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The Cryosphere Discussions

Interactive comment on "Scaling of instability time-scales of Antarctic outlet glaciers based on one-dimensional similitude analysis" *by* Anders Levermann and Johannes Feldmann

Anonymous Referee #1

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Scaling, similitude and dynamic analysis using simple relationships comprises the powerful bedrock of scientific inference that is all too often ignored in favor of "whiz-bang computational codes" and the glories of tedious algebraic solutions to highly approximated fluid dynamic problems. The best example of where this plays out is when G.I. Taylor, the great UK polymath and fluid dynamicist, determined the energy of the exploding atom bomb at Almorogordo, New Mexico from a picture of the explosion on the cover of Time Magazine (and completely out-performed the more rigorous physics approaches that were top-secret at the time). Taylor used similitude analysis and the Buckingham Pi theorem to do the work.

http://chalkdustmagazine.com/features/the-buckingham-pi-theorem-and-the-atomic-bomb/

The significance of the work presented here is that it gives an overarching target for numerical modeling and other more complex approaches to be compatible with. (They may turn out to disagree, and if this happens, the similitude analysis will undoubtedly respond by improvement or by changing a scaling assumption.) More than just providing a "overview" of computational approaches to prediction, the method and the presentation in this manuscript offers a guide to *field glaciologists* who are interested in ensuring that their studies cover the range of ice stream and glacier behaviors and conditions rather than being stuck just focussing on dynamically similar systems that offer no independent insights (e.g., studying the same exact thing).

I regard this work to be of interest to anyone who, by any method, would attempt to pursue a prediction of future response of the West Antarctic Ice Sheet to current conditions and future warming.

Please also note the supplement to this comment:
https://www.the-cryosphere-discuss.net/tc-2018-252/tc-2018-252-RC1-supplement.pdf

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