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The Cryosphere Discussions

Interactive comment on "Ice shelf flexures modeled with a 2-D elastic flow line model" *by* Y. V. Konovalov

Anonymous Referee #2

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This paper presents a 2d ice shelf flexure model, in which ice behave as an elastic media. The ice shelf is solicited by sub-ice-shelf pressure induced by water pressure variations in the cavity below the ice-shelf. The model is first presented and then applied to study the influence of the ice-shelf length, the value of the elastic parameters and the cavity shape. This paper is not easy to read and the objectives are not clearly stated. The model is presented in such way that the equations are discritized at the really beginning, mixing physics and numerics. The results are not presented in a broader context, which would allow to understand what is new in this approach. I think the paper would need serious improvements to be accepted in The Cryosphere, from the model presentation to the application themselves. I give below some input to improve the paper.

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Discussion Paper

Major Remarks:

The way the model itself is presented could be improved so that the reader can really understand which physics is included and then how it is solved. Equations should be presented in their continuous forms, and then a numerics section should be added to present how these equations are solved (discretization, numerical methods, ...).

For this particular application, three-dimensional effects are certainly very important. The limits induced by applying a 2d model should then be discussed.

In Equation (5), the relation is between the tangential stress (Cauchy or deviatoric?) and the tangential velocity. I don't here understand how this sliding law is incorporated in an elastic model which only deals with displacement? Why do you need this boundary condition for the elastic model? Is this sliding law really used in the model? The value of the parameter K_{fr} is not given. The basal velocity is given using lower case letter in the first equation and capital in the second one.

In Equation (7), what is W_b, the vertical velocity or a vertical displacement. There is clearly a mixing between velocity and displacement in the model presentation.

All the notations should be defined where they appear. L in Equation (8) is not defined, neither L_{sh} and L_{gl}. The geometrical notations should be given in Figure 1. Is the elastic model applied on the whole domaine (from the dome to the end of the ice-shelf) or only on the ice-shelf ($x > 40km$).

In the results section, the obtained results should be compared to previous work. Obviously, the fact that the model predicts that a longer ice-shelf will have larger front displacement or that a stiffer ice-shelf will conduct to lower displacements, doesn't look like new results?

TCD

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Figure 9 : the equations should not appear in the figure caption.

Minor Remarks:

page 2842, line 7 : where is located the Academy of Sciences Ice Cap? Should be mentioned.

Âăpage 2843, line 3 : no brackets for these citations.

page 2843, line 19 : Bromirski et al, 2010 is not in the reference list.

page 2846, line 16 : what does C-C' mean?

Beginning of 3.1, it should be specified that it is for a uniform d_0?

page 2849, line 1 : A has already been defined

Interactive comment on The Cryosphere Discuss., 5, 2841, 2011.