

Interactive comment on “Data assimilation using a hybrid ice flow model” by D. N. Goldberg and O. V. Sergienko

Anonymous Referee #2

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This manuscript describes methodological research that tackles two big problems, the adaptation of least-squares inverse methodology to what are called “hybrid models” (these exist at a level just below the commonly named “full Stokes” models), and the incorporation of non-linearity in the adjoint methodology commonly used to solve least-squares problems. The comparison of the “complete” to the “incomplete” adjoint is very persuasive, and indicates that the methods proposed here are on the right track.

The work is interesting and provides a starting point for initiating (via data assimilation) the forward integration of hybrid models. The work is well written, clearly presented and reaches substantial conclusions. The application to an Antarctic outlet glacier test case is very impressive.

The work presents a nice comparison (at the very end) between the virtues of “auto-

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mated” adjoint generators and those generated by analysis.

In figure 5, panel e, can the authors differentiate which aspects of the importance of vertical shear are artifacts of the boundary vs. which have a possible physical cause?

Specific comments:

Why is “first order” capitalized in the abstract and elsewhere?

Although I have no objection to it, it may be over-stated to attribute so much to MacAyeal 1993 near line 15. It may be better to give a range of literature citation that covers the very broad contributions to glaciological inverse methods that have arisen from a variety of contributors.

The definition of SSA needs a space. . .

ISMIP-HOM needs to be spelled out and defined near line 10 of section 4

PIG needs to be defined in section 6.

Interactive comment on The Cryosphere Discuss., 4, 2201, 2010.

TCD

4, C1272–C1273, 2010

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