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The Cryosphere Discussions

Interactive comment on "Surge dynamics on Bering Glacier, Alaska, in 2008–2011" *by* E. W. Burgess et al.

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The Short Comment provided by Mauri Pelto is extremely helpful and will improve this paper considerably. The author sincerely thanks Dr. Pelto for his contributions. In general, the author concurs with nearly all of the comments provided and will work to incorporate the suggestions into the final manuscript. Considering that timeliness is important for interactive discussion, the author has provided preliminary responses to comments that may require continued discussion. All others can be addressed without issue.

1182-21 & 1183-1: Additional discussion will be added on the glacier surge cycle. Consistency in surge phase and location (reservoir, receiving, etc.) terminology will be improved in the intro and elsewhere in the paper as well. Unless the reviewer

would argue otherwise, I will try to shy away from the term "Alaska surge cycle." While there are certainly similarities between observations of surges in AK, each glacier has differences as well and little or nothing is known about most surges that occur in AK.

1184-11: There may be some confusion here and the author could use clarification from Dr. Pelto. The point being discussed here is not the dynamic balance line but rather the top of the (depending on terminology) reservoir zone or active surge zone. This will be clarified in the text.

1184-16: This comment brings up a central issue with this paper. Perhaps the largest benefit from these results would be a better understanding of the relative roles of basal water pressure and driving stress in surge evolution. But without observations of basal pressures, such conclusions will be speculative. The nature of the surge initiation, with initial synchronous acceleration along the entire glacier length prior to a propagating surge front is discussed in the abstract and conclusions and will now be discussed at greater length in the discussion. In addition, the author will add discussion of the potential significance of the small scale propagation fronts (found in 2011) existing within more organized, glacier-wide propagation of the surge. This is likely related to basal conditions as well.

1192-27: The issue of poor discussion of the second stage is brought up at several points in these comments. The reason for the poor discussion of the second stage is an issue of data paucity. Only one 11-day pair was available for the for the entire second stage (75 were obtained for the first stage) (Figure 2,3) thus little is known about the evolution of the second stage. Knowledge of the initiation and termination comes from only the authors' visual observations from overflights, a single time-lapse camera emplacement showing stagnant ice north of the Grindle Hills in July, and personal communications with Bruce Molnia who obtained his on visual observations from overflights (USGS). Due to the relative paucity of knowledge of the second phase, there is little discussion of the subject. Unless the reviewer has further suggestions, the author will do more to explain the lack of data and what is/isn't known.

1194-22: The two previous surges were double staged (will be added to the text). Dr. Pelto poses an interesting question on whether the multi-stage surging occurs elsewhere. The author will have to look into this question.

Figure 1: Dr. Pelto's comment: It would be quite useful to provide identical diagrams indicating the different spatial distribution of velocity during two the various surge phases and the quiescent phase. Response: Again, due to lack of data, figure 3 shows all of the velocity data available for the second stage. The Fig. 1 mosaic is all from 2010. This will be clarified.

Figure 4: This figure actually shows a less steady buildup than in Fig. 2. Note the deceleration between April 2008 - Nov 2008 that is not seen on the Bering (Fig 2). This figure does not show the end of the surge phase. Is further clarification needed?

Interactive comment on The Cryosphere Discuss., 6, 1181, 2012.