



Longest glacier in Antarctica has 'calved'

09 July 2013

Ice researchers use data from the DLR-operated TerraSAR-X Earth observation satellite

Two gigantic cracks have formed in Pine Island Glacier, the longest and fastest-flowing glacier in the Antarctic. A new iceberg with an area of over 720 square kilometres and its smaller 'brother' separated from the glacier on 8 July 2013 and have 'calved' into the Amundsen Sea, off the west coast of Antarctica. Images acquired by the TerraSAR-X Earth observation satellite, operated by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR), documented the gradual propagation of the first crack over a period of several months. On 11 May 2012, a second crack was discovered. Glaciologists can use this data to better understand the processes involved in the calving of icebergs.

A large iceberg, and a 'little brother'

NASA researchers discovered the crack in the glacier during an aircraft overflight on 14 October 2011. At that time, the crack was about 24 kilometres long and 50 metres wide. "The main iceberg that calved from the flowing part of the glacier is almost as big as Hamburg," says Angelika Humbert, an ice researcher at the Alfred Wegener Institute in Bremerhaven. The glaciologist and her team have used high-resolution radar images obtained with the TerraSAR-X Earth observation satellite operated by DLR to monitor the propagation of the crack and gain a better understanding of what was happening. Dana Floricioiu, from the DLR Remote Sensing Technology Institute, has been monitoring this crack on the Pine Island Glacier since the very beginning, and has derived valuable data such as the velocity field of the glacier. "Above this crack, the glacier was most recently flowing at a rate of 12 metres per day," reports Floricioiu. "The second crack was discovered in May, and this gave rise to an additional, 30-square-kilometre iceberg that has moved into the polar ocean along with its 'big brother'," continues Humbert.

Glaciers are constantly moving, flowing and cracking

Because glaciers are constantly in motion and have their own flow dynamics and highly complex geometry that is subject to continuous stress, the calving process is to a large extent still unexplored. "We are dealing with a material that is capable of both flowing and cracking. The interaction of these processes ultimately caused the floating icebergs to break loose," explains Humbert. The researchers have fed data from TerraSAR-X into computer simulations in which the flow and fracture mechanics of ice sheets can be modelled using numerical techniques. "We are incorporating the crack into our virtual ice shelf and then calculating the flow characteristics of the glacier. We pass these results to our partners at the Technical University of Kaiserslautern, who then simulate the crack propagation," explains Humbert.

A comparison with the latest satellite imagery shows researchers the extent to which their simulation reflects the real situation. **Shortly before the 'birth' of the new iceberg, the crack on Pine Island Glacier was 28 kilometres long and 540 metres wide.**

Ice shelves

Ice shelves develop where glaciers flow into the sea. Glaciers are fast-moving masses of ice. An ice shelf is still connected to its ice sheet, but floats on the surface of the sea. With a thickness of several hundred metres, an ice shelf is much 'thinner' than the ice sheet that formed it, large sections of which are frozen to the rocky ground and can be up to four kilometres thick. The unusual feature of western Antarctica is that large areas of this ground lie below sea level.

Warm ocean water moves under the ice shelf

Angelika Humbert does not see a direct link to global warming. Instead, she believes that the formation of cracks in ice shelves and the resulting creation of new icebergs are natural processes. Pine Island Glacier is the fastest flowing glacier in the western Antarctic, but the polar researcher believes that this is due not so much to rising air temperatures as to changes in prevailing wind directions over the Amundsen Sea. These winds cause warm ocean water to move under the shelf ice which, in time, causes melting of the critical transition point between floating and grounded ice. "It is therefore possible that the western Antarctic could become unstable," suggests Humbert.

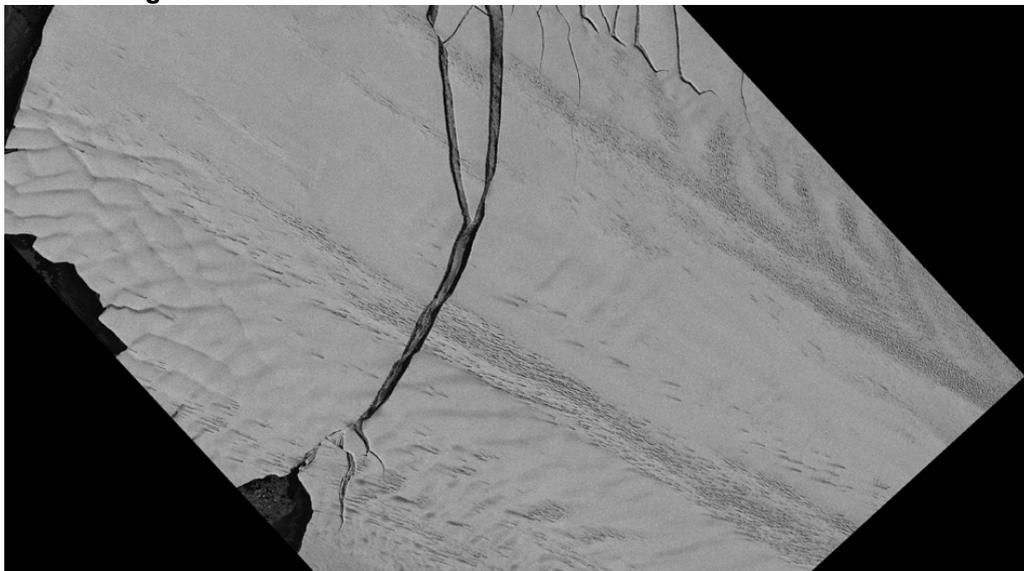
On 14 December 1911 a team led by the Norwegian Roald Amundsen was the first to reach the geographic South Pole. The Amundsen Sea, part of the South Polar Sea, bears the name of this pioneer of polar exploration. Pine Island Glacier flows from the Hudson Mountains into the Amundsen Sea; it calved for the first time in 2007.

Contacts

*Elisabeth Mittelbach
German Aerospace Center (DLR)
Communications, Space Administration
Tel.: +49 228 447-385
Fax: +49 228 447-386
Elisabeth.Mittelbach@dlr.de*

*Prof. Angelika Humbert
The Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven
Division Glaciology
Tel.: +49 471 4831-1834
angelika.humbert@uni-muenster.de*

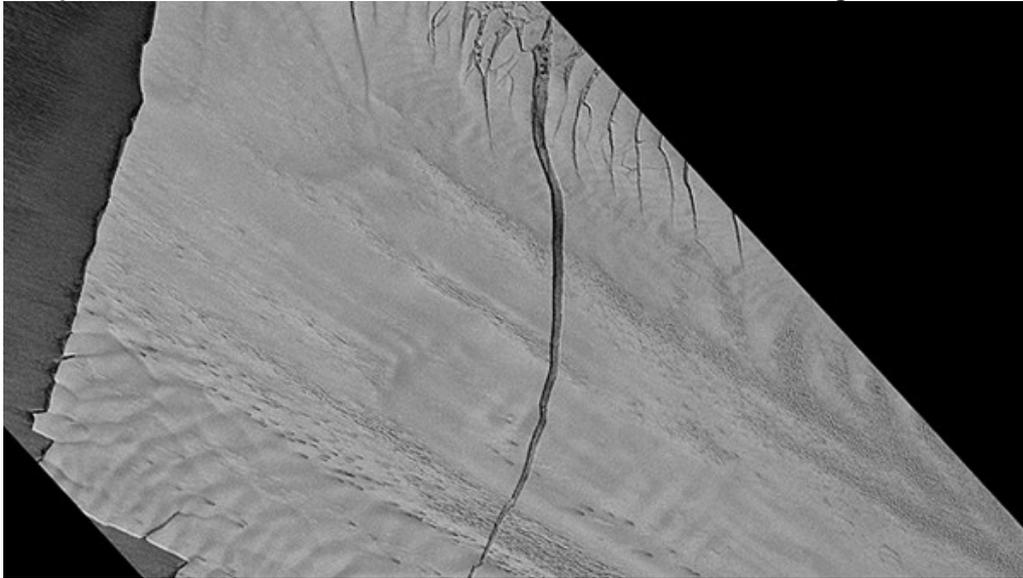
New iceberg in the Antarctic Ocean



The TerraSAR-X image, acquired on 8 July 2013 shows the calved iceberg on Pine Iceland Glacier in the Southern Ocean, which has an area of roughly 720 square kilometers. The glacier broke large icebergs, known as tabular icebergs, into the Amundsen Sea between 2001 and 2007.

Credit: DLR.

13 April 2012 – the crack is 540 metres wide and 28 kilometres long



The crack on Pine Iceland glacier is more advanced and has widened. In this image, acquired on 13 April 2012, the crack faces are now up to 540 metres apart and the crack is 28 kilometres long. Overturned icebergs can be seen at the end of the crack nearest the top of the image.

Credit: DLR.

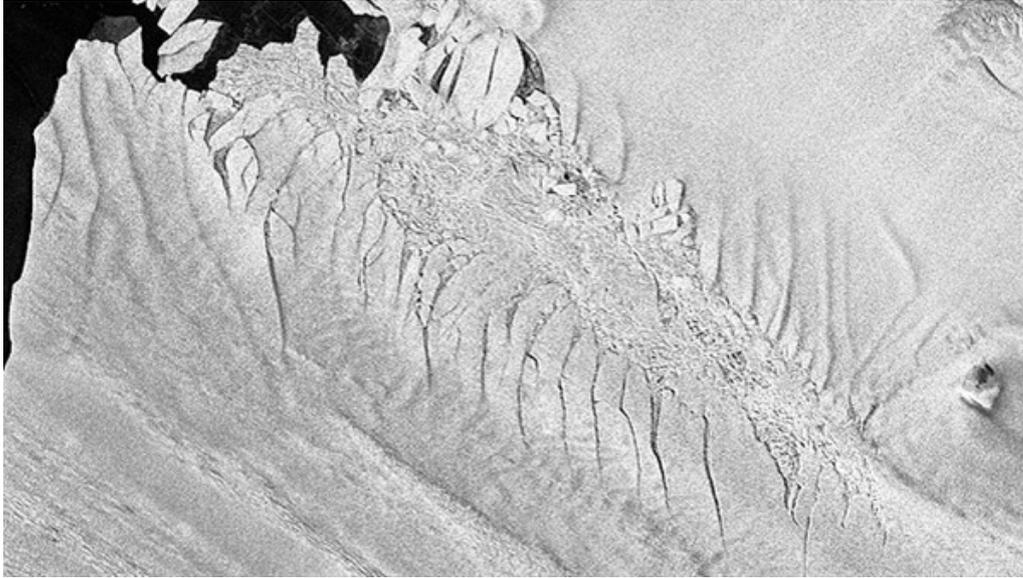
13 October 2011 – the first TerraSAR-X image of the crack, which is still narrow



The first TerraSAR-X image of the crack, which is still narrow; it appears in the centre of the image. The propagation direction is from top to bottom in the image, which was acquired on 13 October 2011 – when the crack was 24 kilometres long and 50 metres across at its widest point (at the top of image).

Credit: DLR.

2 October 2011 – Pine Island Glacier prior to the formation of the crack



The floating part of Pine Island Glacier on 2 October 2011, prior to the formation of the crack. The flow direction is from lower right to upper left. The ice is light coloured, while the surface of the sea is dark.

Credit: DLR.

Contact details for image and video enquiries as well as information regarding DLR's terms of use can be found on the DLR portal imprint.