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The Cryosphere Discussions

Interactive comment on "A decade of supraglacial lake volume estimates across a land-terminating margin of the Greenland Ice Sheet" *by* A. A. W. Fitzpatrick et al.

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Firtzpatrick et al (2013) provide a temporally important data set on supraglacial lake area and volume in southwest Greenland. The data set provides a unique perspective using daily MODIS imagery to determine in volume and area of lakes in the Russell Glacier Catchment. The temporal richness allows for identification of the rapid changes in lake area and volume and comparison to Kangerlussuaq weather records, Watson River discharge records and K-Transect melt records. The data sets value is in its ability to address three key questions from this perspective. 1) How does lake distribution area and volume change with time during a melt season and between melt seasons?

2) How much of the melt volume is stored in the supraglacial lakes? 3) What is the correlation to weather, runoff and melt records? The paper provides a valuable assessment that advances our understanding of the temporal variations in supraglacial lake volume and area. The use of MODIS imagery for depth assessment, at this stage of our understanding can lead to significant volume errors; however, MODIS is the best imagery to utilize and the approach herein is a best practice. All of the suggestions below are minor and are generally requests for clarification or more detail.

1389-17: Is this overestimation of volume a likely consistent result or is the volume error likely to be random?

1390-4: Figure 6a is fascinating. Is the mean areal extent peak for 2003 at 1400-1600 m and above 1600 m in 2008 a reflection of enhanced melt or simply retarded drainage from the lakes? The greater maximum area of lakes above 1600 m in Figure 9a in 2012 suggests the latter for 2008.

1394-8: Once the lakes form at higher elevations such as in 2010 and 2012, does the depression they create tend to persist and make redevelopment more likely?

1394-19: This is 13% of the total discharge for RGC, correct? If so what percent is this of total melt in the region where lakes are common, that it is above 1000 m. If possible it would be valuable to know what percent of the melt in this lake region ends up in lakes before drainage.

1394-26: It is noted that an increase of lake formation to 1780 m with a 1 C rise from the 2002-2012 would occur. 2010, 2011 and 2012 are the only years that have lake formation above 1780 m, was the temperature for these year 1 C above the 2002-2012 mean?

1395-17: 28% rapidly draining is what approximate percent of the lake volume?

1395-24: Do you have any evidence that the refilling was due to a basal closure that supports the statement here or could the closure been due to surface process affects?

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Also is this a rare event or just an example of many rapid refilling events?

Figure 4: The units are for volume for the lakes and discharge, it would be ideal if melt was in volume too, so it can be contrasted more directly with the others.

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