



DLR satellite data helps in the rescue of the Akademik Shokalskiy

09 January 2014

For ten days, 74 scientists and tourists were trapped in the Antarctic on board the Russian Akademik Shokalskiy research vessel. Strong winds had driven ice floes into a bay, blocking the ship's advancement. High-resolution satellite data provided by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) helped to assess the ice conditions at the location.

TerraSAR-X – Germany's radar eye in the sky

In pack ice, the situation can change quickly when the wind shifts. This is why researchers from the DLR Earth Observation Center (EOC) use up-to-date, high-resolution images from the Earth observation satellite TerraSAR-X to provide the crew of the research vessel with up-to-date information regarding the ice conditions. The German radar satellite operates in a variety of modes to permit imaging with varying swathe widths, resolutions and polarisations.

Seeing through clouds and darkness, the satellite is able to observe the ocean and frozen waters from an altitude of around 500 kilometres, providing a swathe width of 30 kilometres. To do this, it emits microwaves that are reflected back to the satellite in a way that depends on the characteristics of the reflecting surface. The technology provides an extremely high resolution of down to three metres. This is crucial, as the ice structure may change greatly over just a few hundred metres. The satellite data provides scientists with a high-resolution image of the surface of the ice.

DLR provides the rescue centre in Australia with real-time images

Faced with the situation of the Akademik Shokalskiy, the DLR ground station processed the satellite images in near real time and transmitted them to the rescue centre in Australia just one hour after acquisition of the Antarctic scenes. Scientists from the DLR Microwaves and Radar Institute used TerraSAR-X to acquire images of the trapped research ship on 1 January 2014. Software at the DLR Research Centre for Maritime Safety in Bremen was used to track the ships, by utilising the contrast and differing textures of the vessel and sea ice to detect the vessels amongst the frozen masses. Assessing the ice can yield a wealth of information on its thickness and properties, for instance whether two floes have collided to form a ridge. Even icebreakers have a tough job making their way through heavier layers such as these.

In the west of the images we see one-year-old ice – so ice that formed in winter; it reveals distinct deformations all around the Akademik Shokalskiy. The pictures also show larger, less deformed floes further to the west of the ship. Northeast of the vessel we find open water. Maritime ice researchers from the Alfred Wegener Institute and the EOC analysed the images and passed on their findings to the rescue centre in Australia, the Emergency Response Division at the Australian Maritime Safety Authority.

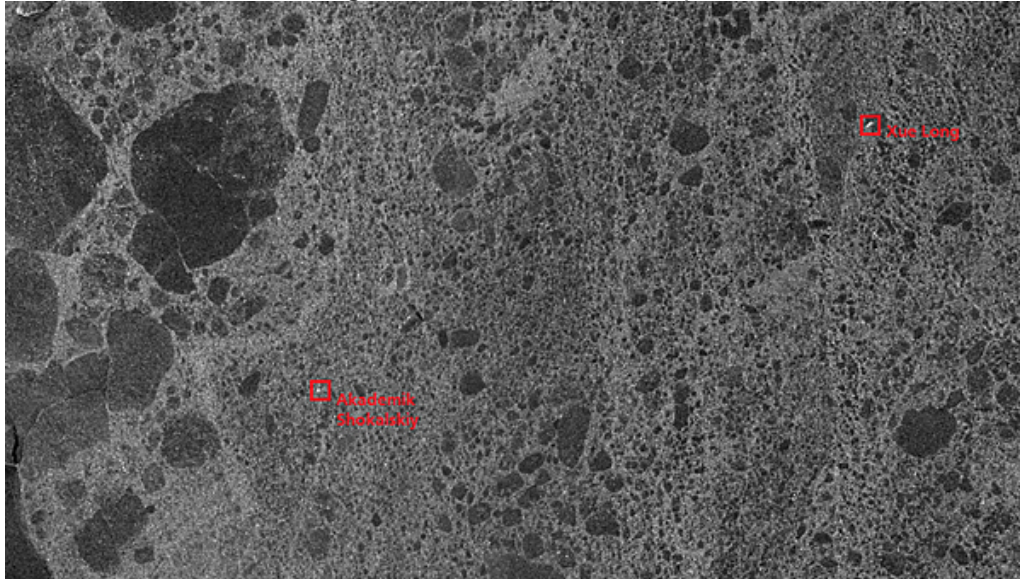
The Chinese icebreaker Xue Long finally arrived to assist the Akademik Shokalskiy. But the ship could only get to within sight of the trapped research vessel before the icebreaker itself was penned in by the masses. On 3 January 2014, a helicopter was dispatched from the Xue Long to transport the passengers on board the Russian research vessel to the Australian icebreaker Aurora Australis, waiting out in open waters. Both icebreakers have since succeeded in breaking free from the ice under their own power.

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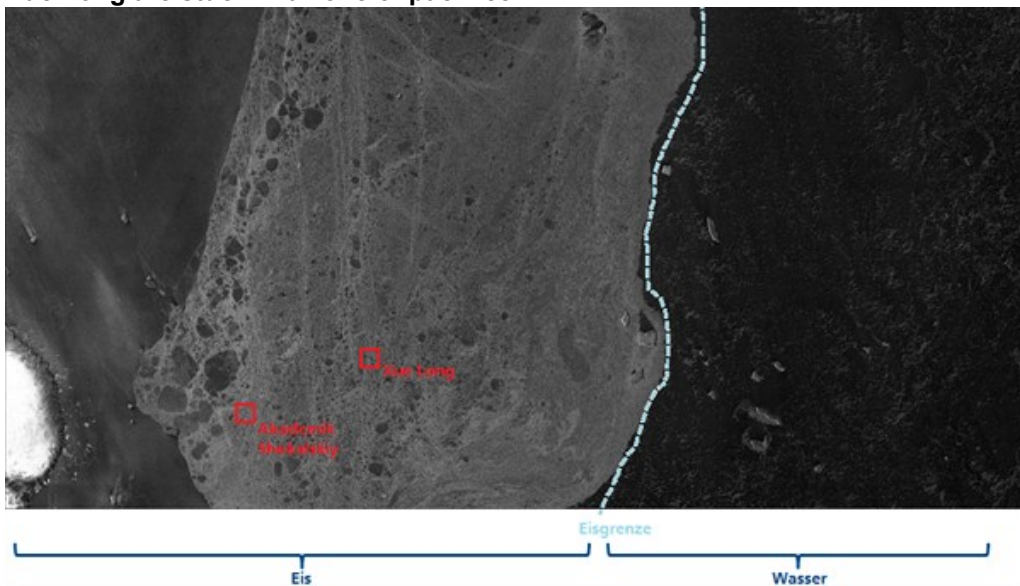
The pack ice zone enclosing the two ships (zoomed in)



TerraSAR-X image from 30 December 2013. Zoom mode reveals a close-up of the pack ice zone enclosing the two ships.

Credit: DLR.

The Russian research vessel Akademik Shokalskiy and the Chinese icebreaker Xue Long are stuck in a zone of pack ice

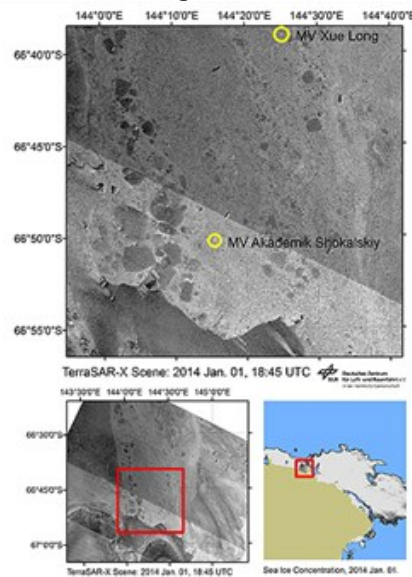


The satellite image covers an expanse of 100 by 55 kilometres. The Russian research vessel Akademik Shokalskiy and the Chinese icebreaker Xue Long lie trapped in a pack ice zone, seen

in the TerraSAR-X image as a light to 'flaky' surface. Further east we see open water (in the right of the image) around 25 kilometres away from the ships.

Credit: DLR.

Satellite images provide real-time images of the ice conditions



TerraSAR-X images, almost in real-time – processed at the DLR ground station in Neustrelitz and complete just one hour after they were acquired above the Antarctic. In the west of the radar images we see one-year-old ice (darker expanses), revealing distinct deformations around the Akademik Shokalskiy (light area); we also see larger floes with less pronounced deformations west of the ship. Open water is found to the northeast.

Credit: DLR.

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