

Interactive comment on “An Estimate of Ice Wedge Volume for a High Arctic Polar Desert Environment, Fosheim Peninsula, Ellesmere Island” by Claire Bernard-Grand’Maison and Wayne Pollard

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This manuscript describes new methods of wedge-ice volume estimation based on GIS approach. It evaluates wedge-ice contents for the Fosheim Peninsula, Ellesmere Island, and compares various methods of such estimations. The paper will be very helpful for permafrost researchers who can use the suggested methods for estimations of wedge-ice volume in different permafrost regions, and I strongly support its publication. However, the manuscript needs some revision. My major comments and suggestions are listed below.

C1

Page 1, Line 21: I recommend to cite a new edition of this book (French, 2018), where the numbers were updated (24%, see Table 5.1).

Page 2, Lines 21-30: Syngenetic IW are much more common than anti-syngenetic, and in some regions (e.g. yedoma regions in Siberia and North America) they occupy very large areas.

Page 4, Lines 17-22: It's better to start describing various methods of IW studies with exposures and drilling because geophysical methods are not very precise. Lines 21-22: Not all of the cited studies used this combination of techniques you're talking about.

Page 5, Lines 19-21: I recommend to cite previous studies because Ulrich et al (2014) already applied semi-automated technique in their study.

Page 5, Line 29: ESL region is not shown in Fig. 3.

Page 6, Lines 7-8: Please check these numbers. In the cited paper, it was stated that wedge ice accounts for 3.3% according to Table 2, and numbers 1.8 and 3.5 are from Table 1. Anyway, these numbers look confusing and I recommend to explain them better (probably you should compare them with volumes of other types of ground ice reported by Couture and Pollard 1998).

Page 9, Lines 10-14: I recommend to clarify your approach. It would be good if you add a simple equation or a figure.

Page 9, Lines 18-20: Actually, polygons in bedrocks are rather common in your study area. I recommend to explain your assumption in a different way: polygons may exist in bedrocks but wedge-ice volume is negligible.

Page 10, Lines 24-30: I recommend to report mean values (perimeter and/or area of IW polygons in different sample areas) either in the text or in Table 2.

Page 13, Line 8: I recommend to mention here that your values from EL2 are very similar to "high density" values in the cited paper.

C2

Page 13, Line 16 – Page 14, Line 4: There are many publications on volumes of gas and solids in wedge ice (and their contents are rather small), so it is much more important for your purposes to obtain the field data on size and morphology of ice wedges specific for your sample areas – these numbers are very variable and may affect your IW volume estimations much stronger.

Page 14, Lines 11-13: I recommend to cite Jorgenson et al., 2006, 2015 here (they describe ice-wedge dynamics and related positive and negative ecological feedbacks).

Figure 4. Please change colors: it should be yellow for manual and blue for semi-automated methods.

Figure 7. This figure strongly resembles Figure 7 in Ulrich et al., 2014. I understand that you have already mentioned in the text that you follow their method (and this figure depicts your own sample area) but anyway I recommend to mention in the caption that this model was developed based on their approach.

MORE COMMENTS AND SUGGESTIONS ARE PROVIDED IN THE ATTACHED FILE.

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Please also note the supplement to this comment:

<https://www.the-cryosphere-discuss.net/tc-2018-29/tc-2018-29-RC2-supplement.pdf>

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-29>, 2018.