

## ***Interactive comment on “Estimating supraglacial lake depth in western Greenland using Landsat 8 and comparison with other multispectral methods” by A. Pope et al.***

**A. Pope et al.**

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Thank you to Gordon Hamilton for providing a positive, thoughtful, and constructive review of our work. We have done our best to reply to your comments, as detailed below:

Major Comment: Thank you for this suggestion to bring more focus to the paper. While we agree that methods and applications are sometimes better divided, in our case we think that it is important to demonstrate the utility of the method and provide an example of its use. Providing an application also places the method more in discussion with the research literature. Without this, we believe that there would be questions about

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efficacy of application and results. One year of data does not tell us anything about longer term changes, and so we do not think it merits a separate publication at this time. Provided Landsat 8 keeps functioning well, we would hope to return to the dataset and method in 5 years' time to look at a more meaningful time series for a separate work.

P3259 L3: Deleted.

P3259 L21: replaced "glacial" with "ice sheet's"

P3260 L4: Descriptions of positive feedbacks joined into one sentence: "supraglacial lakes contribute to multiple positive feedback processes, including ice shelf disintegration in Antarctica (Banwell et al., 2013; Glasser and Scambos, 2008) and melt-albedo interactions (Leeson et al., 2015)."

P3260 L10: Reference changed to 2011

P3260 L17: added "WorldView-3" (because WorldView-1 didn't have this capability)

P3261 L21: replaced "a supraglaciale" with "the same" in order to clarify

P3262 L12: Thank you for this clarification. That sentence has been removed.

P3262 L18: Changed to "lake bottoms"

P3262 L25: Changed position of the word "parameter"

P3263 L3: Phrase deleted

P3263 L5: replaced "assumption" with "approximation for Ad"

P3263 L6: replaced "in an application of a form of" with "we use spectral mixture analysis to"

P3264 L15: The Legleiter relationship had only three field sites and tested rather than location, the setting, i.e., more testing river vs. creek vs. lake. As they only tested one lake, we make no claim here about location.

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P3264 L15: deleted based

P3265 L5: Deleted “In situ concurrent and bathymetric”

P3266 L7: Shortened as suggested

P3266 L7: Written out as “four”, replaced “further” with “farther.” All numbers below 11 used in a non-technical context were replaced with written words.

P3266 L9: “in 2014” moved to the end of the sentence

P3266 L15: “based” moved after parentheses

P3267 L1: Sentence added: “Similar validation for ASTER has been carried out with airborne LiDAR from before lake drainage (Georgiou et al., 2009).”

P3267 L2: Written with a superscript as “meters per pixel”

P3267 L14: Changed to LiDAR

P3267 L21: This is from work in prep, and so “preliminary studies” can’t be cited – so deleted.

P3267 L26: “as” changed to “because”

P3268 L2: “errors” changed to “blunders”

P3268 L6: clarified to be in total

P3268 L10: Edited as suggested

P3268 L17: replaced “success” with “performance”

P3268 L19: added in “m” where appropriate

P3268 L21: replaced “Landsat 7” with “ETM+” for clarity

P3269 L17: Sentenced replaced as suggested

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P3269 L25: “day” not “Day”

P3270 L4: replaced “returned by” with “derived with”

P3270 L5: Sentence deleted.

P3270 L7: This section includes BOTH regions. The first sentence has been amended to clarify this: “We difference all overlapping areas of DEM and Landsat-derived lake depths in both case study regions.”

P3270 L17: Replaced “very good” with “close”

P3270 L22: deleted “ice flow”

P3270 L23: Replaced the first phrase with “Despite meter scale uncertainties (1.6m) at the pixel level...”

P3271 L5: added “across the entire study area”

P3271 L5: Deleted the first part of the sentence “A histogram of all lake depths shows that”

P3272 L20: First paragraph has been removed.

P3273 L11: changed to “Indeed, other work (Moussavi et al., in review) ...”

P3273 L16: re-written as suggested

P3273 L23: removed “values”

P3274 L1: this “m” was removed by TCD. Re-added in text.

P3274 L29: Removed text regarding “significantly overestimated” – the 30% is what falls out when you follow through the overestimated g with an average reflectance estimate.

P3275 L2: replaced “believed” with “concluded”

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P3275 L5: Removed final two sentences of the paragraph.

P3275 L12: Reference added.

P3275 L13: deleted as suggested

P3275 L14: moved reference to earlier section and added supplementary material to make it easier to find these values

P3275 L17: The first paragraph in this group was discussed. In order to better focus the discussion (as suggested by reviewer Quincey), four subheadings have been added: Retrieval Performance Factors, Revisiting Lake Depth Retrievals, Supraglacial Lakes in the Hydrological System, and Sensitivity Analysis.

P3276 L29: This radiative transfer modelling addresses atmospheric variability, not the lake-based HYDROLIGHT model that you used, so the two aren't directly related, if I understand correctly.

P3277 L4 changed “variability” to “varies” and added “is” later in the sentence

P3277 L6: deleted “on”

P3277 L6: Parentheticals were removed and the one run-of sentence was replaced with “Much of this error appears largely random for a given point in time and space. Thus, while it decreases confidence in individual lake depth retrievals, averaged water volume retrieval should not be biased.”

P3278 L24: Deleted “in the discussion”

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Interactive comment on The Cryosphere Discuss., 9, 3257, 2015.

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