

Interactive comment on “Initial results from geophysical surveys and shallow coring of the Northeast Greenland Ice Stream (NEGIS)” by P. Vallelonga et al.

Anonymous Referee #2

Received and published: 11 March 2014

This paper presents important results from a 67m firn core drilled into the upper part of the Northeast Greenland Ice Stream and ground based radio echo-sounding and seismic surveys conducted in the area. Annual cycles of accumulation and climate variables including insoluble dust, sodium and ammonium concentrations and electrolytic conductivity are resolved in the firn core for the past 400 yr. An RES profile dated using NGRIP ice core reveals that climate records are preserved for this site for at least 51 Kyr. The datasets presented in this study are important for further study of past climate and ice dynamics and firn densification process around a shear zone. I support the publication of this paper after the revisions detailed below:

The paper is generally well written but some parts should be improved. For example,
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an important reference in this paper is under review (Christianson et al., 2014). It is hard to review some important parts of this paper without reading the other paper. The authors should include more discussions in context of the Christianson paper. I find including an additional zoomed-in figure with the survey lines located on a velocity map with the shear margins included will put the RES image (Fig 4) and Fig7 in context. Fig 4 should also be accompanied by a surface elevation profile for the RES image extent in order to locate the topographic depressions mentioned in the paper. The interpretations of these figures in terms of accumulation and flow-induced strain rates should be discussed in the main text.

In Basal lithology section, the authors mention that their radar indicates that the central portion of the ice stream bed is wet with water oriented along flow. How did the authors come to this conclusion? I assume it is in the companion Christianson et al (2014) paper? This is an important statement and some general discussions about the radar processing to derive the bed wetness should be included.

Specific comments:

L 21: Introductory sentence and L22 does not read well. I suggest combing "Although...not fully understood" part of L22 with L21.

P 694, L 22: "...whose great...respond..." should this be "response"?

P 695, L9: "The past and present..." the sentence is not clear.

P 697, L2: The author mentions surface and bed elevation grids and 350 line km of GPS and RES data. It was not clear to me how far apart were the lines spaced? Please clarify in the text.

P697, section 2.3, paragraph heading: Suggestion : Ice core analysis using ...

P698, Section 2.4: How deep were the snow pits? Needs to be located on the map, how far apart were they from the core?

P 704, L10-15: While I completely agree that surface toughs will capture drifting snow leading to increases surface accumulation, the deep ice in the radar echogram may also indicate changes in strain rates due to ice flow. This should be discussed further. Locating the extent of RES profile (Fig 4) on a velocity map with the shear margins superimposed will help. I can see that a general ice velocity figure is included, but hard to identify the extent of the RES profile from this figure. Also an ice surface elevation profile is needed to locate the toughs over the radar profile in Fig 4. Please see my comments on this topic elsewhere in this review too.

Figures:

General comments: The figure captions are long and difficult to read. There is also lot of flipping back and forth between the different panels of the same figures in the captions. References, unless absolutely necessary can be removed from the captions.

Figure 2:

a and b: The color scale captions may be made Surface Elevation, Bed Elevation for ease of reading.

2b: The white outline is hard to see.

I personally do not like any ellipsoidal or geoid information in figure captions. They make the captions long and harder to read. This info should be contained in the main text or the caption for the color scale can be something like : Surface Elevation (Ellipsoidal)

Figure 3(a,b) :

I had to read the figure caption several times to understand the panels. Adding the shear margins will help Fig 7 interpretation. Also, the actual figures in the journal are small and the fonts are hard to read. Please change the font size.

3b: I assume 3b background is Bamber bed topography?

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The velocity contours are hard to see and difficult to interpret. My previous suggestion of including an enlarged panel of the location of RES profiles, particularly Fig 4 on a background of ice velocity can solve this problem and the velocity contours from a and b can then be removed.

Fig.4: A surface elevation profile is needed to show surface undulations over the radar echogram.

Fig 7: Need a zoomed in figure maybe as an inset to show the survey sites with respect to the shear margin. Or adding shear margins in Fig 3 will solve the problem.

Interactive comment on The Cryosphere Discuss., 8, 691, 2014.

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