

Interactive comment on “Pine Island Glacier ice shelf melt distributed at kilometre scales” by P. Dutrieux et al.

Anonymous Referee #2

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General comments: Through analysis of high-resolution satellite/airborne observations using a Lagrangian method, the authors quantify patterns of oceanic melt at the base of Pine Island Glacier ice shelf. Previously observed transverse and longitudinal basal channels are found to play a significant role in controlling the spatial distribution of melting, indicating that these small-scale (~ 1 km) features must be understood and either resolved or parameterized if the melting is to be modeled accurately. Theories about the formation and evolution of basal channels that are consistent with observations and known physical processes are presented. The analysis is technically sound, and the authors do an excellent job of summarizing earlier work on PIG and integrating their study into a coherent picture of this ice shelf.

Specific comments: Overall, this is a strong contribution, so my specific comments

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consist only of requests for clarification.

P1596, L12: How is the Lagrangian elevation change assigned a position relative to the Eulerian grid used for the other terms?

Section 2.4: It might be easier for the reader (especially the first time through) if the more usual method were discussed before your new method, rather than after. Also, a brief comment on the advantages of the Lagrangian method might be a useful preview of the analysis presented later.

Section 2.5: I have several questions on this section. How was the scale for smoothing chosen? Why does this smoothing window imply a length scale of > 10 km for the medium scale? Why are features smaller than 2 km eliminated from the small-scale anomaly field? Also, just in terms of word choice, it seems rather odd to have a "small" scale with a lower bound and a "medium" scale with no upper bound.

Section 3.3: Is the "channel" scale the same as the "small" scale, or is it smaller? If they are different scales, how were they separated?

Technical comments: P1594, L4: The length scales "short (~ 1 km)" and "medium (~ 10 km)" are different from the definitions given in section 2.5 later.

Caption of Figure 3: This should state more clearly that parts (a) and (b) are the small-scale anomalies from the smoothed fields.

Interactive comment on The Cryosphere Discuss., 7, 1591, 2013.

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