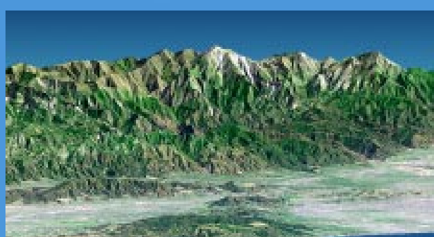
National Aeronautics and
Space Administration

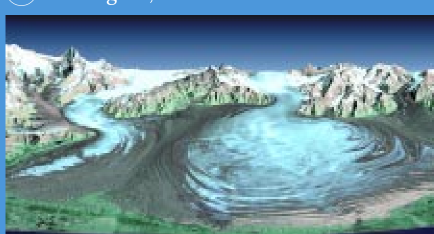
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

The World in Three Dimensions: Shuttle Radar Topography Mission

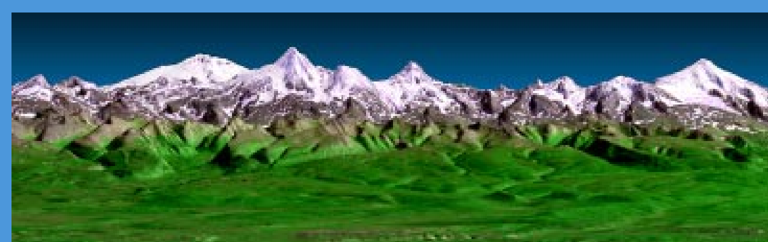


1 Los Angeles, California

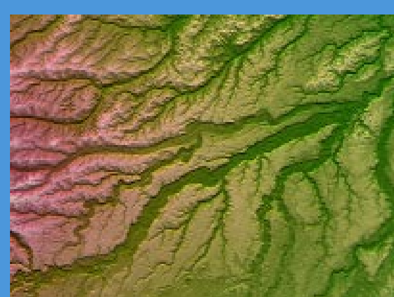
2 Wellington, New Zealand



3 Malaspina Glacier, Alaska

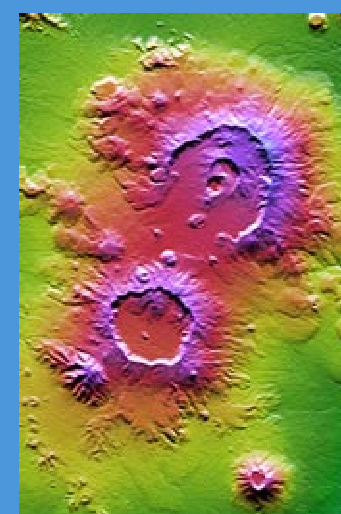


4 Kamchatka Peninsula, Russia



5 Amazon Basin, Brazil and Bolivia

6 Strait of Gibraltar



7 Volcanoes, Eritrea

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The World in Three Dimensions: Shuttle Radar Topography Mission

The Shuttle Radar Topography Mission (SRTM) has achieved its goal of producing the most complete high-resolution map of Earth's landforms. Radar measurements over 80 percent of Earth's landmass, home to nearly 95 percent of the world's population, were collected during a single 11-day Space Shuttle mission in February 2000. These data were then processed to create the SRTM digital elevation model. Nearly every natural process at Earth's surface and most human activities are affected by the altitude, slope, and shape of that surface, making the SRTM elevation model an important input to scientific research and for planning many human endeavors.

This image of the world in Mercator projection was generated with SRTM elevation data greatly reduced from its original resolution. Color coding depicts the lowest elevations in green, rising with elevation through yellow and tan, to white at the highest elevations. Data for Antarctica and areas north of 60 degrees north latitude were not acquired by SRTM, but coverage is nearly complete for South America, Africa, Australia, the majority of North America and Eurasia, and most of the world's islands.

The inset images depict SRTM data up to its finest horizontal resolution of 30 meters (98 feet). The four perspective views (1,3,4,6) combine SRTM elevation models with Landsat satellite imagery, resulting in enhanced visualizations of the natural scene, including green vegetation. The other three inset images (2,5,7) are map views of color-coded elevation that generally rises from greens, through yellows, to reds. Collectively, these images represent the significance of topography in controlling the urban landscape and transportation, in determining water supply and water runoff hazards, in affecting climate and ecosystems, in revealing earthquake and volcanic hazards, and in numerous other factors that affect our lives.

USES OF TOPOGRAPHIC DATA

There are lots of ways that people make use of topographic data. Scientists use information about topography in their studies of plant ecology and animal migration. Elevation information provides clues about rock types, and can tell us how the surface of Earth changes due to the actions of glaciers, volcanoes, and the processes of mountain building and erosion.

City planners use topographic data to help locate suitable places for buildings, roadways, and cell phone towers. Aircraft pilots require accurate topographic information for flight planning and navigation, and the military requires precise topographic information for training and real time operations. Meanwhile, topographic maps are the mainstay of day hikers and weekend backpackers.

THE NEED FOR SRTM

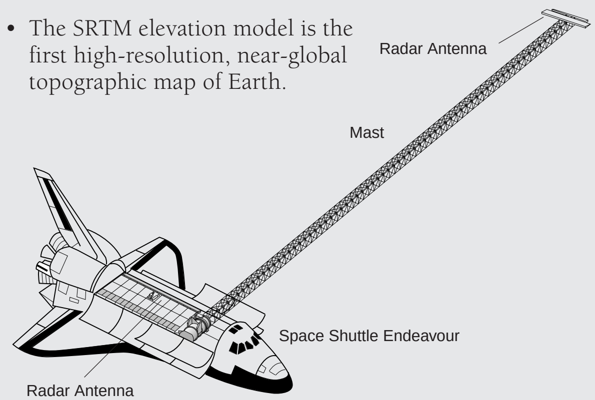
High-quality maps have not been available across much of the globe. Some countries have mapped their territory but restrict access to those maps. Elsewhere, no detailed maps exist at all. And even where detailed maps have been available, they have usually been produced here and there, over a long time, using a variety of methods that have yielded inconsistent results. Most previous mapping has used a combination of stereoscopic aerial photography and ground surveys to calculate elevation information. But limited aerial access, difficult ground access, and/or persistent cloud cover have hindered this method. And these traditional methods are labor intensive and expensive.

SRTM used radar instruments from orbit to collect its data. Using a spaceborne platform eliminated the problems of ground and aerial access. Radar can "see" through clouds, so even tropical areas were reliably mapped. The mission had one flight, one set of hardware, and one method, so consistency was maintained. And being global in scope, the mission costs greatly benefited from an economy of scale.

SRTM is a cooperative project of the National Aeronautics and Space Administration (NASA), the Department of Defense's National Imagery and Mapping Agency (NIMA), and the German and Italian space agencies. The Jet Propulsion Laboratory, California Institute of Technology, manages the SRTM project for NASA's Earth Science Enterprise and NIMA. SRTM data are distributed by the U.S. Geological Survey (USGS) Earth Resources Observation Systems (EROS) Data Center, Sioux Falls, South Dakota.

SRTM Mission Results

- SRTM mapped nearly all of Earth's landmass between latitudes 60 degrees north and 56 degrees south. That is about 120 million square kilometers (46 million square miles).
- More than 12 terabytes of radar data were acquired for production of the elevation model plus a radar image "snapshot" of Earth.
- The full resolution SRTM digital elevation model shows detail as small as about 30 meters (98 feet), about the size of a basketball court.
- The SRTM elevation model is the first high-resolution, near-global topographic map of Earth.



SRTM simultaneously used antennas in the payload bay and at the end of a mast to record radar signals reflected off Earth's landforms from two differing viewpoints.

For more information, visit these Web sites:

SRTM — http://www.jpl.nasa.gov/srtm/

USGS — http://edc.usgs.gov/srtm/data/obtainingdata.html

NASA Planetary Photojournal — http://photojournal.jpl.nasa.gov

National Imagery and Mapping Agency — http://www.nima.mil/

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