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Ice sheet model-dependence of persistent ice-cliff formation

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A recent development in the modeling of marine ice sheet response to ocean forcing has been the postulation of a "cliff-collapse" mechanism, which promotes dramatic thinning and retreat beyond that already expected from the Marine Ice Sheet Instability (MISI). The specific mechanism proposed is brittle failure of large ice cliffs produced after hydrofracture-promoted ice shelf collapse. By invoking this mechanism, ice sheet modelers have been able to close the gap between observations from the paleorecord and simulations of Antarctica's past contributions to sea level rise. When thus "calibrated" to the paleorecord, simulations of Antarctica's contribution to future sea level rise are substantially larger than simulations that do not invoke the new cliff-collapse mechanism.
However, Antarctic marine ice sheet experiments using the high-resolution BISICLES ice sheet model have demonstrated a lack of persistent ice cliffs, even after ice shelves are catastrophically removed. As a result, the cliff-collapse mechanism plays a minor role in ice-sheet response to ice shelf loss. We explore the reasons behind this discrepancy, considering in particular the roles of model resolution and model physics in the formation of persistent ice cliffs.