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Interactive comment on “Increased rate of acceleration on Pine Island Glacier strongly coupled to changes in gravitational driving stress”

by J. B. T. Scott et al.

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Thanks for your comments. This paper was originally written as a letter length paper. Although we believe all of the most important scientific information is included, this is a good opportunity to make some clarifications.

Unfortunately we don't have any good recent information on grounding line retreat since the grounding line position identified by Eric Rignot in 2000 is the most recent available. This paper in itself is not about grounding line retreat (although there are obvious links) therefore the retreat is mentioned simply to inform the general reader of some of the changes that are occurring on PIG.



Interactive
Comment

Yes basal topography is important for PIG. The higher basal elevation extending inland from the grounding line also corresponds with an area of much higher basal drag. In the area of lower basal elevation upstream there is much less basal drag. The new data presented in this paper is examining the upstream area entirely, starting 55 km from the grounding and extending 171 km inland, the downstream basal conditions that are very important near to the grounding line are not being specifically examined in this study.

We do look at the average velocity in the 1990s from the papers of Ian Joughin and Eric Rignot. The paper of Luchitta et al. gives a velocity for PIG in the 1970s but that is only right next to the grounding line (a long way from PC55) and we don't have any elevation changes for this time period.

Three cores were taken in the 2006/2007 season. One at PC111; one 10 km north and 10 km south of this location. In the 2007/2008 season another was taken near PC171 and one approximately half way between these locations. All of these core locations were linked together with a 500 MHz radar survey.

The 'inline' position is the 'inline with flow' position and this does not include vertical motion. As there is no net horizontal displacement in any other direction than the flow direction during the season, and there is negligible horizontal displacement perpendicular to flow, the horizontal displacement is essentially the same thing. The best way to clarify this could be to state the 'horizontal displacement, inline with the flow direction' in the text when referring to figure 4.

Yes it is from strain rates that we calculate the stress.

To obtain the 2006/2007 velocity take the 2007/2008 velocity and subtract the mean acceleration between the seasons. We didn't put this into the table separately as it can be easily calculated from two other columns.

The reason PS169 is not in between PC111 and PC171 is because it is on a different

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flowline (and in fact a different tributary) therefore it is not between PC111 and PC171.

The acceleration and slope change correlation is shown in figure 3. We don't think there is a justification for overloading the article with more detailed graphs. It is a short article and all of the important information is in it.

Interactive comment on The Cryosphere Discuss., 3, 223, 2009.

TCD

3, C21–C23, 2009

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