Geosci. Model Dev. Discuss., 8, C125–C126, 2015
www.geosci-model-dev-discuss.net/8/C125/2015/

Geoscientific Model Development Discussions
Open Access

Interactive comment on "Finite-Element Sea Ice Model (FESIM), version 2" *by* S. Danilov et al.

Anonymous Referee #1

Received and published: 6 March 2015

The authors present version 2 of FESIM, already partially presented in Losch and Danilov (2012) and applied on Werkele et al. (2013) and Wang et al. (2014). Version 1 implements an EVP formulation and Version 2 includes a VP solver based on a Picard iterative process on top of the use of PETSc library for solving linear systems. The authors present in exhaustive details the VP, EVP and mEVP (the latter from Bouillon et al. 2013) implementations with finite elements. They defend as well the simple grid staggering followed in FESIM (P1-P1) which is notably unstable in general use of fluid mechanics. Finally, –and this is the most scientifically interesting aspect of the paper– they expose a defect in the classical implementation of EVP (Hunke, 2001) in that the damping coefficient is not homogeneous across all stress components and that correcting this defect enables a much better convergence without necessarily resorting to mEVP (which however is not that more costly than any others discussed). This was mentioned in Kimmritz at al. (2015) but not rigorously addressed. It is now at least

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

experimentally, and the authors leave to another study a theoretical analysis of this finding.

I much appreciated the manuscript in the technical presentation, science and quality of the text. I therefore recommend the manuscript for publication under really minor revisions.

-Throughout the text, I found equations presented outside paragraphs without numbering. Is this a decision by authors, the technical editor or a software glitch? p.872-873 seem the worse. My personal preference is to use the numbering extensively whether the equation is referenced or not in the text, but I leave the final decision to the technical editor.

-p.864, line 18, is it possible to add a reference for the FE Taylor-Galerkin method?

-p.876, lines 13-14. The statement "variable resolution serves only to illustrate that FESIM works on unstructured meshes" undervalues the discussion on resolution on p.873 lines 19-25 and p.877 at lines 7-12. Would it be possible to modify this statement?

-p.877, line 3, I am not clear what the authors means by "additional Picard iterations". Is it Np=2+10 when 10 additional iterations are done?

-p.878, line 5, is "VPb" is equivalent "VP2p" of p.877? If so, can a more homogeneous notation be chosen? Same comment at line 6 about "additional" as previous point.

-p.880, line 24: "it looks like" may be to colloquium...

-The plots in Figures 7 and 8 are inverted!

Interactive comment on Geosci. Model Dev. Discuss., 8, 855, 2015.