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The Cryosphere
Discussions

Interactive comment on "Transition in the fractal geometry of Arctic melt ponds" *by* C. Hohenegger et al.

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We thank the reviewers for their thoughtful comments and suggestions. Below we reply to the comments of Prof. D. MacAyeal.
General comments:

1. This is an interesting and valid question. While at some point, we might be able to draw a connection between melt pond geometry and the mechanical characteristics of sea ice floes, currently we do not see any evidence of such a connection.
2. At this stage, we only have limited data on the time evolution of individual pondscapes, which makes it difficult to address this question. However, we believe that the small 1-d ponds, with further melting, coalesce to form larger 2-d ponds.

While horizontal flow of melt water is certainly an important process in the evolution, it is not clear what role it plays in the time dependence of pond geometry.

Specific comments:

1. The perimeter is determined using the "perimeter" option (algorithm) of the "regionprops" function for connected components in the Matlab Image Processing Toolbox. The perimeter is computed by calculating the distance between each adjoining pair of pixels around the border of the region. For non-singular regions, this corresponds to the sum of the distances between the pixel centers. For singular regions (regions made of a single row or column), the perimeter returns twice the distance between the pixel centers.
2. "Homogenization," also known as "upscaling," refers to a set of ideas and methods in applied mathematics which address the problem of computing the effective behavior or properties of inhomogeneous media or systems. For example, consider an electrically insulating host containing uniformly dispersed conducting inclusions. Homogenization theory gives a range of mathematical techniques for obtaining rigorous information about the effective or overall conductivity of this composite. Many of these techniques are discussed in the references listed in the paper.

These two specific comments will be incorporated into a revised version of the paper.

Interactive comment on The Cryosphere Discuss., 6, 2161, 2012.