

1 Editor Review: Technical Corrections. Andreas Vieli, 30 Sep 2014

1.1 General Comments

The authors have addressed (or justified) the raised points by the reviewers and editor satisfactorily and only very minor mostly technical corrections remain. Thus, the publication can be accepted for publication after addressing the few very minor technical/editing issues listed below.

We thank the editor for his decision and for tracking remaining technical corrections that will further improve the manuscript. We address all of the corrections below.

1.2 Technical Comments

- Equations: add a comma after equations when the sentence continuous after equation ('equation, ...where....' (see reviewer Aschwanden).

Done. Thank you for the clarification on the proper use of commas with equations

- p. 3. Last line: the bracket at end of line should probably go onto next paper

Done.

- p. 4 line 1: the space between the bracket '(' and 'Phased' should be deleted

Done.

- p. 4 line 21: should it not be '... surface velocities ARE used...'

Done.

- p. 5 line 15: is there not an 'an' missing? '...such AN objective...'

Done.

- p. 7 eqn 3: how is Neff calculated/assumed?

Neff is calculated as equal to the overburden pressure at the base. We updated the manuscript accordingly.

- p. 11 line 13: In the response to point by reviewer Heimbach, the authors agree that 4 times is not 'true' and in actual application it is less and they mentioned to have changed that in the text. I guess it is sort of there but reading through this message of less then 4-times does not come through very well. Maybe it is enough to replace 'Indeed,...' by 'In reality,...' or 'In our case,...'. The real performance should be clarified.

We agree that the explanation was not clear. We replaced it with the following: "In reality, this ratio is much lower than the currently accepted

ratio of 10 expected of operator-overloading approaches. The reason for this discrepancy lies in the fact that our stress-balance and mass-transport solvers are not fully scalable [Larour *et al.*, 2012]. Our computation time, irrespective of whether it is carried out in forward or AD mode, is therefore 90% constrained by the solver, and not the automatic differentiation phase. The ratio of 4 is therefore not representative of what is expected for a fully scalable solution. ”

- p. 13 line 27: The issue of negative values for densification (line ??? in re-vides version) raised by reviewer Aschwanden seems to remain. Although the authors explained how to interpret this in their response (which is acceptable), they do not in the paper, and I advise the authors to explain this in one sentence in the paper itself.

Done.

- p. 18 line 4: delete one closing bracket (between ‘Fig. 8’ and ‘d’).

Done.

- p. 18 line 19: according go figure and response this should be 1000m not 100m.

Thanks for catching that!

- p. 20 line 9: I would delete the ‘certainly’ as another certainly appears in next sentence.

Done.

- p. 22. Line 17: the ‘eff’ in Neff should be subscript (as in equation 3).

Done.

- p. 23 line 12: ‘results suggest’ instead of ‘resultst suggests’ (plural)

Done.

- p.23 line 14: is there not a ‘should’ (or similar) missing in front of ‘...be entertained...’?

Indeed. Done.

References

Larour, E., H. Seroussi, M. Morlighem, and E. Rignot, Continental scale, high order, high spatial resolution, ice sheet modeling using the Ice Sheet System Model (ISSM), *J. Geophys. Res.*, *117*(F01022), 1–20, doi:10.1029/2011JF002140, 2012.