Classification of calving fronts around Antarctica

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Iceberg calving is the largest loss term in Antarctic mass balance. The iceberg areas vary from a few square meters (growler) to several hundred square kilometres (huge tabular icebergs or ice islands) and their shape (blocky, domed or tabular) depends on the morphology of their calving front. The Antarctic coastline has a length of about 18 000km and is characterized by a large spectrum of morphological properties. In contrast to the Greenland ice sheet, Antarctica is surrounded by a variety of large, medium and small sized ice shelves, besides of glacier tongues and parts without offshore floating ice masses.

With the aid of synthetic aperture radar (SAR) images all ice shelves and glacier tongues around Antarctica were mapped. The mosaic of the RADARSAT-1 Antarctica Mapping Project (RAMP) Antarctic Mapping Mission 1 (AMM) was used at a 100 m x 100 m image resolution and the ice shelves were extracted by using the grounding line of the MODIS Mosaic of Antarctica (MOA) Project and the RAMP1-AMM coastline. An automated detection of crevasses was used as a first calving front classification. On the basis of the orientation of the crevasses to one another and relative to the calving front, and the distance between them, an estimation of the dominant size of potentially calving icebergs was made. Other parameters (e.g. shape of the calving front itself, pinning points) were used to make a clearer distinction between calving sites. The Antarctic coast is classified into several groups of calving sites e.g. no floating ice offshore (e.g. Mawson Coast), large ice shelf (e.g. Filcher-Ronne-Ice Shelf) or large glacier tongue (e.g. Mertz Glacier).

The resulting map of the classified calving fronts around Antarctica and their description will be used to achieve a detailed picture of crevasse formation and propagation within a co-operation with material scientists and ice shelf modelers.