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Subaqueous terminus evolution at Tasman Glacier, New Zealand, as determined by remote-controlled survey

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The presence of subaqueous ice ramps at the terminus of calving glaciers result from a combination of subaerial and subaqueous processes. These ice ramps eventually buoyantly calve, an event that can be hazardous to companies operating boat tours on proglacial lakes. However our knowledge of ice ramp forming processes, and feedbacks associated with their evolution, is sparse. We are using a remote controlled jet boat to survey bathymetry at an active calving margin. This vessel, mounted with both depth and side-scan sonar, can map subaqueous portions of the terminus right up to the active calving face at no risk to the operators. Surveys at the Tasman Glacier terminus over three consecutive years have revealed that subaqueous ice ramps are ephemeral features. In 2015 multiple ice ramps extended out into the lake from the terminus by 100-200 m, with the ramp surface being as much as 60 m below the water line at its outer perimeter. The maximum depth of the Tasman Lake at this time was 240 m. Within one month of the survey taking place, the largest of these ice ramps had calved and disintegrated. The consistent location of ice ramps between surveys indicates that other factors, like subglacial hydrology, may influence ice ramp evolution.