Section 3.2.1.). We have reworked the processing methods for the HiCARS data section as suggested in the line-by-line comments, which indeed makes it much clearer and easy to follow. Thank you for your suggestions. We had a glitch with the automatic table numbering in LaTex, this is now fixed and all tables are properly references. As for Table 1, we prefer to keep it in the main manuscript as (1) we now reference it in the main text, (2) it contains important information for comparing the different radar systems and (3) we do not currently have a supplement and adding a supplement just for one table seems awkward.

Figure 3: Throughout the discussion and the conclusion, the authors mention that the main limitation to the tracing of deep IRHs in the region is impeded by rugged bedrock that induces dipping geometries and attenuation of the radar return. As this is one of the main argument provided to explain why the authors were unable to extensively trace and directly date IRHs 20-26, it would indeed be useful to provide a direct example of this. However, I'm not convinced that this is adequately shown in the manuscript. The authors refer to Figure 3 as an example of this, but I think a much better example could be provided

such as a radar image passing over the Concordia Subglacial Trench, which as the authors mention in the paper is an area where basal processes affect substantially IRH geometry in the area and thus would link well with your main conclusion. With regards to Figure 3 in its current state, is difficult to assess the continuity of the IRHs at depths. As a starting point, it would be much clearer if the authors could replace the continuous lines which result from the picking algorithm for something more subtle like crosses or circles at regular intervals. Additionally and as I show in my comments below, I feel this figure could be much improved, first by replacing the screenshot view for a proper figure with axes. There is a lot of unnecessary information in this figure at the moment, especially the different tools and menus from the Landmark Desktop which complicate unnecessarily the presentation of this figure. In my understanding, the point of this figure is three-fold: 1) Show how IRHs can be intersected with other data at crossover points, 2) the vertical position of each of the 24 IRHs (highlighted those that were dated and those that were not), and 3) the fact that tracing IRHs at depths is impeded by rough topography and radar attenuation. Whilst this figure shows these to some extent (mainly point 1 and 2), it lacks heavily in clarity and simplicity and may confuse easily the reader. I would suggest replacing this for a much more standard radar figure, with perhaps a zoomed-in view of the bottom $\sim$20% of the ice thickness where IRHs become discontinuous. More details on this can be found in my line-by-line comments.
Answer: We completely agree that our choice of radar transect for Figure 3 was perhaps not the most useful with regards to our discussion. We really like your suggestion and have decided to replace this radargram with the one going across the Concordia Subglacial Trench (OIA/JKB2n/X57a). We now provide a proper figure with axes showing depth instead of two-way-travel-time, and provide a zoomed in view of the bottom section of the ice column where IRHs drop out. We have removed the basemap view, and highlight this transect on Fig. 1 instead. Finally, we now highlight the depths of the IRHs as circles instead of continuous lines for better visibility.

Published dataset: I'm also interested to know why the authors chose to place NaN values in the IRH depth column for each of their IRH in the csv files (data accessible at: https://www.usap-dc.org/view/dataset/601411). If there are no values for IRH depth, then why placing these rows in your dataset files? If this because you provide IRHs at regular 1-km intervals (for mcords and HiCARS) and 250-m for DELORES, then wouldn't it make more sense to provide all the other values (i.e.surface elevation, ice thickness, bed elevation) separately? If your aim is to provide IRH depth (and the values for ice thickness, surface elevation, bed elevation) plus all the ice thickness/surfelev/bedelev values along the flight line, then why not creating two separate csv files, one with all these values along the flight line, and one for when you only have IRH values? Also, I'd suggest to add somewhere in your paper that the IRHs are provided along regular intervals depending on which radar system you used.
Answer: For the data release, we wanted to have a single file per IRH that contains all relevant information for any users in a convenient format. This is why we prefer to keep the ice thickness/surfelev/bedelev values with the IRH depth values so that each IRH data point has a corresponding ice thickness/surfelev/bedelev value. The way we managed our IRH depth NaN values is as follows: if the IRH is completely absent from a radar transect, that radar transect is ommitted from the file. However, if the IRH is present in part along a radar transect, we provide all ice thickness/surfelev/bedelev values for that transect and complete untraced sections of the IRH with NaN values. This was of publishing the data seemed most thorough. That way, NaN sections can easily be dropped out by users. But if, e.g. for modeling purposes, upstream conditions of bedrock topography, ice thickness, etc are needed, they are de-facto provided.

Line-by-line comments:

L06: Could you provide an age range for your IRHs here? You could be more accurate when you say 'beginning of the holocene' and provide the age of your shallowest layer. Perhaps, it would also be useful to provide the percentage depth of your shallowest and deepest IRH in the abstract too.
Answer: We have now added this information in the abstract: "Through direct correlation with the EPICA-DC ice core, we date 19 IRHs that span the past four glacial cycles, from 10 ka, beginning of the Holocene, to over 350 ka, ranging from 10% to 83% of the ice thickness at the EPICA-DC ice core site."

L27: 'The IRH' should be 'The IRHs'
Answer: Corrected.

L34: Extra reference to this methods point is this recently accepted paper on IRH dating over Pine Island and Thwaites glaciers in JGR-Earth Surface by Bodart et al. (2021). Full ref: Bodart, J.A., Bingham, R.G., Ashmore, D.W., Karlsson, N.B., Hein, A.S., and Vaughan, D. G. (2021). Age-Depth Stratigraphy of Pine Island Glacier Inferred from Airborne Radar and Ice-Core Chronology. Journal of Geophysical Research: Earth Surface. doi: 10.1029/2020JF005927.
Answer: We are very happy to add this reference. It was not yet published at the time of submission.

L35: Extra reference to this point: Karlsson et al. (2014) in Journal of Glaciology. Full ref: Karlsson, N.B., Bingham, R.G., Rippin, D.M., Hindmarsh, R.C., Corr, H.F. and Vaughan, D.G., 2014. Constraining past accumulation in the central Pine Island Glacier basin, West Antarctica, using radio-echo sounding. Journal of Glaciology, 60(221), pp.553-562. doi: 10.3189/2014JoG13J180
Answer: This reference has been added.

L40-41: Yes, but not only due to its sheer size. Different types of data acquisition methods (e.g. system frequencies, survey objectives), different processing regimes, and the multitude of institutes who collected the data must also be mentioned as a comparison to why it's so much harder to create an Antarctic-wide product like over Greenland.
Answer: We agree that this is an important point to specify. The sentence has been expended as follows:
"An extensive internal stratigraphic data set has already been obtained for the Greenland Ice Sheet (MacGregor et al., 2015). However, due to its sheer size, but also the wide variety of data acquisition platforms and processing algorithms applied to the data as a result of the multitude of institutes involved in data collection, the Antarctic Ice Sheet will require more time and the acquisition of additional ice-penetrating radar data in order to: (1) connect existing surveys and (2) extend coverage to under-surveyed parts of the ice sheet."

L49: 'using the AICC2012 chronology'. Suggest adding 'ice-core chronology' as it is the first time you mention AICC2012 in your paper.
Answer: Agreed, this has been added.

L58: Suggest removing the double parenthesis and 'participants are listed alphabetically'
Answer: The reference was fixed, it now reads: (EPICA commmunity members et al., 2004)

L75: Could you add on Figure 1 where the Concordia Station is?
Answer: At this scale, the ice core site and the station location are coincident. This information has been added in the caption as follows:
"Note that Concordia Station is coincident with the EDC ice core site at this spatial

scale." and Fig. 1 is now referenced at the end of this sentence.

Fig 1: Could you switch the colours for the ice divide (purple) and the HiCARS $<$2016 (black) around? It would be easier to keep all the radar surveys in colour and make the ice divide black
Answer: We have now switched the colors for Fig 1: HiCARS is now in magenta, the ice divide is in gray (so it can be differentiated from the surface elevation contours which are in black).

Fig 1 caption: 'shown as solid lines whose colour is a function of the radar system'. This is an odd phrasing. Maybe replace by 'whose colour is shown in the figure legend'.
Answer: We have changed the sentence as suggested.

L82: The table order in the manuscript is not sequential and does not correspond to the actual tables in the text. The authors refer to Table 2.1 for the radar system characteristics but this is labelled as Table 1 in the main manuscript. Also, is there really a need to have two tables for system characteristics before and after processing in the main text? Table 1 ('ice-penetrating radar system characteristics before focusing and migration') is useful but maybe more suited to the supplementary materials, especially since the authors don't mention it in the main text. The frequency range could be mentioned in the text as this is maybe the most useful information here. Table 2 is much more useful when it comes to quantifying uncertainties in your dataset.
Answer: We had a LaTex glitch, all the table numbering has been fixed. We do think it is useful to have Table 1 in the main manuscript as it provides a convenient summary of the three radar systems. But we have added references to it in the main text: once line 87, and again at the end of the paragraph as follows:

"For comparison, the MCoRDS radar system uses a center frequency between 180-210 MHz and a compressed pulse width of 51 ns (Table 1)."

L101: Again, table 2.2.3 does not exist. Please amend this. If you're referring to Table 2 as above, then this suggests again that Table 1 is better suited to the S.I. as it is not mentioned in the text and is relatively less important than Table 2. Also, below this line, you have a reference to Holschuh et al. (2014) in footnotes. I believe this is a glitch from using LaTeX and should be removed.
Answer: Indeed, there was an issue with the LaTex file. All table references have been fixed, as well as the footnotes. Thank you.

L106-110: The connection between the two paragraphs is not very clear and leads to misunderstanding. Particularly, the link between L108 and L109 is confusing. I suggest rewording as follows: 'To improve along-track geometries and produce foc 1 and foc2, we use the matched filter-focusing approach of Peters et al. (2007) by interpolating the data to 1 meter records along track and filter out coherent noise. For Foc1, [. . .] etc.
Answer: We agree that upon re-reading the paragraph, the transition was not very clear. We have taken your advice and have modified the start of the paragraph as follows:
"To improve along-track geometries and produce the foc1 and foc2 radar products, we use the matched filter-focusing approach of Peters et al. (2007) by interpolating the data to 1 meter records along track and filtering out coherent noise. For *foc1*,..."

L116: I did not understand the beginning of this sentence starting with 'our primary processing approach for IRHs was foc2'. Please rephrase. Again this could be improved using the suggestion above. I think putting this and the previous paragraph together would make more sense here.

Answer: We meant that foc2 radar products are preferentially used when tracing IRHs. But we agree the wording was unclear. We have now merged this paragraph with the previous one, and made the structure more parallel with the description of the foc1 products. Changes are:
"... but is not appropriate for deep IRH tracing (Holschuh et al., 2014). For *foc2* ('2-D focusing'), we accommodate range variation of up to 1 μs, allowing our matched filter to track echoes for each point for synthetic apertures of over 2 kilometers. By doing so, ..."

L122: Again the authors are referring to Table 2.2.3 which does not exist. Please amend all the other mentions of this table and others as well.
Answer: Apologies for the confusion. The numbering has been corrected

L123: This is confusing. You mentioned Pic1, foc1 and foc2 but only used Pic1 and Foc2. Why did you not use foc1 and is it worth mentioning it here if you did not use it at all?
Answer: We did not use foc1 here as foc2 provides the best results for tracing sloping IRHs. As stated a little further above in the paragraph: " The *foc1* processor often produces good results for the bed (particularly in the presence of surface scattering) but is not appropriate for deep IRH tracing(Holschuh et al., 2014)". However, we prefer to keep the description of the foc1 radar product as it is used, in addition to foc2, to measure the ice thicknesses and bed elevations for the transects. We have therefore added the following sentence in the paragraph:
"The foc1 product was not used to trace the IRHs as foc2 provides the best results for tracing sloping IRHs in comparison to foc1."

L126: Please rephrase this sentence as it is confusing.
Answer: We have rephrased it to:

" We explicitly state in the published IRH data set which processing type (*pik1* or *foc2*) was used for IRH tracing."

Table 2: The 2nd reference for DELORES in the table (i.e. Lindsey 1989) is obscure. Perhaps King et al. (2016) is more appropriate for this dataset and the processing methods are well described in this paper. Full reference: King, E.C., Pritchard, H.D. and Smith, A.M., 2016. Subglacial landforms beneath Rutford Ice Stream, Antarctica: detailed bed topography from ice-penetrating radar. Earth System Science Data, 8(1), pp.151-158. doi: 10.5194/essd-8-151-2016
Answer: We have added the King et al. (2016) reference. But we have kept Lindsey (1989) here as this reference provides important information on how to calculate the horizontal resolution of a signed waveform system, which is the case of the DELORES system.

L150: The abbreviation of two-way travel time (i.e. TWTT) needs to be in capital letters and consistent throughout the text and figures.
Answer: We now make sure to use "TWTT" throughout.

L168-170: I'm not certain these sentences are appropriate for this section as they sound similar to L157 where a similar issue is mentioned. I suggest removing sentences on L168-170 and combining with section 2.3. Section 2.4.1. could then start with 'One of the HiCARS survey line [. . .] etc.'
Answer: We have followed the advice given here. The paragraph now begins at:
"One of the HiCARS survey lines...".
Lines 168-170 have been moved to Section 2.3.

L170: Please improve the formatting of the equations. There is a weird line

(linked to LaTeX formatting) which needs to be removed and a footnote in the middle of the text which also needs to be removed.
Answer: It was the footnote of the table that was appearing somewhere it should not be. Thank you. This has now been fixed.

L171: "with a gap of 94 m between the ice core site and the point of closest approach" – in the description of your dataset on the USAP portal (https://www.usap-dc.org/view/dataset/601411; see abstract and 'read_me' files), you state that the distance between the ice-core and the radar transect is 110 m: "Ice core ages are transferred onto the IRHs on radar transect MCM/JKB1a/EDMC01a at distance = 110.153 m along the transect." Please amend whichever value is erroneous.
Answer: Our syntax was misleading. The gap is of 94 m between the ice core site and the point of closest approach. The 110.153 m refers to the value of the *distance along transect* column in the data set corresponding to that point of closest approach. We will reword the abstract and read_me in the USAP portal to be clearer.

Fig 3: This figure is poor. It looks (is) like a screenshot of the Landmark desktop with quick annotations on it. I am not convinced that this choice of presentation helps support any particular point made in the text. I think showing crossovers and the ticks representing the depth of a same IRH across crossovers is very useful, but I don't see why this has to be presented in its current form as a screenshot of the desktop. I suggest re-working this figure substantially (see minor point above), starting with adding a depth axis in meters as opposed to the TWTT on the left hand-side of radargram and moving from a screenshot to an actual figure showing a crossover point and the depth of your IRHs at this point. It would be good to have coordinates on the map to the left and a clearer choice of colours (I can't see the yellow marking on the white background). It is

also not clear why some IRHs are red and marked as (isochrones) and some are yellow and marked as (horizons) until you read the caption. Also, nothing tells you that the yellow IRHs are not isochronous, so why are they called differently? If this is due to the fact they are undated, then it would make more sense to change the annotations to: IRHs (dated) in red and IRHs (undated) in yellow.
Answer: Our aim with this figure was to show the environment that these IRHs are traced in, so you are right that this is a screenshot of the Landmark Desktop. But upon reading your comment, it seems it does not have the added value that we had anticipated. It has now been changed to a real depth radargram of a transect that runs across the Concordia Subglacial Trench. We chose to remove the map on the left, as we now locate this transect on Fig. 1. We now refer to "dated IRHs" and "undated IRHs" rather than "isochrones" and "horizons", as this it indeed mistakenly suggests the horizons are not isochronous when they are. This new vocabulary has been adopted throughout the manuscript, and in this figure. We also adopt the suggested marking of IRHs with circles and crosses. And we provide a zoomed view of the bottom half of the ice column where undated IRH are traced but rapidly drop off.

L184-188: You state that the IRHs that cannot be traced all the way to your radar transect remain undated. But you do date them using the 1-D model. They might not be directly dated at the ice-core, but you still attempt to date them. Since this sub-chapter is titled Age attribution, I'd expect that you include the information on the 1-D modelling here too. Currently, this section implies you have several undated IRHs. . . but you do date them (although indirectly)! Some details on the 1D model would therefore be useful here.
Answer: We have now moved part of the 1-D modelling description here. We have added the following at the end of the paragraph:
"We can however provide an estimate of the age of these "undated IRHs" using the 1-D pseudo-steady (Parrenin et al., 2006) ice flow model described in Parrenin et al. (2017). We use the dated IRHs as age and depth constraints to calculate a

steady state age-depth modeled field for each radar transect. The ages simulated for the bottom 20% of the ice sheet, i.e. older than the deepest dated IRH, are therefore extrapolated ages. From the measured undated IRHs depths, we sample the simulated age-depth field and assign a modeled age to every trace along the radar transects (Fig. 8). We can then assign a mean modeled age for each undated IRH.".
We have therefore shortened the paragraph in the Results section accordingly.

L219: Could you provide an approximate figure for the amount of snowfall in the 10 years of data collection? Even though this can be neglected as it will like be of the order of a few meters and much smaller than the maximum uncertainty from the radar systems, it would be good to state this here for sake of transparency.
Answer: We now provide the yearly snowfall at Dome C right after this statement, which indeed is much smaller than the depth uncertainties calculated for the IRH depths:
"$\sim$25 mm/yr, Stenni et al., 2016."

Table 3: I think this table would be better placed under 2.5.2 as you haven't yet explained how you calculate age uncertainties. Also, would it not be more accurate to round the depth and depth uncertainties to the nearest meter? The uncertainties in IRH depth from the radar are unlikely to be of sub-meter accuracy, particularly with the older radar datasets used here. This is also particularly true for the much deeper IRHs (see Table 4)
Answer: This is a good point and Table 3 has now been placed under 2.5.2. (now 3.5.2 as a result of other changes made in the manuscript). We now keep two significant figures for both the depth and age uncertainties and have removed the trailing zeros for the depths (also applied to Table 4)

L232: Again, be careful with the order of your tables. You state the age uncertainties for each IRH is summarized in Table 2.5.1. Do you mean Table 3?
Answer: Yes, this has been rectified (LaTex glitch).

L237-238: This is fairly wordy. Do you mean that you normalised the depth of your IRHs?
Answer: Not exactly: we provide the depth anomalies of each IRH with respect to its average depth below the surface. By doing this, all the IRHs can be on the same color scale in the figure which allows the reader to identify which IRHs are steeper/more rough than others, always with respect to their average depth. We have reworded this slightly to make this point clearer as follows:
"Figure 6 shows, for each dated IRH, the depth anomaly of the dated IRH with respect to its average depth from the ice surface, as a percentage anomaly. It shows where the IRH is deeper or shallower locally than on average."

L238: The transition between the sentences above and this paragraph is not very clear. Could you make anything below L238 a separate sub-chapter? As it describes IRH stratigraphy, perhaps you could name this 'Characteristics of Internal Stratigraphy'?
Answer: We have followed your suggestion and made everything below L238 in the results section into subsection "Characteristics of internal stratigraphy".

Fig 4: I can't easily distinguish between the magenta colour representing the IRH and the pink vertical bounds that represent the IRH age uncertainties. Instead of a colour, could you maybe change the linestyle to '- -' or something similar? Also could you add the units in the caption for δD?
Answer: We have chosen to restructure the figure (now Fig. 5) a little for clarity. The grey shading that was used to highlight the interglacials is now replaced by

horizontal light red bars at the top of the figure (to avoid cluttering), while the IRHs are represented by vertical dashed lines with a light blue shading for the uncertainties. We did not change the uncertainties to a '- -' because it would not be visible for the shallowest IRHs that have a small uncertainty. The caption has been modified appropriately and the δD units have been added in the caption: "... δD variations in per mil Standard Mean Ocean Water (SMOW)"

L267: 'Interest' should be 'of interest'
Answer: This paragraph has been changed slightly, following reviewer 1's comments, and appears further down in the Discussion.

L274: 'some 500 km away' is vague. Can you be more accurate?
Answer: The exact distance is not really relevant, only the point that there are hundreds of kilometers separating the two ice cores sites. But we have measured the distance more accurately modified as follows:
"Difficulties mostly arose in approaching the Vostok ice core site, located $\sim$550 km away, due to wind-driven snow redistribution buried beneath the surface, ..."

L278-282: Please rephrase these sentences and add some examples of what you mean as it is vague. You say that modelling efforts have brought to light the influence of basal processes on internal stratigraphy. Can you be more specific? You state that these effects can be seen on Figure 3, but it's not very clear what you mean. I think a new figure highlighting these different processes would be useful here, as I showed earlier. Especially as you go further in depth in the next sentences and provide an example over the Concordia Subglacial Trench. This figure would also link up well with L238-242.
Answer: To be more specific, we have expanded this section to include examples of processes that can impact the IRH geometries. The paragraph now reads as follows:

"Most difficulties in tracing IRHs arise for the deepest IRHs (Fig. 3). Robin and Millar (1982) first described how the effect of the bedrock topography has the strongest impact on the internal stratigraphy immediately above the bed, and decreases with distance from the bed, while modeling efforts have brought to light the influence of basal processes on internal stratigraphy. Variations in basal geothermal heat flux, the presence/absence of basal lubrication, or the roughness of the bedrock topography can cause the folding or the down-/up-draw of the IRHs which all complicate the continuous tracing of their geometries (e.g. Leysinger Vieli et al., 2011; Vieli et al., 2018). This increasing complexity of the IRH geometries is obvious, even visually, in the IRHs presented here (Fig. 3). Because the deepest IRHs are generally the steepest, their coverage is spatially limited (Fig. 8). "
In addition, we have changed Fig 3 to show, as suggested, IRHs flowing over the Concordia Subglacial Trench.

Fig 5: It is relatively hard to see the percentage depth of each IRH. Could you make it bold and bigger? Also the star representing the EDC ice-core site is fairly difficult to see; it's very small and color navy is too dark for the background.
Answer: (Now Fig. 6) We have made the percentage depth bigger and have changed the EDC ice-core site marking color to yellow for better visibility.

Fig 6: I think it would help if you had a consistent naming for all your IRHs. Throughout the text and in Figure 5, you use the word IRH or ISO but then in Figure 6 you use the abbreviation H (=horizon?). It would be clearer if you kept the naming convention you've used in Figure 5 and name the IRHs on Figure 6 as ISO20 to ISO 26. This point could also be said of Figure 7 and Table 4 where different abbreviations are used to refer to the same sets of IRHs.
Answer: (Now Fig. 7) Now that we have changed the vocabulary to "dated IRH"

and "undated IRH", we have changed the naming convention on the figures to "IRH"+number corresponding to their number in Tables 3 and 4. And it now also matches the USAP data set naming convention.

L290: Remove the indent before 'In using'
Answer: We prefer to keep the indent here, as it indicates the beginning of a different point of discussion. After inserting reviewer 1's comments, the discussion has also been modified further.

L292: 'tractable'. Can you be more specific?
Answer: We have changed it to "achievable".

L299: 'very good one-to-one match'. I'm not sure this figure shows a 'very good' match. This is perhaps pedantic but 'a good match' is probably more accurate.
Answer: We agree it was perhaps over confident. We changed it to "good match".

Fig 8: I'm not sure why this figure is in the conclusion. Can you move it up in the results or discussion section? It would also be useful if you could provide the location of where these crossovers are (e.g. in Figure 1). If you didn't know they were crossing each other, you could easily assume they are from different locations (i.e. the layers on the DELORES radargram don't always look exactly like the layers on the OIA radargram even considering system resolutions; especially the bottom two). It would also perhaps be useful to remove the continuous lines from the automatic tracker as they mask the true layer, and instead show the layer as circles or crosses (see similar comment for Figure 3)
Answer: (Now Figure 4) We have moved the figure up into Sect. 3.3, following Reviewer 3's advice. We have also labelled the relevant radar transects on Figure 1,

and detail better in the Fig. 4 caption that these are crossover locations so that it's clear to the reader. And we have changed the IRH markings to circles either side of the intersection, as suggested. Note that we changed the color map to an inverted grey scale as it shows the IRHs better at this zoom. The caption now reads:
"Zoomed-in view of radar transect intersections between different radar systems: (a) between the HiCARS OIA transect OIA/JKB2n/Y77a and the DELORES transect 2H30E-H30B (both marked on Fig. 1), and (b) between the HiCARS OIA transect OIA/JKB2n/Y77a and the MCoRDS transect 20121227_01 (red line on Fig. 1). The traced IRHs are highlighted by red circles either side of the crossover point (marked by a red vertical line). The vertical scale is the true vertical depth (TVD) in meters. Note that in this color map, IRHs (maximum amplitudes in radar returns) are displayed in white."

L307: You could add a reference to Bodart et al. (2021) here too.
Answer: Yes! It wasn't published yet at the time.

L318-319: I don't think that the arguments provided in the paper show that this is the case so I think this sentence should be removed. Nothing tells you that the 10% of the ice column contain 1.5 m year old ice based on your analysis. You even state above that the fact the 1-D model does not account for stagnant ice could lead to the modelled ages being off but you remain vague on how much this could be. Thus there is no real evidence that you could find 1.5 M ice there. We assume this is the case, but your results don't show that clearly
Answer: We agree, and together with reviewer 1's suggestion, we have now changed this sentence to:
"This data set was used to confirm suspicions of 1.5 million-year-old ice in the Little Dome C region (Van Liefferinge and Pattyn, 2013; Parrenin et al., 2017),and will also provide the basis for a regional assessment of age at depth for other planned deep

drillings in this region (e.g. Australia)".

L320-323: Data Availability: I think it would be useful if you could provide links to where the readers can access the CReSIS, HiCARS and DELORES data. Are the last two stored in an open repository?
Answer: We now provide a link to where the readers can access the CReSIS, HiCARS and DELORES data.