

# SRTM X-SAR Digital Elevation Models

Digital elevation models, generated from data acquired by the German-Italian X-SAR interferometric radar instrument on the Space Shuttle during the 'Shuttle Radar Topography Mission', plus the respective height error maps, can be obtained at no cost for scientific use from the German Aerospace Center DLR. This document contains background information on the mission and the various elevation products. It describes data access options and outlines the conditions of use. More detailed information can be obtained by following the links provided.

## The Shuttle Radar Topography Mission

The Shuttle Radar Topography Mission (SRTM) was a joint mission of the German Aerospace Center DLR, the Italian Space Agency ASI, and NASA/JPL (USA). From February 11 to 22, 2000 two interferometric synthetic aperture radar (InSAR) systems onboard the Space Shuttle Endeavor acquired data with the objective to generate a global high resolution digital elevation model (DEM). The American C-band radar system was complemented by the German-Italian X-SAR, a higher resolution X-band radar instrument. The DLR [SRTM website](#) provides additional information on the SRTM X-SAR mission. Further details on the SRTM mission, on technology, accuracies, and applications are available from [NASA SRTM website](#) and in [this document](#).

The SRTM DEMs were generated by a technology termed 'radar interferometry' or 'InSAR'. Two radar antennas, one inside the Space Shuttle cargo bay, the other at the end of a 60 m extension pole, simultaneously acquired radar data. During the processing, the phase differences of the two corresponding datasets are compared and converted into elevation values. An introduction to SAR interferometry can be found at [here](#).

While the DEMs generated from the American C-band data are available through the United States Geological Survey (USGS) and other sites, the X-SAR DEMs can be obtained via DLR.

## Coverage

Similar to the NASA/JPL SRTM C-band DEM products, the DLR/ASI X-SAR DEMs cover the entire globe between 60° northern and southern latitude. While the coverage of the C-band DEMs is continuous, the higher precision - and hence narrow swath width - of the X-SAR instrument results in crisscrossing image strips with diamond-shaped areas of no data. Detailed information on the local coverage of the SRTM X-SAR data and DEMs can be obtained from the DLR [SRTM website](#).

## DEM Products and Access Options

In addition to the DEM products generated during the mission, DLR has created several value-added products. See below for specifications and access options. All SRTM X-SAR products can also be found in the DLR Earth observation data catalog, accessible e.g. via the EOWEB Geoportal (<https://geoservice.dlr.de/egp/>).

### SRTM X-SAR 15' Tiles

- Details: Original DEM product packages generated during the mission, each containing the DEM and HEM covering an area of 15'x15'.
- Projection: Geographic (Lat/Long), WGS84
- DEM format: DTED ([format specification](#))
- Access: Search DEMs based on an area-of-interest and order up to 100 tiles via the EOWEB Geoportal (<https://geoservice.dlr.de/egp/>)

### SRTM X-SAR 10° Regional Mosaics

- Details: Zip-archives containing 10°x10° mosaics of the elevation data (DEM) and the height error map (HEM) together with a quicklook and a footprint and browse image in kmz format. The filename specifies the bottom left coordinate of the 10°x10° mosaic.
- This product replaces the SRTM X-SAR 10° packages with the individual 15' DEM tiles in DTED format. For requesting the superseded product please contact [geoservice@dlr.de](mailto:geoservice@dlr.de)
- Projection: Geographic (Lat/Long), WGS84
- DEM format: GeoTIFF
- Access: Select and download products via the EOC<sup>1</sup> Download Service ([https://download.geoservice.dlr.de/SRTM\\_XSAR](https://download.geoservice.dlr.de/SRTM_XSAR))

### SRTM X-SAR Global Mosaics

- Details: Global elevation, elevation error, and shaded relief layers.
- Projection: Geographic (Lat/Long), WGS84 (EPSG:4326)
- DEM format: GeoTIFF (native), NetCDF
- Access: View, display in compatible clients, or download custom subsets via OGC-compliant web services (WMS, WCS) (<https://geoservice.dlr.de/web/services>, <https://geoservice.dlr.de/egp/>)

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<sup>1</sup> DLR Earth Observation Center

## SRTM X-SAR DEM Specifications

One pixel of the DEM corresponds to approximately 25 m x 25 m on the ground. Elevation values are provided at a resolution of 1 m. The horizontal accuracy of the SRTM X-band DEMs is  $\pm 20$  m (abs.) /  $\pm 15$  m (rel.), both with 90% circular error. The vertical accuracy is  $\pm 16$  m (abs.) /  $\pm 6$  m (rel.), both with 90% linear error.

As a result of the processing methodology a few locations within the DEM will have 'no data' values. These voids have not been removed. With standard Remote Sensing image processing tools the missing values can be interpolated. The DEMs have not been edited with respect to coastlines and water bodies. Therefore, coastlines may not be well defined and water bodies may not be perfectly flat.

The DLR SRTM X-SAR DEMs are experimental products and are provided as-is on a best effort basis.

## Conditions of Access and Use

The use of the SRTM X-SAR DEMs is governed by the following conditions of use. When accessing and using the data the user accepts the conditions of use detailed below.

The SRTM X-SAR DEMs are intended primarily for scientific purposes. Redistribution of the original SRTM X-SAR DEMs is not permitted, neither for commercial nor for non-commercial purposes. No further restrictions, except those contained herein, are being imposed on the use of the DEMs or derived products.

The SRTM X-SAR DEM products have been generated to the highest possible standards of accuracy using state-of-the-art technology. However, the products are provided as is. No warranty of any kind, whether explicit or implied is given. Furthermore, since the products are provided free-of-charge, DLR shall not be liable for any damage arising out of the SRTM X-SAR products' use. The user is responsible for observing that no damage is caused to anyone or anything by his use of the SRTM X-SAR products. By obtaining the SRTM X-SAR products, the user therefore agrees to hold the German Aerospace Center (DLR) harmless from and against any and all claims which might arise by himself or any third party from the use of the SRTM X-SAR products.

For all derived products based on the SRTM X-SAR DEM products and for all publications including these data or derived products, using the following copyright information is mandatory: ©DLR/ASI <year of production>.