

## ***Interactive comment on “Active subglacial lakes beneath the stagnant trunk of Kamb Ice Stream: evidence of channelized subglacial flow” by B.-H. Kim et al.***

### **Anonymous Referee #1**

Received and published: 13 June 2016

This is interesting work, which extends our knowledge of the processes controlling the dynamical behaviour of the Kamb Ice Stream. I believe this work has the potential to make a substantial contribution to our field. However, there are several fairly major issues that need to be addressed ahead of publication; these are outlined below.

General points:

1. I appreciate that for 4 out of the 5 authors, English is not a first language, and although the language is fairly good (much better than I could do in Korean), there are still many instances in the manuscript that need to be edited for English grammar/language – I would recommend the native English speaking author to edit the manuscript accordingly. 2. I found the structure of the paper to be a little confused – methods where in

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the results, discussion in the results, no conclusion section. This needs to be rectified with careful attention as it makes the manuscript difficult to follow. 3. I am confused as to why you present so many methods for deriving elevation change from CryoSat-2 data – I think there are three – one of which was introduced in the results section (see note above). Is this necessary? And if you believe so, please be clear why it is that you are doing this and which results are linked to which method. 4. You introduce ICESat results in the results section but there is no mention of this in the methods section. You need to include a description of this data and the processing methodology in you methods section. 5. Throughout your text you report numbers of surface lowering from altimetry but you do not report associated errors – this makes it difficult to discern whether or not the changes in rates that you report are significant or not. I suspect in some instances they might not be. This must be rectified. 6. Also regarding errors, you report in you methods that you output and error statistic for the CryoSat elevation change signals from the regression error but later, in figures, use uncertainty measures from standard deviations of measurements and also from the signals from (assumed) constantly changing regions. I think it would be better/clearer/less confusing to stick to just one measure of uncertainty for any given parameter.

Specific points (given by Page number and Line Number – e.g. P1 L1):

P1 L112 – change “inferred from CryoSat-2 altimetry, indicating that” to “inferred from surface height changes using CryoSat-2 altimetry and indicate that. . .”

P1 L13 – change “The orientation of the drainage network. . .” to ‘The structure of the subglacial drainage network. . .’ P1 Introduction – general comment: I think that in the introduction you need to explain more about the previous work done into understanding the stagnation of the KIS. There is more than one theory for why this ice stream stagnated, and so I think that you need to acknowledge this.

P1 L20 – this is a bit of an empty statement – explain why or to what extent the stagnation is significant for the mass balance of the WAIS – i.e. there is a mass gain.

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P2 L5 – you outline the limitations of the ICESat data, but what about the limitations of interferometry (which you mention in Line 3) for detecting SGLs ?

P2 L5 is this lake in the Northern Corner highlighted in any figure? If not, I would do so and include a reference here.

P2 L10 – it would be helpful if you clearly stated the aims and objectives of your study here.

P2 L 29 – why not just use a simple threshold at this stage?

P3 L3 – Why not just use a smaller grid cell size? It is likely that there would be sufficient data within the grid cells at  $\sim 2$  km to provide a robust solution.

P3 L5 – regression of what? Do you mean the quadratic fit?

P3 L6 – is your selection of lake areas subjective or quantifiable? You need to explicitly state what criteria you use to determine if an area is lake or not.

P3 L9 -10 – these are results not methods

P3 L10 – I would be interested to know if there are any potential lakes where you don't see any.

P3 L11 – I don't understand why you have also use the plane fit method if this provides more detailed information on the boundaries. Also, I don't really understand how this can provide more detailed information on the boundaries, because the same data should be included in both methods.

P3 L12 state the resolution of these DEMs. Also what filtering criteria, if any, do you use to remove unreliable height estimates.

P3 L18 – why do you think this is? Provide a physical explanation.

P3 L18-19 – lake areas should be in results.

P3 L19-20 – more detail needed for the methodology of deriving the hydraulic potential

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– at least a reference to the paper(s) from which you derived the method.

P3 L25-29 – this is methods.

P3 L27 – state the magnitude and standard deviation of the trend removed? How much spatial variability was there in this trend?

P3 L 32- include uncertainty – this needs to be done for all your results (numbers) reported in the text.

P4 L 4 “descend completely yet” – replace with “ returned to the previous level by the end of the study period.”

P4 L7 – L17 – this is all discussion

P4 L 20 – what are the values of head differences when the lakes are fully filled? Include numbers.

P4 L28 – you need to include your methods for using the LRM data in your methods section.

P4 L 35 replace “present” with 2015.

P5 L 9 significant effect on what?

P5 L 9 – what exactly do you mean by the estuary? What characteristics does it have? In Figure 6 you show the area in a box – on what basis have you defined this area?

P5 L11 – where has this ICESat data come from? Again you need to include this in your methods.

P5 L 12 – How have you accounted for mission offsets in the elevations measured by the two missions? If you haven’t, I don’t think that you can meaningfully present the two as a ‘continuous’ time series on the same plot. Suggest you either show on separate plots, or show one plot of elevation changes (dhdt).

P6 L1 – explain why the feature is too concave for CryoSat-2 to detect.

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P6 L8 – Change “If this method is applicable to the KIS, the strong. . .” to “ If this method is applicable to the KIS, it is probable that the strong. . .”

P 7 – what about the conclusion section?

Figure 1 – I presume the yellow line is the Grounding Line? Include in figure caption.

Figure 2 – There are two regions of surface lowering and 1 region of surface increase in the north of this figure? Why aren't these identified as lakes?

Figure 3 – why not show continuous fields of the ice surface elevations and elevation anomalies?

Figure 4: why do you show the standard deviations here and not the uncertainty on the elevation change measurements that you derived in the processing?

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