

Products

Mission

The X-SAR/SRTM mission provided an intriguing opportunity to record highly precise topographical data using a space-based radar system. In addition to the main antenna in the cargo bay of the space shuttle, an additional receiver antenna was mounted at the tip of a 60 meter long, extendable mast. This combination made it possible to generate for the first time a three-dimensional view of Earth from space.

All the radar data were converted to digital elevation models for land surfaces between 60° north and 57° south latitudes.

Digital Elevation Model

The altitude information is obtained from the echoes of the transmission signal reflected back from the earth's surface. Each elevation value is generated by an "area signal" that has a spread of about 25 m. The elevation data set is referenced to geographical coordinates and offered in 15'x15' latitude/longitude segments, so-called tiles. The product size is about three megabytes including the associated height error map, so it can be rapidly distributed over networks. The delivery format is DTED (Digital Terrain Elevation Data); for the elevation reference there is a choice of WGS84 ellipsoidal elevation or mean sea level.

The product specifications of the SRTM/X-SAR elevation models is given in table 1.

Grid spacing	1"x1" longitude and latitude
Elevation steps	1m
Datum (horizontal)	WGS84
Datum (vertical)	WGS84 or MSL (optional)
Data format	16-bit signed integer
Horizontal precision (absolute)	$\pm 20\text{m}$ 90% circular error
Horizontal precision (relative)	$\pm 15\text{m}$ 90% circular error
Vertical precision (absolute)	$\pm 16\text{m}$ 90% vertical error
Vertical precision (relative)	$\pm 6\text{m}$ 90% vertical error

Table 1: DEM Product

Besides the elevation information, a confidence level has also been determined for each pixel. It has been estimated statistically by taking neighboring pixels into account and is primarily a reflection of the stability of the phase values and the base line (the relative position of the two antennas). The height error map thus describes accuracy relative to neighborhood. Reference data is required to determine absolute precision.

SAR Image Products

The image products are offered in three different representations and image geometries. These are:

- Single Look Complex (SSC)
- Multi-Look Ground Range (MGD)
- Geocoded Terrain Corrected (GTC)

For the SSC product, real and imaginary parts are supplied for each pixel in the sensor-specific signal travel-time geometry. For the MGD product the brightness values are determined for each pixel and transformed into so-called ground range geometry. This produces homogenous rastering over the range (perpendicular to the flight direction). Since the three-dimensional orientation of every pixel is determined, the image product can also be orthorectified and transformed to a map projection. These steps are carried out for the GTC products. All the data sets cover an area of about 150 km in the flight direction and 50 km in range and are supplied in CEOS format.

Table 2 summarizes the product specifications of the image products.

	MGD	SSC	GTC
Projection	Ground Range	Slant Range	UTM
Ellipsoid	GEM6	n.a.	WGS84
Image data format	Amplitude	Complex	Amplitude
Spatial resolution:			25 m
Azimuth	25m	8-12 m	
Range	25m	17 m	
Pixel spacing:			25 m
Azimuth	12.5 m	13.32 m	
Range	12.5 m	3.9-5.8 m	
Abs. positioning error (s)			< 30 m
Azimuth	3km	3km	
Range	<4 km	<4 km	

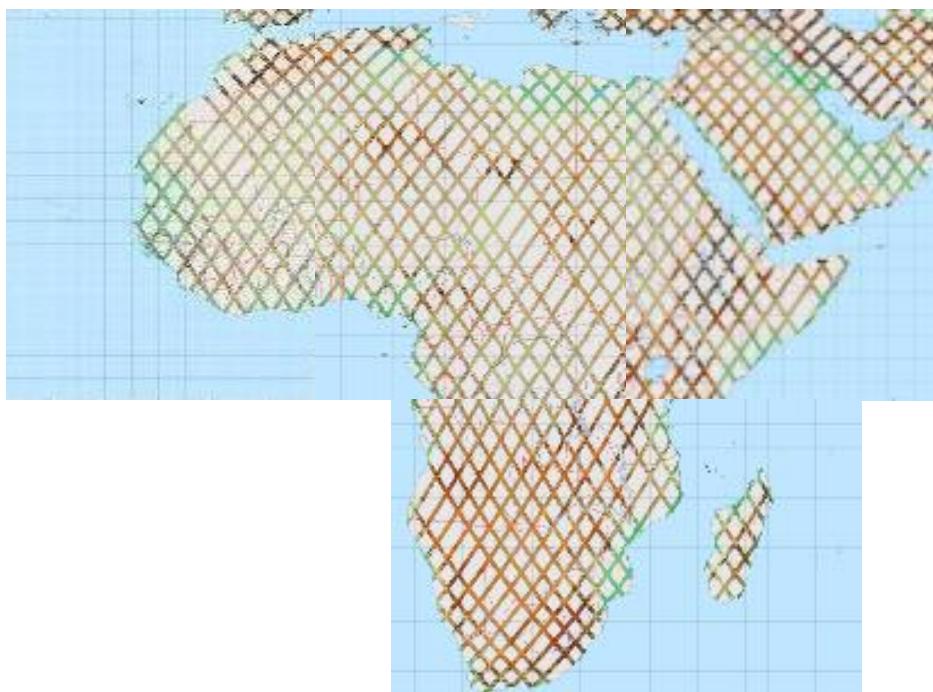
Table 2: SAR Image Products

Gobal coverage of SRTM / X-SAR data

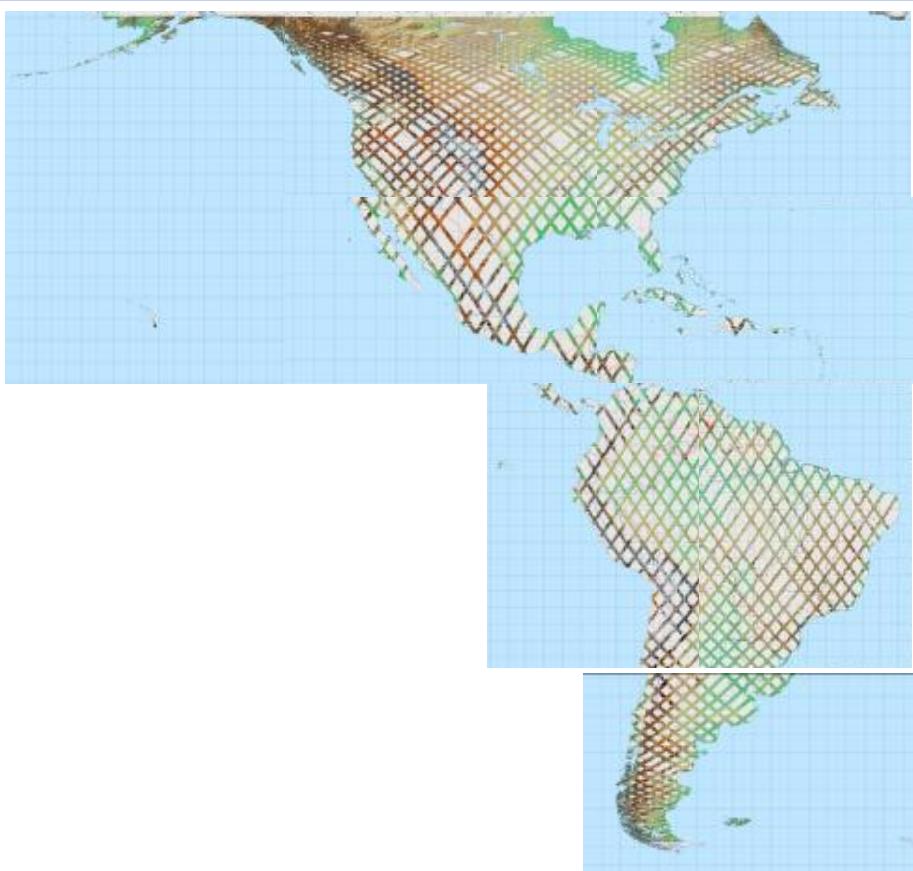
Europe



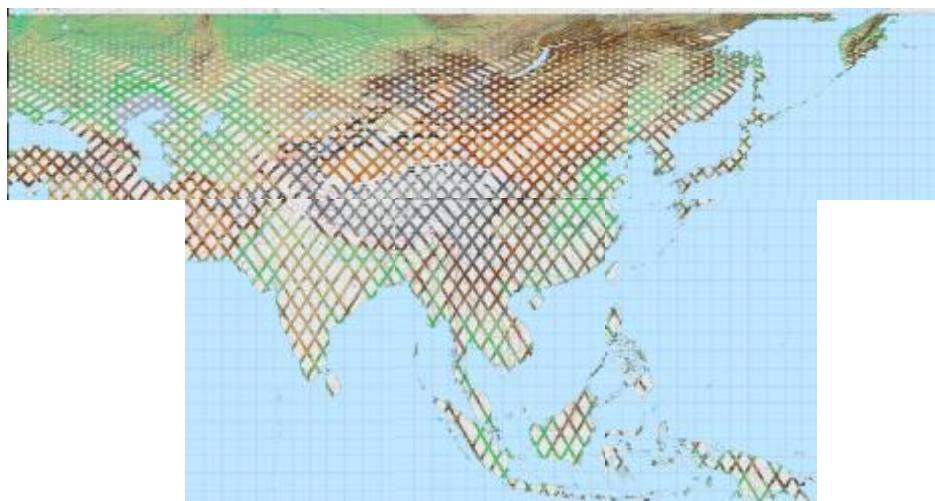
Africa



America



Asia



Australia



Marketing of SRTM / X-SAR data sets

SRTM X-SAR products can be obtained via DLR's EOWEB order service.