German Aerospace Center

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TerraSAR-X image of the month: Alpine upland at Christmas time

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Alpine upland

This image from the German TerraSAR-X radar satellite shows the alpine upland from the lower reaches of the Inn valley through Rosenheim as far as Wasserburg am Inn. The River Inn, snaking across the image, is easy to recognise. The Simssee lake lies in the middle and to the east, part of the Chiemsee lake can be seen. This colour image, taken on Christmas Eve 2008, particularly highlights towns, forests, fields and areas of water. The snow on the Chiemgau alps and in their valleys shows as black areas. In the image, north is to the right and west to the top. The image covers an area of 50 kilometres by 30 kilometres.

Black snow

The X-band radar beams are reflected particularly strongly and multiple times by building facades. That is why towns and buildings mostly appear light, but the darker streets, open areas and shadows also give them a particular contrast, making them light red to magenta coloured in this image. The imaging qualities of TerraSAR-X also make forests and groups of trees appear structured. Some of the radar reflections are returned from individual tree trunks, for others the signal returns diffusely, having been scattered multiple times by treetops. Because of this mix, the forests are shown as yellow-green in the image. In contrast, open areas and agricultural land appear relatively light and uniform to the 'radar eye' of TerraSAR-X (green-blue). Still water surfaces scatter the radar waves 'away' like a mirror from the transmitter, which is looking side-on, and thus appear in the image as black.

Dry snow is not normally directly visible in a radar image, but at the time that this image was taken it had already started to thaw and was wet in the middle regions and therefore was also ‘smooth’ for the X-band radar and reflected the waves away. Since the radar system shows distances and the mountain tops are closer to TerraSAR-X, which was passing to the west, they appear to be upright here.

The operational processing chain automatically generates statistically prepared images like this one. From 2010 they will be included with each TerraSAR-X picture product as an interpretation aid and for overview purposes. Differences in resolution and radiometric properties of different images are equalised as far as possible; however, there is no precise classification of the image content in this simple presentation method. The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is developing significantly more complex algorithms for this purpose, which can be used to gain detailed information about urbanisation and land use and coverage from TerraSAR-X images. Radar data are also used to determine the global biomass and the way it is changing. With the aid of such methods it is possible to track the evidence left by human activities on Earth.

The TerraSAR-X mission

TerraSAR-X is the first German satellite that has been manufactured under what is known as a Public-Private Partnership (PPP) between DLR and Astrium GmbH in Friedrichshafen. The satellite travels around 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 of 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.

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