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Ice Shelf Calving Risks for Halley Reseach Station, Antarctica

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The Halley Research station, operated by the British Antarctic Survey, has been located in Antarctica since 1956. The station is built upon the Brunt Ice Shelf, a 130 m thick ice shelf that extends out from the mainland continent onto the Weddell Sea. The Brunt has the potential to break off, or "calve", into icebergs. As with all ice shelves, the Brunt grows larger at a steady rate due to glacial flow from the mainland; as a result, the Halley station is pushed out further into the sea where its risk of calving off increases. A new replacement station, Halley VI, is currently being constructed closer to the mainland; however, even upon its completion, it will still be subject to calving risks.

Risks due to a possible calving event can be subdivided into three broad scenarios.

The first scenario is that the Brunt calves due to its own natural geometry; that is, at a certain size, cyclic tidal flexing causes fatigue cracks that propogate across the shelf and cause calving along a weak fault line. This scenario is supported by the observation that a major calving event occured between Worseley's 1915 map and the next available observation in 1955. However, data from currently-operating dual-band GPS stations show that there are presently no major strains within the ice shelf, and thus that this calving scenario is not an immediate threat.

The second scenario is that an iceberg collision may trigger a calving event. The Brunt is protected by a shallow bank that deflects most major icebergs, but a 250 sq. km iceberg came within 5km of the Brunt in April 2010, indicating that icebergs are still a threat.

The third scenario is the calving of Stancomb-Wills, a larger adjacent ice shelf with many active rifts. We have been tracking the growth of these rifts, which will cause a calving event no later than 2020 if they grow at their current rate. If Stancomb-Wills calves, it will be a drastic reduction in the stability of the Brunt, which would then become an ice shelf unsupported on three sides rather than two. Additionally, Stancomb-Wills itself will become a large iceberg that may collide with the Brunt, causing an immediate calving.
Our risk management system for monitoring these threats are a combination of remote sensing and GPS stations, and a strategy to move the station to a safer region of the ice shelf.