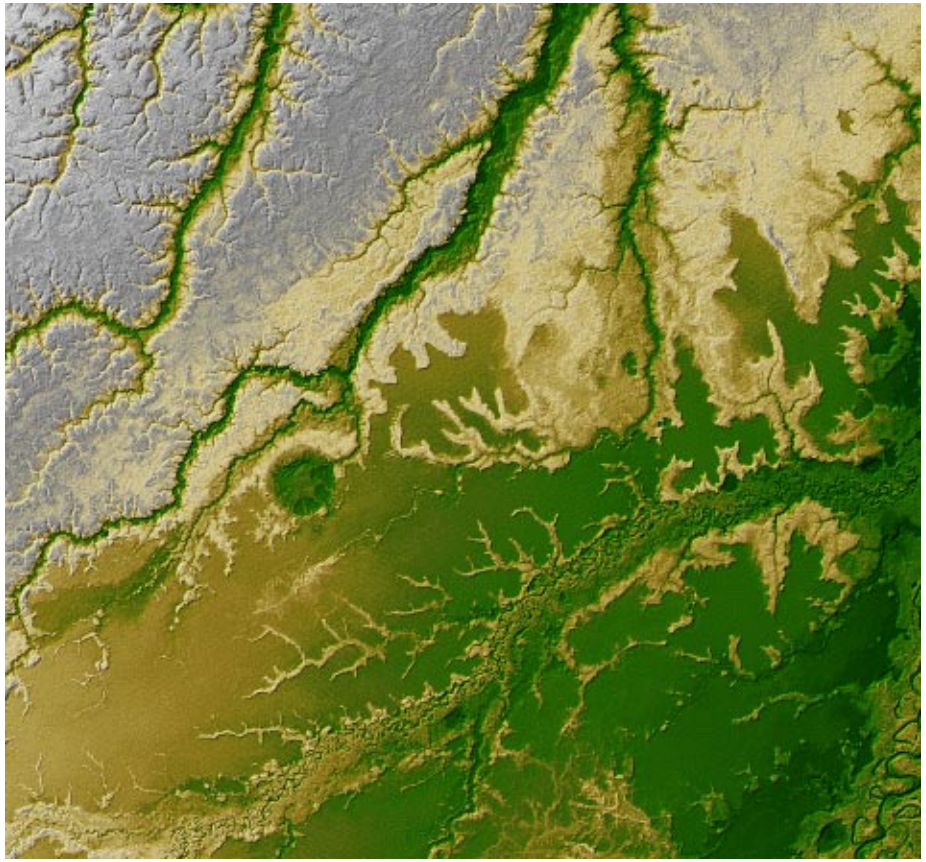
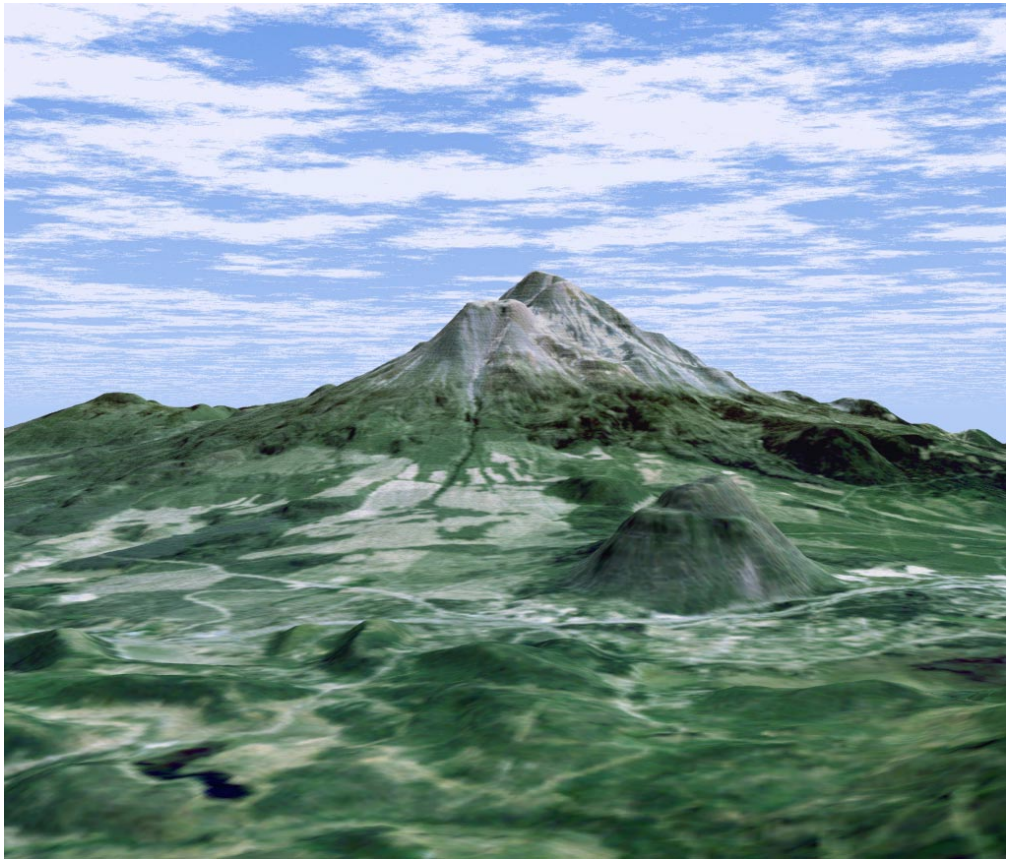
National Aeronautics and
Space Administration
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

The World in Three Dimensions:
Shuttle Radar Topography Mission



Iturralde Structure, Bolivia



Mount Shasta, California

Mount Kilimanjaro, Tanzania

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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.

These three images illustrate SRTM data in visualizations of Earth's terrain. The Iturralde Structure in Bolivia is an 8-kilometer (five-mile) wide crater, probably the result of a meteor or comet impact thousands of years ago. SRTM data provide investigators with the first topographic map of the site. The crater is the circular feature at the left-center of this color-coded elevation image that shows elevation rising from green, through tans and yellows, up to grays.

The other two images are perspective views generated from SRTM data combined with Landsat satellite imagery. The Mount Shasta image includes the smaller Shastina volcanic cone on its upper flank and Black Butte, another volcano, in the foreground. A false sky completes the picture in this use of SRTM data for natural scene rendering. The panoramic view of Mount Kilimanjaro, the highest point in Africa, shows the volcano's three peaks and includes the Meru volcano (left) and nearby savanna (background) as well. Topographic expression in both perspective views is exaggerated two times to enhance terrain details.

SRTM AND NASA EARTH SCIENCE

The Shuttle Radar Topography Mission provides important information for NASA's Earth Science Enterprise, which is dedicated to understanding the total Earth system and the effects of human activity on the global environment. Topographic data are a critical resource in understanding Earth's natural systems. Mountains capture the moisture of passing airmasses, while canyons and channels direct the overland flow of water, and topographic altitude and shading produce microclimates that host diverse plant life.

But just as landforms affect today's natural processes, natural processes have produced those very landforms. Volcanism, earthquakes, stream erosion and deposition, glaciers, and even an occasional meteor impact (as seen here) alter the landscape, leaving clues to events that occurred long before we were around to observe them. The present topography gives us evidence of the past, showing us how Earth has changed and how it will likely continue changing into the future.

LOOKING AT EARTH AND TO THE FUTURE

SRTM met its objective of obtaining a near-global elevation data set by use of a technique called radar interferometry, in which radar signals transmitted from the Shuttle and then reflected off Earth's surface were recorded at two receiving antennas, one in the cargo bay and one at the end of a 60-meter (200-foot) mast. Differences in the signals received varied with height across Earth's surface and were used to calculate the shape of the surface.

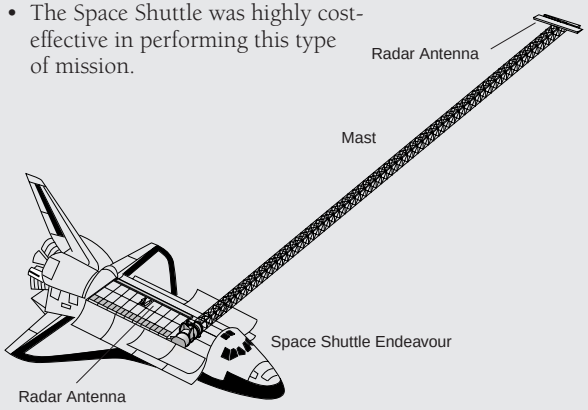
In little more than a week, the Shuttle Radar Topography Mission gathered a "snapshot" of our home planet. The elevation data serve as a year 2000 baseline against which future topographic change can be measured. But the data will also be used for numerous other purposes for decades to come, and the technology demonstrated paves the way for future interferometric radar missions that will monitor Earth's changing landscapes.

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.

The Space Shuttle's Unique Role

- Use of the Space Shuttle and its crew permitted hands-on operation, including on-orbit checkout and troubleshooting.
- SRTM used radar mapping hardware from a previous Shuttle flight, which was efficient and provided an added measure of reliability.
- The Space Shuttle is well suited to perform a worldwide mapping mission, as it is able to observe most of Earth's landmass from orbit.
- The Space Shuttle was highly cost-effective in performing this type of mission.



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/