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Comment on essd-2021-91

Anonymous Referee #1

Referee comment on "Airborne ultra-wideband radar sounding over the shear margins and along flow lines at the onset region of the Northeast Greenland Ice Stream" by Steven Franke et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-91-RC1, 2021

Review of "Airborne ultra-wideband radar sounding over the shear margins and along flow lines at the onset region of the Northeast Greenland Ice Stream" by Franke et al..

This manuscript describes a newly constructed airborne radar sounding dataset over the initiation zone of Greenlands largest outlet glacier, NEGIS. The survey area covers several hundread kilometers along strike, including the EastGRIP drill site, and with many transects perpendicular to ice flow. The authors describe the data collection and processing steps, resulting in the construction of numerous 'cleaned' radargram profiles for download by interested readers.

The authors have written a concise and well formated manuscript which achieves their goals of presenting and releasing a new radar dataset of NEGIS. This dataset covers a larger spatial extent than previous products, and has been robustly processed and archived, and hence is a valuable dataset for future work. I only have minor comments, as the paper is already of high quality, and is suitable for publication in ESSD.

Minor comments:

1). The paper could be strengthened by emphasazing with more precise examples what types of new insights, and scientific discoveries, this dataset may help address. In the `Relavance of the data set' section, they say "These observables constitute boundary conditions and elucidate properties and processes of NEGIS" (Lines, 268 - 269), which is true, but it is vauge. Perhaps the authors should identify the key things in glaciology that refined bed and ice column images could help reconcile: e.g., basal hyrdaulic processes,

stick-slip processes, rheologic deformation laws (Podolskiy and Walter, 2016), etc. The connections of their data to the many previous studies at NEGIS could also be highlighted more; such as, are the main features of these data consistent with Christianson et al., 2014, Villelonga et al., 2014, Riverman, 2019, etc?

2). In Figure 3), caption, it's stated, "ice flow direction is out of page". However, the ice flow direction is actually "into the page", as can be seen since c1', c2', c3', are all on the right hand side of these transects, and in map view Fig. 1, the c1', c2', c3', are on the south-east side of the ice stream, and of course NEGIS flows north.

3). In discussing the flow perpendicular radargrams, they state " In the anticlines' cores, we find strong englacial reflections, which have been misinterpreted before as bedrock (Franke et al., 2020)". (Lines 212 - 213). Can the authors clarify this point? What new lines of evidence are being used here, compared with the study Franke et al., 2020, to re-interpret these features? The remaining sentences of this paragraph, "We note that some of the englacial reflections appear to be attached to the basal reflection (Figure 3a). Figure 3b shows that the deformations patterns in the anticline cores are very complex" (Lines 213 - 214) could also be expanded to include more details.

4). In relation to SAR processing, it's stated that "We used a two-layered velocity model with constant permittivity values for air (r = 1) and ice (r = 3.15)" (Line 137). Can the authors clarify that no problems are encountered by ignoring the uppermost ~50 - 100 m of firn in the ice? Clearly the ice column is not precisely a homogenous medium, so the authors should qualitatively (or quantitaively) justify the effects of this approximation.