The Cryosphere Discuss., 7, C81–C83, 2013
www.the-cryosphere-discuss.net/7/C81/2013/

The Cryosphere Discussions

Interactive comment on "Characterizing supraglacial lake drainage and freezing on the Greenland Ice Sheet" *by* N. Selmes et al.

M. Pelto

mauri.pelto@nichols.edu

Received and published: 21 February 2013

Selmes et al (2013) have completed a thorough and rigorous documentation of the location, size and mode of cessation of Greenland Ice Sheet supraglacial lakes. This paper will be a valuable addition to the rapidly expanding publication list on GIS supraglacial lakes. There are two very recent publications that were likely not published yet at the time of submission that will have to be referenced Howat et al (2013) and Johansson et al (2013). Neither of those studies is as expansive an inventory. Most previous studies have not focused on a comprehensive examination of the mode of drainage or refreezing of supraglacial lakes. This required use of the daily MODIS imagery. The tracking of interannual variation of lake behavior is a simply fascinating aspect as well. The comments below are minor.

Specific Comments:

483-11: Box and Ski (2007) noted several fast draining lakes that drained several times during the same melt season. Was this observed in your examination, if so, how was this dealt with? This may not be the best location to address this.

484-13: It is noted that more lakes refroze in 2006 and that was not surprising. Johansson et al (2013) note a specific number of melt days (40 melt days, +-18 days) needed to initiate a lake which would be worth citing here.

484-20: At one of the locations where the lack of SE lakes is mentioned, it should be noted the very different width of the ablation zone in that sector as seen in Van den Broeke et al (2009). The combination of the steeper balance gradient and that the southeast has a much higher surface gradient is certainly one reason for this.

485-5: Should provide some quantification in the text of typical lake duration for the various classes from Figure 7 here. Compare these to the duration's of Johansson et al (2013) for their examination of a selected region. The duration should also be compared to Sundal et al (2009) who examined lakes at lower elevations in three study areas.

486-29: Should it be noted that fractures would be restricted in zones of compressive stress?

This deserves more analysis. The sentence is not clear. Howat et al (2013) show a rising trend in the highest elevation of lakes which should be referenced. There Figure is also useful in illustrating the ELA versus these lakes. For Figure 5 what is the median or mean refreezing lakes elevation versus the ELA. Howat et al (2013) used the highest 5% of the lakes to find maximum elevation of lakes. However, your study can provide a different measure that may have value that is the elevation above which say 90% of the lakes refreeze.

488-19: Local lakes that drain in a similar time frame, if they do not share the same frac-

TCD
7, C81–C83, 2013

ture system, could be in the same stress environment experiencing the same weather conditions leading to fracture development and propagation.

Figure 5: Contours need to be labeled the mean ELA should also be identified.

Box, J.E. and K. Ski, Remote sounding of Greenland supraglacial melt lakes: implications to sub-glacial hydraulics, 2007: Journal of Glaciology, 181, 257 – 265, 2007.

Howat, I. M., de la Peña, S., van Angelen, J. H., Lenaerts, J. T. M., and van den Broeke, M. R.: Brief Communication "Expansion of meltwater lakes on the Greenland Ice Sheet", The Cryosphere, 7, 201-204, doi:10.5194/tc-7-201-2013, 2013.

Johansson, A. M., Jansson, P., and Brown, I. A.: Spatial and temporal variations in lakes on the Greenland Ice Sheet, J. Hydrol., 476, 314–320, 2013.

Sundal, A. V., Shepherd, A., Nienow, P., Hanna, E., Palmer, S., and Huybrechts, P.: Evolution of supra-glacial lakes across the Greenland Ice Sheet, Remote Sens. Environ., 113, 2164–2171, 2009.

Van den Broeke, M. et al..: Partitioning Recent Greenland Mass Loss, Science, 326, 984–986, 2009.

Interactive comment on The Cryosphere Discuss., 7, 475, 2013.