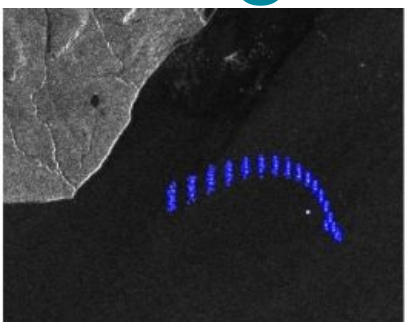
Real-time Satellite Monitoring of Icebergs in Russian Arctic



From July to September 2012, specialists from ScanEx RDC, Russia, along with Atomflot Federal State Unitary Enterprise and other partners, performed real-time satellite monitoring of icebergs in the Kara Sea, Laptev Sea and connecting Vilkitsky Strait. Within 45 days, 130 VHR satellite images and radar images of sea areas and 60-plus images of the Vilkitsky Strait were received and processed.

One of the largest icebergs was located by the satellite in the Kara Sea slightly to the west of the Vilkitsky Strait on 30 August 2012. The iceberg with a cross-section of 250 metres was found in the area at 77°40' N 99°00' E. Another large iceberg with its subsurface part of 83m x 51m drifted from 20 August to 1 September 2012 in the Kara Sea with its centre being at 75°26' N 62°48' E.

Surprisingly, many icebergs were found in the northern part of the Laptev Sea in 2012. The fact was confirmed by satellite images and reports from the ships cruising in that part of the sea.

The problems to locate and monitor icebergs in Russian Arctic became urgent in the wake of a higher traffic in the northern sea way and intensified operations to develop the Arctic shelf. In the Kara Sea, the shelf and outlet glaciers in the eastern coast of the Novaya Zemlya archipelago were selected for monitoring. To obtain the images of glaciers and sea areas, 6 space devices with optic and radar equipment of high and medium resolution (from 0,7m to 30m) were used: EROS A, EROS B, RADARSAT-1, RADARSAT-2, SPOT 4 and SPOT 5.

Images from satellites were downlinked real time to ScanEx's ground stations and those of the company's partners. ScanEx RDC provided real-time order, reception and jointly with the partners processing of diversified space information. The use of a network of receiving terminals in Russia made it possible to forward space information with minimal time delay. Also, it turned out to be a cheaper option compared to the products of foreign providers.

Verification of satellite observations was made from FSUE Atomflot ships and those owned by other entities. High resolution space imagery and ship automatic identification (AIS) data were also used for verification purposes.

Earth remote sensing satellite systems were instrumental to locate iceberg building and monitor how the largest icebergs drift. The application ScanDrifter to model drifting of floating objects was tested to propagate iceberg drift direction and rate. Space imagery was collected at 'Icebergs' thematic web geo-portal where all current hydro meteorological information and navigation data in the zone under control (based on AIS information) were also integrated.

During the project development, the procedures for daily combined imagery of pre-selected Arctic regions with radar and optic equipment of high and medium resolution with real time processing and forwarding the products to consumers were executed. The observations resulted in estimation of radiometric and signature parameters of the icebergs, and generated a map of iceberg distribution in the Kara Sea and Vilkitsky Strait.

The findings received in 2012 as well as in 2011 (a pilot project for iceberg monitoring took place last August-October) were used to coordinate industrial activities launched by FSUE 'Atomflot' and other entities in the Kara Sea and Vilnitsky Strait. The experience gained in the course of implementation of the project can pave the way for the establishment of a long-range information system to monitor navigation and industrial operations in Russian Arctic.