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TerraSAR-X image of the month: Forest imaging in Gabon for the United Nations

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TerraSAR-X image of Gabon, 60 kilometres south east of the capital Libreville

How much forest cover remains? What is the land like – is it forest, bush, water or some other type of landscape? Has forest cover been destroyed by human beings to make way for other uses? For the United Nations' Global Forest Resources Assessment, every detail counts. Field researchers have difficulty in obtaining an overview of the situation at ground level, while heavy cloud cover often disturbs observations from the air. "For the first time, we're using the radar imaging capabilities of TerraSAR-X," says Ralf Knuth from Friedrich Schiller University of Jena (Friedrich-Schiller-Universität Jena). The Forest Resources Assessment with Synthetic Aperture Radar (FRA-SAR 2010) project has been underway since 2008, with the aim of filling the gaps in the United Nations' knowledge of global forest resources. The radar satellite can image Earth's surface, unaffected by cloud cover or the availability of daylight. "During the test phase, we have been focusing on areas with heavy cloud cover", says Knuth, who is evaluating the data with his team, "In tropical areas, for instance."

This TerraSAR-X image of the month shows an area in the West African state of Gabon. The forest cover spans 210,000 square kilometres, or 70 percent of the country's entire land area. The satellite image shows an uninhabited area around 60 kilometres south east of the capital, Libreville, in the vicinity of the Komo River delta. "The centre of the image most likely shows a mangrove forest, surrounded by tropical rain forest." The flat surface of the river reflects the radar signals away from the satellite and thus appears as a dark area in the image. The forested area, on the other hand, has a rough texture when seen from space, which returns the radar signal to the TerraSAR-X satellite at varying intensities.

Ralf Knuth, Robert Eckardt, Nicole Richter and Christiane Schmuilius from the University of Jena are evaluating the TerraSAR-X images. The researchers are comparing the radar images with existing optical images from Landsat satellites. This comparison enables them to determine how the radar satellite images various landscape features. This information will form the basis for an analytical programme to automatically evaluate the radar images. The results could be used to make maps showing a variety of landscape types, including water, forest and bush.

"Proper, on-the-ground field research and optical imaging from the air will continue, of course, but the TerraSAR-X images give us additional information about inaccessible areas and enable us to penetrate cloud cover from space," says Knuth. Combining all this information should provide a complete overview of the global situation of forest resources. The project will be completed in 2011 with the evaluation of the remote sensing data. Then, the United Nations will decide how to use the analysis of radar data in future assessments.

The TerraSAR-X mission

TerraSAR-X is the first German satellite that has been 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.

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