Response to the review of RC2

Color scheme for the responses:

Text of the reviewer in **black**.
Response of the authors in **blue**.
Removed text/figure in the manuscript in **red**.
Added text/figure in the manuscript in **green**.

This manuscript presents a high-resolution airborne radar data set (EGRIP-NOR-2018) for the onset region of NEGIS. We found that the authors have used this data set to produce and publish the gridded ice thickness and bed topography data as well as the TWTs of the ice thickness along the radar profiles in the onset region of NEGIS, which constitute important boundary conditions for numerical model. Even so, the data presented in this manuscript is of exciting importance. From it, we can also derive the characteristics of isochronous layer to reveal the historical properties and processes of the NEGIS, especially when combined with ice core data. There are, however, major issues with the manuscript that would be valuable to address.

Response:

We would like to thank the reviewer for his constructive and generally positive evaluation of our manuscript. The answers to the suggestions and comments of the reviewer can be found in the further course of the text.

First, the data set is not accessible via the given identifier in the paper (https://doi.pangaea.de/10.1594/PANGAEA.928569) may for it is still under review (it shows "The rights given by your login do not allow downloading of dataset #928569. Please login with another user name!"). As a result, I have not been able to assess whether the data set meets the requirements of the journal.

Response:

We are sorry that the reviewer did not find access to the data. It is correct that the given PANGAEA link does not allow access (yet) to the data and is locked until the manuscript is published. We did this because of the open review process of ESSD and otherwise everyone would have been able to download the data prior to the peer review of the manuscript.

We created a temporary link with full access at the initial submission of the manuscript, which was sent to the editor to forward the link to the reviewers (as obviously the authors are not supposed to communicate with the referees directly). We have been in contact with the topical editor and editorial support that this link will be sent to the reviewer, to access and check the data.

Second, “line 63” says “unique airborne radar data”. I think it is a needless over-assertion which weakens the credibility of the authors and manuscript. Does IceBridge have any observations in this area? If so, I think the authors should make a cross-comparison with IceBridge to validate the data set. If not, can use crossover analysis to validate the data set. In addition, can the authors give the calculation and accuracy of GPS and INS in this manuscript? From the manuscript, they have an important impact on the accuracy of the data set. In a word, I think the accuracy evaluation of the data set is not enough.

Response:

L63
We removed the term “unique”.

Operation IceBridge (OIB) data
We appreciate the idea of the reviewer. A cross-comparison of CReSIS/OIB data would be a feasible idea to validate and compare the data sets. However, we are not completely sure what the reviewer is suggesting with a crossover analysis to validate the data set. If the reviewer is referring to a crossover analysis of ice thickness, we refer to an earlier publication (Franke et al., 2020) where ice thickness and bedrock topography has been compared with other available products. However, ice thickness data is not part of this data description manuscript, but the radar data as such. We believe that a robust crossover of ice thickness of our data set and OIB data (acquired over multiple decades) would include several steps to assure that the data has been processed and the surface and bed reflection determined in a consistent way.

Nevertheless, we included a comparison of selected OIB and AWI radargrams, which are located closely to each other or intersect. We expand the Appendix section of our manuscript and include a few figures where we compare OIB radargrams with our data. Nevertheless, we find this of little added value, as the hardware as well as the processing software of the AWI UWB and OIB MCORDS systems are basically identical, apart from being different versions.

We added the following text and figure in the Appendix (B):

Appendix B: Comparison to OIB surveys

We evaluate the quality of the EGRIP-NOR-2018 radar data by comparing selected profiles with OIB radargrams. Figure B1 a shows two locations in our survey regions, where we compare two intersecting radargrams, respectively. For the comparison, we focus on the environment outside the ice stream in the southeast, where we observe large englacial folds (Figure B1 b), and the radar stratigraphy along the shear zones (Figure B1 c,d). In summary, the comparison shows that the EGRIP-NOR-2018 data have a comparable quality and resolution of the internal layers as well as the bed reflection. In Figure B1 c and d we note that the steeply dipping internal layers are slightly better resolved in our data set.

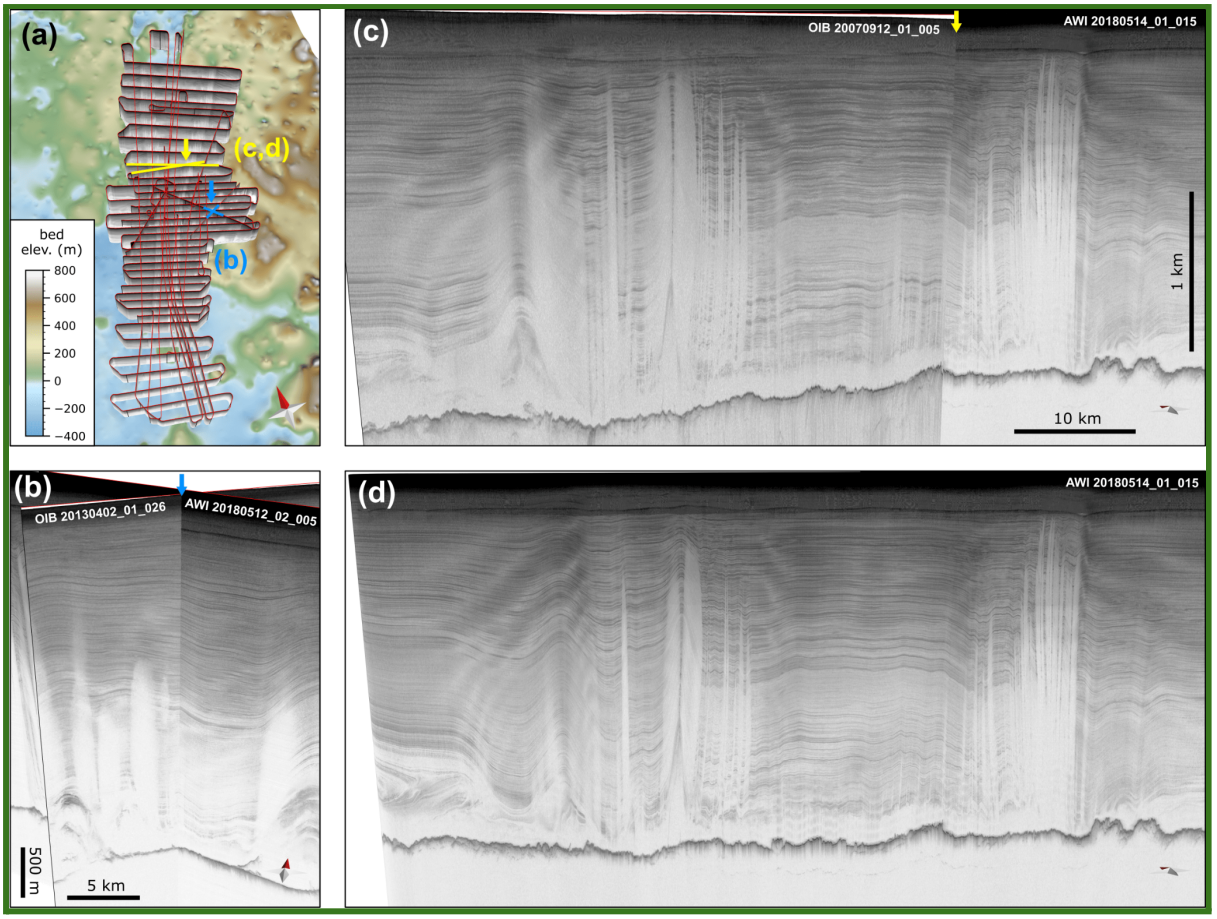

Figure B1. Comparison of selected AWI UWB radargrams with OIB radargrams. (a) 3D view on the EGRIP-NOR-2018 survey highlighting the location of: (b) two intersecting radargrams (OIB profile 20130402_01_026 and AWI profile 20180512_02_003), and (c,d) two nearly parallel oriented profiles showing both shear margins of NEGIS (OIB profile 20070912_01_005 and AWI profile 20180514_01_015).

GPS/INS

Regarding the calculation and accuracy of GPS and INS data we added the following paragraph (and restructured the text to make it consistent) to improve the accuracy evaluation of our data:

To estimate the flight trajectory we used Novatel OEM6 receivers at 20Hz data rate. The precise point positioning (PPP) post processed accuracy (commercial software package Waypoint 8.4) is estimated to be better than 3 cm for latitude and longitude and better than 10 cm for altitude. INS data was acquired by the onboard laser gyro inertial navigation system (Honeywell LASERREF V). Its accuracy is given to be better than 0.1° for Pitch and Roll and better than 0.4° for True Heading (Honeywell Product description).

I made some specific comments and suggestions below, which I hope will help improve this paper.

L175: What does “ki” mean in equation 4?

L182: What does “kt” mean in equation 5?

Response:

We are glad that the reviewer found both mistakes in L175 and L182 in equations 4 and 5. We actually changed the nomenclature for the “k”s in the equations in the following way:

eq1: k is now $k_{t;}$ and describes the windowing factor due to the frequency and time domain windows

eq4: ki is now k_t because it is the same constant as in eq1.

eq5: we changed k_t to k_y.
k_y is the approximate cross-track windowing factor for a hanning window applied to a small cross-track antenna array.

The explanation for the constants is now added in the text below eq1 and eq5.

Figure 3 “C1,2,3” should be “C1-C1’, C2-C2’, C3-C3’”, keep the same with Figure 1

Response:

We believe this suggestion is referring to the beginning of the caption in Figure 3. Thus, we changed the following in the caption:

$C_{1,2,3}$ → C_1-C_1’, C_2-C_2’, C_3-C_3’,
