Review of Modeling environmental influences on calving at Helheim Glacier, East Greenland by S. Cook and co-autors.

Cook et al. propose a study based on a flow line model in which a crevasse-depth criterion is implemented to represent calving. They applied the model to Helheim Glacier and further explore various processes which are suspected to affect the calving rate.
The topic of the paper is clearly in line with the Cryosphere publications. I would however not recommend publication of this work in its present form and would like to see addressed the following points (sorted by order of importance) before publication:

- I found the argumentation a bit circular. The calving law used is based on a crevasse-depth criterion and authors demonstrate that the most important process is the one that increase the depth of the crevasses (water in the crevasses). This is acknowledged by the authors (p 4423, l 17) and such a limitation should be much better discussed. Particularly, how their results are sensitive to the water content? How robust are their results if another calving criterion would have been chosen?

- There is no paragraph describing the calving criterion. References to other works have been done, but for self consistency and discussion of the implication of the chosen criteria, I strongly believe that a description of the calving implementation is required.

- I have some difficulties with the structure of the paper, what model analysis exactly means? That the model behaves in a reasonable way versus observations, and therefore pertinent to go one step further to test the implications of various processes? If this is the case, why is it presented after the four perturbation experiments? I would suggest to make a new section 3 that deals with the model validation (would include most of the material of current section, 2.5 and 3.5) and presentation of the perturbation experiments (currently 2.4). Section 3 would then become section 4.

- I have some difficulties with the metrics they propose in section 3.5. Authors mention that comparing terminus behavior is “not an appropriate validation method” (p. 4442, l. 10). However, this is the metric they used for all the perturbations experiments (see Fig. 2, 3, 4, 5, 6, 8). This sounds to me as a bit inconsistent. Furthermore, I am very skeptic with one of the metric choose to compare the model with results: the iceberg size distribution. The model used is not designed to represent each calving event, then, how establishing valuable comparisons with iceberg size? This is also acknowledged by the authors (p 4411, l 21-25).

two other more minor points:
- justification of using Jakobshavn Isbrae temperature field is very weak (end of page 4413). Why this glacier and not another ? Why not using the temperature field from a thermo-mechanical coupled ice-sheet model on Helheim glacier?
- Figure 4a clearly shows that changing the basal conditions does not significantly affect the longitudinal deviatoric stress, and thus seasonal variations of the basal conditions does not significantly affect the terminus position (Fig 4d). Then, when coupled to seasonal change in the water crevasses, the story is completely different as changing or not the basal condition strongly affect the terminus position (Fig 4e). Why? This is not discussed and I think would deserve some more explorations and explanations.