Elevation models from SRTM now available for download free of charge

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When Space Shuttle Endeavour launched on 11 February 2000 for the 'Shuttle Radar Topography Mission' (SRTM), it was carrying two radar antennas; one in the shuttle's payload bay and the other on the end of a 60-metre mast. Over the course of eleven days, researchers at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) acquired data for a three-dimensional terrain model of large areas of the Earth. Now, DLR is making these data available for scientific purposes via EOWEB, free of charge.

The SRTM structure was one-of-a-kind; the mast, which was deployed from the loading bay of the Shuttle during flight, was the longest man-made structure in space at that time. During the course of its orbit around the Earth, the payload antenna transmitted radar signals earthwards, and both antennas received radar signal reflections. The radar images provided a representation of Earth's surface viewed from two different positions, enabling researchers at DLR's German Remote Sensing Data Center (Deutsches Fernerkundungsdatenzentrum; DFD) to derive a precise Digital Elevation Model (DEM) of the surface of the Earth. "For the first time ever, we had a dataset characterised by uniform quality around the globe," stated DFD Director Stefan Dech. By the time Endeavour returned to Kennedy Space Center on 22 February 2000, DLR had obtained high-precision mapping data for more than 113 million square kilometres of the Earth from an altitude of about 230 kilometres – forming the basis for what became known as the 'Map of the 21st Century'.

During the mission, the radars allowed researchers to obtain elevation data regardless of the time of day and weather conditions. The flight path of Endeavour dictated the areas imaged by the radars; the SRTM data covered regions with latitudes between 60 degrees north and about 60 degrees south – the polar regions were inaccessible. While NASA used a C-band radar to record the entire accessible land surface of Earth with an altitude precision of plus or minus ten metres, DLR used an X-band radar to cover a smaller area, but with a precision of plus or minus six metres. "The accuracy of these global elevation models has yet to be surpassed," said Dech. This explains why, eleven years later, many researchers are still using these datasets.

The SRTM was not just a milestone in terms of high-precision mapping of the Earth from space; it was also the precursor to and a test for the current TanDEM-X mission, which involves two identical German radar satellites orbiting Earth in formation to record a comprehensive and even more precise DEM that is scheduled for completion in 2013.

The X-band DEMs from the SRTM mission have resolution of one arcsecond, corresponding to a pixel size of 25 metres at central latitudes. Each DEM covers an area of 2.5 by 2.5 degrees and is composed of 'tiles', each measuring 15 arcminutes by 15 arcminutes (900 by 900 data points). They can be downloaded free of charge by registering with EOWEB. Registered users can download these datasets from an FTP server. SRTM data can be incorporated directly into digital maps or geographical information systems by means of a standardised Web Map Service (WMS).

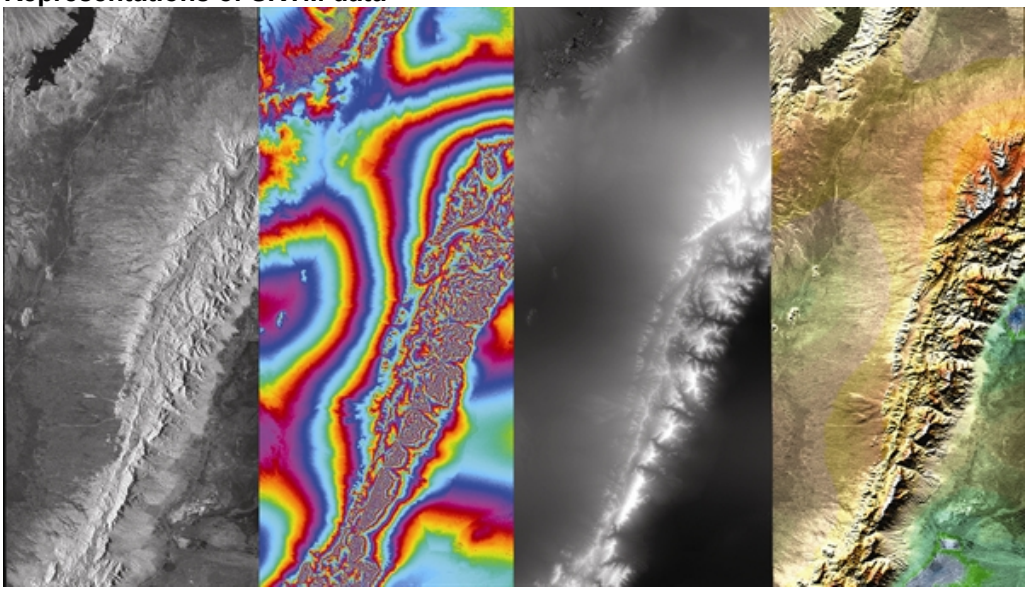
Contacts

Manuela Braun
German Aerospace Center (DLR)
Media Relations Section
Tel.: +49 2203 601-3882

Fax: +49 2203 601-3249
Manuela.Braun@dlr.de

Prof. Dr Stefan Dech
German Aerospace Center (DLR)
Earth Observation Center (EOC) - German Remote Sensing Data Center
Tel.: +49 8153 28-2885
Fax: +49 8153 28-3444
Stefan.Dech@dlr.de

Representations of SRTM data



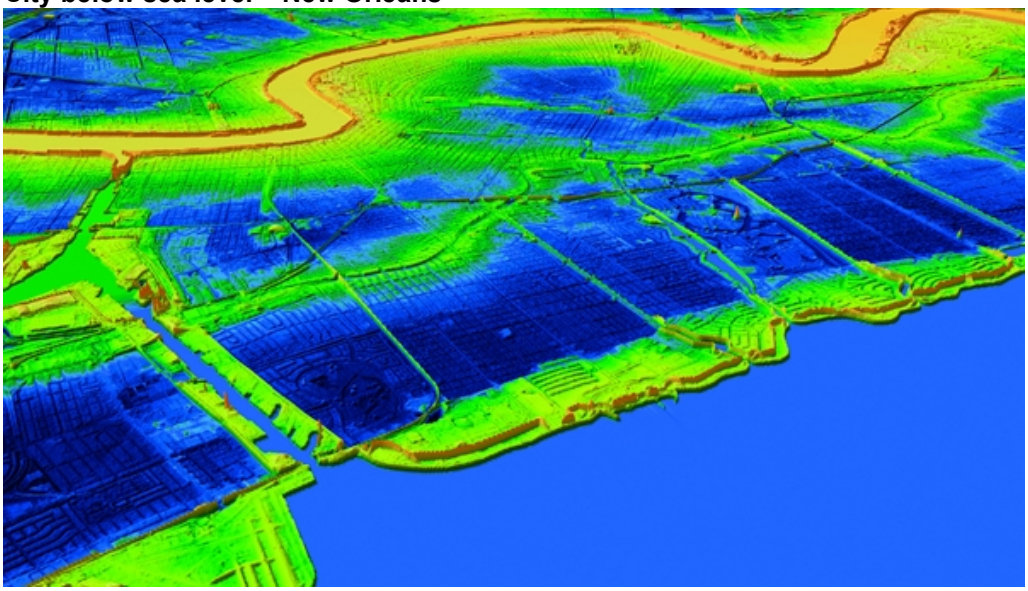
Based on two radar images supplied by SRTM (one of the two images can be seen on the extreme left of this illustration), the first intermediate step is to calculate the differences between them. These differences in phase information are then depicted in the second image from the left as fringes. From these, the elevation model (third image) can be derived. Low-lying regions are shown as dark areas, with lighter coloured areas denoting higher elevations. Each grey-scale value represents an elevation measured in metres above sea level. The last image in the sequence shows the final digital elevation model, shaded and coloured using an atlas colour scheme. To make the image easier to interpret, the radar image is incorporated into the colour data.

SRTM image of Hokkaido

Hokkaido is the second largest island in Japan and constitutes the most northerly prefecture in the country. This SRTM image shows the southwest of the island with the cities of Hakodate and Muroran as well as the mountains Yokotsu-dake (1167 metres) and Komaga-take (1133 metres).

Credit: DLR (CC-BY 3.0).

City below sea level – New Orleans



This coloured SRTM elevation model shows the elevations for New Orleans in the southern USA. Large parts of the city lie considerably below sea level and would flood without elaborate and extensive protective measures. The yellow and green zones lie above sea level, while the blue zones lie up to four metres below it.

Credit: DLR/USGS.

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.