Earth Syst. Dynam. Discuss., 6, C750–C751, 2015
www.earth-syst-dynam-discuss.net/6/C750/2015/

Earth System Dynamics
Discussions

Interactive comment on "The eigenvalue problem for ice-shelf vibrations: comparison of a full 3-D model with the thin plate approximation" *by* Y. V. Konovalov

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Received and published: 6 November 2015

This paper presents 3D numerical solutions of a linear elastic eigenvalue/vector problem for idealized ice shelves in hydrostatic equilibrium and compares them to a thin-plate treatment. Overall, I thought the manuscript was too thin to be considered a full paper, both in terms of the description and justification of the methods and the range of the experiments considered.

I think that the manuscript relies a bit too much on readers checking earlier work (by the same author), for example, I was puzzled by reference to resonant modes in a problem with no dissipation, and then noticed a paragraph referring to a 2014 paper in

the summary - not the method section, where it is needed - (p1614,lines 24 onward), which talks about modifications to the boundary conditions at the base. A concise explanation within the manuscript would be helpful.

The most interesting difference from the thin plate model would seem to be the stress concentration close to the grounding line. I think that the paper should explicitly consider both the numerical accuracy of this result and its applicability to a range of idealized ice shelf/tongues . With regard to numerical accuracy a convergence study should be included in the manuscript, so that we can be sure this is not simply an issue of lower accuracy near a boundary. The applicability issue is not so simple, but there are at least three avenues to explore (and I think they should all be explored): (1) aspect ratio, (2) buttressing, and (3) the nature of the grounding line boundary condition.

(1) aspect ratio : The ice geometries considered have rather a high aapect ratio (4 km long, 200 m thick), but real ice shelves tend to be much longer and only a bit thicker.

(2) buttressing : the geometries considered are grounded at x = 0, and free edges on the other lateral boundaries. This resembles e.g the Drygalski ice tongue, but a more common configuration is for the ice shelf to have only one free edge.

(3) Nature of the grounding line boundary: how much does the stress concentration, which from fig 7 is greatest toward the vertical center, depend on the rigid pinning at x=0 and all z? If some deformation was permitted across the GL , how does this change?

Interactive comment on Earth Syst. Dynam. Discuss., 6, 1605, 2015.