

Interactive comment on “Thresholds in the sliding resistance of simulated basal ice” by L. F. Emerson and A. W. Rempel

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Thanks, Denis, for your thoughtful review. We will revise the manuscript to address each of your general and specific comments. Brief answers to the main questions you raised are given below.

With our experimental design, we wanted to keep the particle size much smaller than the diameter of the ice disks. We limited our experiments to a maximum particle diameter of 1.5mm – from a sieved Willamette River sand that was rich in lithic fragments and contained a mixture of quartz, feldspar and mica. We would expect the sliding regimes to remain intact if larger particles were used. In particular, the sandy regime is favored by larger particle sizes. As we note in the text, a straightforward extrapolation of our experimental results would suggest that cm-sized particles with concentrations greater than 2% should produce sandy-regime behavior. It is possible that the heterogeneity of

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particle sizes and concentrations in natural glacier systems may tend to suppress the threshold-type behavior that we observed. We hope our simple experimental results will be useful in guiding further efforts to unravel the controls on sliding behavior in nature.

The potential for a regime change with large changes in normal stress is certainly suggested by these results. It would be interesting to explore this further, but we are not in a position to continue with this work ourselves at the moment. Unfortunately, our experimental apparatus would need to be modified significantly in order to increase the normal stress much more, and our force gauge is not sensitive enough to generate meaningful results at much smaller loads. Our own collaboration on this work is nearing its close. We hope that other workers will follow up on these issues in the future.

The manuscript will be revised to address each of your specific comments. Thanks again,

Lisa Emerson and Alan Rempel

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