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Interactive comment on "Spatial and temporal variability of water-filled crevasse hydrologic states along the shear margins of Jakobshavn Isbrae, Greenland" *by* Casey A. Joseph and Derrick J. Lampkin

Casey A. Joseph and Derrick J. Lampkin

cajoseph@terpmail.umd.edu

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Comment #1 "The authors make much of increases in drainage over the study period, yet don't take into account a similar trend in observation frequency. Any potential bias needs to be accounted for before any such conclusions can be reached."

Reply #1 The major bias that we observed was the inconsistent sampling due to cloud cover. We acknowledges this bias, which limited the scope to which we could attribute any one process to the observed behaviors of these systems.

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Discussion paper

Comment #2 “I can’t actually work out what the main conclusions of this paper are, let alone if they are supportable. Perhaps a separate conclusion section might have helped me understand what the point is? The discussion is based heavily on the existing literature and the conclusions hinted at appear to result from reviewing the literature rather than insight from the presented results. I don’t believe that the results presented in the paper actually add anything to the discussion.” Reply #2 We have attempted to revise to make our conclusions clear. We separated the discussion and the conclusions section to P12 L3.

Comment #3 “The paper is badly written with little evidence of care or proof reading. Some sections have incomplete sentences. Others are overly verbose. This does not help the reader fathom what conclusions they are expected to take home.”

Reply #3 We have substantially revised the paper to address grammatical, textual, and structural errors.

Comment #4 “Page 1. 14: May has the fewest filled days? Not, for example, December?”

Reply #4 The study period is from 2000-2015 for the months of May-September. I have revised this to make it clear in the abstract before the mention of May having the fewest filled days.

P1 L11-12: “A fusion of multi-sensor optical satellite imagery was used to examine hydrologic states during the melt season (May to September) from 2000 to 2015.”

Comment #5 “Inter-seasonal drain frequencies over this system...". “I’ve read this several times and I’m not sure what it means.”

Reply #5 This means that throughout a given melt season, the amount of drainage could vary between 0-5. I have reworded this section to make it clearer.

P1 L14: “The number of drainages per crevasse group in a season ranged from 0 to 5.”

Comment #6 “(and throughout the paper): Do you mean averaged between -1 and 2? Or averaged from -1 to 2?”

Reply #6 We mean that for any given melt season in the study period, the average temperature ranged between -1 and 2C.

P1 L16: “Over the study period, average summer temperatures ranged from -1 and 2 âĄřC and...”

Comment #7 “Page 2: 4: See Joughin et al. (1996) and Everett et al. (2016)”

Reply #7 I have added in the suggested citation.

P1 L24-28; P2 L1 “Commensurate with these changes has been the documented impact of surface meltwater on ice sheet velocity during the summer within the ablation zone (Zwally et al., 2002; Joughin et al., 2008; van de Wal et al., 2008; Shepherd et al., 2009; Bartholomew et al., 2010; Sundal et al., 2011; Palmer et al., 2011; Hoffman et al., 2011), via supraglacial lakes, channels, and moulins largely beyond regions of fast flow (Echelmeyer et. al., 1991; Joughin et al., 1996; Box and Ski, 2007; McMillan et al., 2007; Sneed and Hamilton, 2007; Das et al., 2008, Sundal et al, 2009; Lampkin, 2011; Selmes et al., 2011; Tedesco and Steiner, 2011; Howat et al., 2013; Koenig et al., 2015).

Comment #8 “19: Is there a citation for these crevasse systems being responsible for hydrological weakening of the shear margin?”

Reply #8 The impact of crevasse drainage weakening the shear margins is noted in Lampkin et al., 2013. I have added the citation to the manuscript.

P2 L21-22: “We characterize temporal patterns in the drain state of water-filled crevasse systems responsible for hydrologic weakening of Jakobshavn Isbrae (Lampkin et al., 2013).”

Comment #9 “20-21: This is not a sentence.”

Reply #9 Added in “is evaluated” to complete the sentence

P2 L23-24: “This work provides an important benchmark from which future changes in this component of supraglacial hydrology and the role of meltwater in fast flowing ice streams are evaluated.”

Comment #10 "satellite derived measured velocity data". Redundant word

Reply #10 Removed the word ‘measured’ due to redundancy

P2 L29-30: “We examine spatial and temporal variability of surface strain fields based on satellite-derived velocity data.”

Comment #11 “27: Again, it feels like the authors never finished this sentence.”

Reply #11 Added ‘data are used’ to make the sentence a complete thought.

P2 L30 P3 L1-2: “Additionally, near surface air temperature data are used to evaluate meteorological conditions associated with melt production and runoff that can influence the hydrologic state of the water-filled crevasse systems.”

Comment #12 “Page 4: 18: Presumably you know how many crevasse groups were filled, making inferences from the number of drainages rather pointless?”

Reply #12 The paper explores the frequency of drainages in a given season for each crevasse group. If a crevasse can fill and drain more than one time, then presumably more meltwater can be injected to the bedrock, and enhance ice loss.

Comment #13 “Page 7 onwards: This whole section is very hard to read. Some paragraphs might help!”

Reply #13 We have separated the sections, and revised them to be more clear.

Comment #14 “Figure 4a: No matter how much I read the description of this figure I cannot work out what it actually presents. I also don’t see how it fits into the paper as a whole.”

Reply #14 This figure shows for each crevasse group, how many days it was filled each month for each year. This gives us a visual representation of the filling and drainage patterns. Figure b shows over the entire study period the mean amount of days that each group was designated the filled state. The axis on fig 4a has been adjusted to be more easily read.

P23 L1: Adjusted figure.

Please also note the supplement to this comment:
https://www.the-cryosphere-discuss.net/tc-2017-86/tc-2017-86-AC2-supplement.zip

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