Interactive comment on "Parameter sensitivity analysis of dynamic ice sheet models-Numerical computations" *by* Gong Cheng and Per Lötstedt

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Response to Referee #2

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I find this manuscript very relevant to TC. It presents interesting results from a new inversion comparing Full Stokes and SSA models. Nonetheless, I believe the manuscript requires significant revision before publication.

Motivation: The manuscript does not give the reader a sense of why this study is necessary or important. This is particularly true for the Introduction, where it should be made clear why this exercise is undertaken and what can be expected as an advance compared to previous work.

Response: The second paragraph in Introduction is now a motivation.

Language: There are not so many grammatical mistakes, but nonetheless, phrasing choices used her make it somewhat difficult to follow the text. I suggest the authors ask an independent reviewer to help improve this aspect of the manuscript.

Response: The language has been revised here and there.

Conclusions (and Discussion): I would like to see somewhat more general extractions from the work to make it more broadly applicable. How would this method work on a more realistic domain? What would it take to make the approach work for real data? Do you believe the last conclusion (ranking of the conditioning of transfers) is general

for any problem?

Response: The Discussion and the Conclusions have been extended with more results from the numerical experiments and the analytical solutions. The method is general and would work in 3D with some simplifications based on ideas in adaptive mesh refinement. Real data for u and h may be used for inversion to find C and b at the base. The relation between the inverse problem and the sensitivity is mentioned now in Section 2.2.5.

Specific comments

1. Abstract: Please add a sentence or two specifically reporting the important results found from this exercise.

   Response: New sentences are now in the Abstract summarizing some of the conclusions

2. Paragraph starting P1L20: This review needs revising. Aside from the references, as mentioned by reviewer 1, this paragraph does not leave the reader with a clear idea of which study addressed which issue, and why. Please carefully improving phrasing.

   Response: Parts of the Introduction have been rewritten with more references and a description of the work there.