



TerraSAR-X image of the month - bottleneck off the Orkney Islands

02 July 2012

A mere 10 kilometres separate John O'Groats, at the northernmost tip of the Scottish mainland, and South Ronaldsay, in the Orkney Islands. What passengers on the ferries directly experience can also be observed from space by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) TanDEM-X and TerraSAR-X satellite duo; in the Pentland Firth, the water flows at great speed, often causing a rough crossing.

The water between the mainland and the island is flowing through a bottleneck. The sensitive radar systems on board TanDEM-X and TerraSAR-X can detect the motion, even from a height of 500 kilometres. The satellites flew over the group of Scottish islands just once, separated from one another by 50 metres in the direction of flight, and captured the turbulent waters moving between the Atlantic Ocean and the North Sea. "By comparing the two images, we analyse the changes resulting from the time difference between their acquisition," explains Steffen Suchandt, a researcher at the DLR Remote Sensing Technology Institute. The interferogram constructed from the two images shows the quiet waters in a dark red colour; here, the movements are very small and the current hardly perceptible. The situation is quite different where the colour coding for the Pentland Firth changes from violet to blue. "In the blue section, the water is flowing at three metres per second away from the line of vision of the radar systems, one of which is transmitting the signals to Earth and both of which are receiving the reflections." The different transit times of the radar signals have been turned into colour-coded flow velocities and wave motion in the image.

Sheltered zone in orange

DLR has gained extensive experience in determining flow speeds through the evaluation of images from other missions. "The Pentland Firth has a particularly strong current," Suchandt emphasises. This is easy to see in the image, where the two small islands, Stroma and Swona, slow the current down substantially. Whereas the water is flowing at high speed as it reaches their eastern sides, almost circular calm areas form on their western sides – coloured red and orange in the image – along with eddies in the water flowing past at speed.

The images from the radar satellite provide important information for scientists: "With remote sensing from space, we can observe surface currents, for example, over a longer period of time and over a large area." This data can, in turn, assist climate researchers in their work. But there is another advantage that can be derived from observing the moving water; since the tidal flow is equally strong between the Scottish mainland and South Ronaldsay, where might it be worthwhile to build a tidal power plant? "Our satellite data can help in the search for suitable locations."

The TerraSAR-X mission

TerraSAR-X is the first German satellite manufactured under what is known as a Public-Private Partnership between the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) and Astrium GmbH in Friedrichshafen. The satellite travels around the Earth in a polar orbit and records unique, high-quality X-band radar data about the entire planet using its active antenna. TerraSAR-X works regardless of weather conditions, cloud cover or the absence of daylight and is able to provide radar data with a resolution down to one metre.

DLR is responsible for using TerraSAR-X data for scientific purposes. It is also responsible for planning and implementing the mission as well as controlling the satellite. Astrium built the

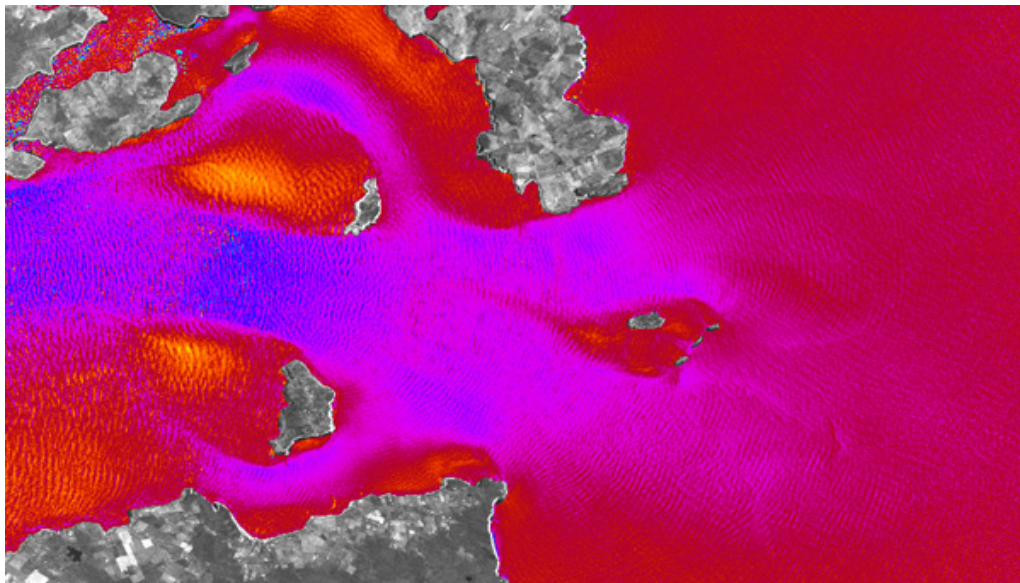
satellite and shares the costs of developing and using it. Infoterra GmbH, a subsidiary company founded specifically for this purpose by Astrium, is responsible for marketing the data commercially.

Contacts

Manuela Braun
German Aerospace Center (DLR)
Media Relations, Space Research
Tel.: +49 2203 601-3882
Fax: +49 2203 601-3249
Manuela.Braun@dlr.de

Steffen Suchandt
German Aerospace Center (DLR)
DLR Remote Sensing Technology Institute
Tel.: +49 8153 28-3011
Fax: +49 8153 28-1420
Steffen.Suchandt@DLR.de

Currents in the Pentland Firth



Between the Scottish mainland and the Orkney island of South Ronaldsay, the water flows at very high speed. The German Aerospace Center (DLR) TerraSAR-X and TanDEM-X radar satellites make it possible to identify and analyse these currents from space.

Credit: DLR (CC-BY 3.0).

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.