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A simple but robust model for the buttressing of calving glaciers through ice mélange

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Under future warming scenarios, both ice sheets on Greenland and Antarctica are likely to discharge ice into the ocean at an accelerating rate. In many regions along the coast of the ice sheets, the icebergs are discharged into a bay. If the addition of icebergs through calving is faster than their transport out of the embayment, the icebergs will be frozen into a mélange with surrounding sea ice. In this case, the buttressing effect of the ice mélange can be considerably stronger than any buttressing by mere sea ice would be. This in turn stabilizes the glacier terminus and leads to a reduction in calving rates. Here we propose a simple but robust buttressing model of ice mélange.