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A Mathematical Modeling for Stability of Ice Shelves

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Iceberg calving is the reason for more than half of mass loss in both Greenland and Antarctica. It also indirectly contributes to sea-level rise; changes in calving rate can shorten the ice shelves, speed up the grounded ice and increase changes in ice sheets. Therefore, having a better understanding of this phenomenon by a mathematical modeling seems essential.
Lacking of a precise representation of calving in ice sheet and glacier models may yield to nonphysical predictions.
We perform a parameter study to identify groups of key parameters. Here we use boundary element method and compare our result to works done by van der Veen (1998) and Nick et al. (2010).
A hydraulic crack propagation is assumed to happen vertically from both base and surface of the shelf. The solution for different scenarios is analysed in the form of stability of a dynamical system. An unstable solution results in an iceberg calving which leads us to a general calving law.