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The Cryosphere Discussions

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

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This paper presents an interesting topic that has not been thoroughly explored in past laboratory experiments. Novel experiments are conducted to investigate the role or entrained sand particles during ice sliding with particular emphasis on the role of melt films. This work will help to close the gap between observation of natural systems and theory.

Overall I think this is a good paper with a few minor adjustments needed. Running an experiment by decreasing normal stress rather than increasing it will show that your results are not biased by displacement history. The distinction between h and hp is unclear in the text. Further explanation of Figure 5 in text should resolve this issue.

I think this paper is both interesting and relevant to Cryosphere.

General Comments

1) Why not give cohesion in addition to coefficient of sliding friction? This may be helpful in the 'slippery' regime when μ is nearly zero

2) It may be useful to list the measured μ for the sand control disks in Table 1.

3) The distinction between h and hp is somewhat confusing and not immediately clear. More care should be taken when first introducing hp.

4) I'm curious as to how the blocks evolve after each run. Each block is used 3 times first at no additional load, then 2.25kg and finally 4.5kg. Do changes in the blocks cause the scatter in shear strength measurements shown in Figure 3? Repeating the same applied load or running samples backward may allow you to decrease the uncertainty, or attribute it to a cause.

Specific Comments

P102L11: Awkward. Page 102; Line 20-26: Why not reference Table 1 here? This will show the tested parameters and controls in a more consistent way than only listing them in text. The table can be referenced again when discussing your friction results.

P103;L619: "Stiff apparatus" is not consistent with "stick-slip cycles" In most configurations "stiff" apparatuses only stick-slip in special cases, such as, rock on rock sliding at high normal stress or narrow grain-size distributions of glass beads.

P103L20: I'm not sure if your repeat experiments are on the same sample or an identically constructed sample. This sentence could be moved to the end of L13 to avoid confusion.

P104L22: Does "significant" refer to statistically significant or non-zero?

P105L24: Should reference Figure 4 after '...exceeds a critical level."

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P106L3: hp has not been defined before it is used in text.

Fig.2: The arrow gives the appearance that the weight was applied at that particular time. Can each run be denoted by using different colors and a legend?

Fig.3: Can the friction coefficient be given in the plot or caption for the ”sandy” trend as reference? Otherwise it may help to plot both shear stress and normal stress on the same scale to allow the reader to judge the slope.

Interactive comment on The Cryosphere Discuss., 1, 99, 2007.