Capsizing icebergs release earthquake-sized energies

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A large iceberg can carry a large amount of gravitational potential energy. While all icebergs float with the bulk of their mass submerged beneath the water's surface, some drift around with precarious orientations-they are temporarily stable, but an outside push would send them tumbling over. Large icebergs, like those that split from the Jakobshavn Isbrae glacier in Greenland, can release the energy equivalent to a magnitude 6 or 7 earthquake when they capsize.

A 1995 event demonstrated the potential for destruction, as a tsunami spawned from a capsizing iceberg devastated a coastal Greenland community. Measuring how energy is dispersed during capsizing is crucial to understanding the risk associated with these events but is also key to determining their larger role in surface ocean dynamics.

Using a laboratory model fjord and 27 x 10 centimeter (10.6 x 4 inch) polyethylene iceberg analogues with varied widths, Burton et al. measured how energy is released to the surrounding water during capsizing. A camera tracking a floating buoy measured the height of any tsunami waves, and analysis of the iceberg's movement let them determine the kinetic energy involved in the rotation. Corroborating earlier research, the authors find that the size of any tsunami waves will be at most 1 percent of the iceberg's initial height.

Further, they find that 84 percent of the iceberg's original potential energy would end up as turbulence or heat in the surface ocean waters. While such a large amount of turbulence would be important for surface

dynamics in the open ocean, it would be particularly powerful in a semi-enclosed region like the fjord surrounding the Jakobshavn Isbrae glacier, where dozens of icebergs spawn each summer. In the fjord, trillions of megajoules worth of turbulence redistribute the water, destroying temperature and salinity stratifications.

More information: Laboratory investigations of iceberg capsize dynamics, energy dissipation and tsunamigenesis, Journal of Geophysical Research-Earth Surface, doi: 10.1029/2011JF002055, 2011
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