USGS
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Shuttle Radar Topography Mission (SRTM)

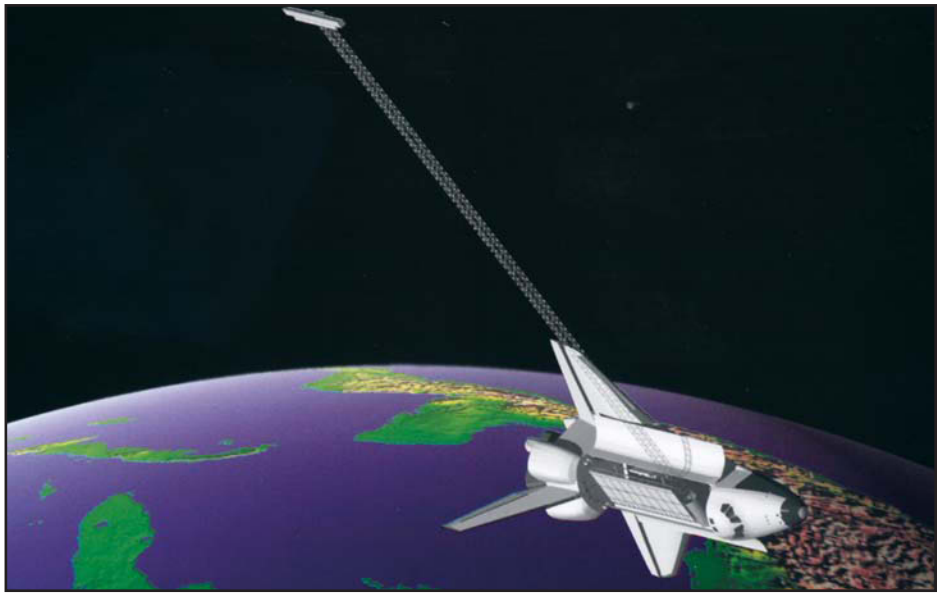

Figure 1: The space shuttle Endeavour and the 200-ft long SRTM antenna deployed for image acquisition.

Background

Under an agreement with the National Aeronautics and Space Administration (NASA) and the Department of Defense's National Imagery and Mapping Agency (NIMA), the U.S. Geological Survey (USGS) is now distributing elevation data from the Shuttle Radar Topography Mission (SRTM). The SRTM is a joint project between NASA and NIMA to map the Earth's land surface in three dimensions at a level of detail unprecedented for such a large area. Flown aboard the NASA Space Shuttle Endeavour February 11-22, 2000, the SRTM successfully collected data over 80 percent of the Earth's land surface, for most of the area between 60º N. and 56º S. latitude. The SRTM hardware included the Spaceborne Imaging Radar-C (SIR-C) and X-band Synthetic Aperture Radar (X-SAR) systems that had flown twice previously on other space shuttle missions. The SRTM data were collected specifically with a technique known as interferometry that allows image data from dual radar antennas to be processed for the extraction of ground heights.

Data

NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif., processed more than 12 terabytes of raw SRTM data into preliminary, research-quality digital elevation models, on a continent-by-continent basis. NIMA will complete editing, verification, and reformatting of the preliminary data by the end of July 2004. The USGS EROS Data Center in Sioux Falls, S. Dak., is the long-term archive for SRTM data and provides these data to the general public and the science community. Data available to the geospatial data user community include 1-arc-second (approximately 30-meter) resolution data over the United States and its territories, and 3-arc-second (approximately 90-meter) data over non-U.S. territory. The SRTM data complement other elevation data available from the USGS EROS Data Center.

Applications

Elevation data are used for various applications, most notably the production of topographic maps and three-dimensional visualizations of the Earth's surface. The earth science community regularly uses products like SRTM data for hydrologic and geologic investigations. The SRTM dataset provides a recent snapshot of the Earth's land surface, which is useful for comparing against historical elevation data like the USGS National Elevation Dataset (NED) to assess changes to the landscape, as illustrated in Figures 2 and 3:

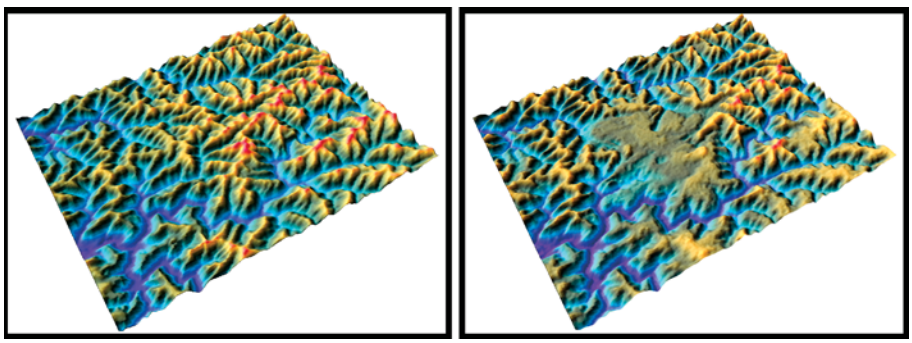

Figure 2: Changes on the land surface in eastern Kentucky (Breathitt, Knott, and Perry Counties) from surface mining, as depicted by comparing NED (left, pre-disturbance) and SRTM data (right, postdisturbance, with the Star Fire Mine in the middle of the image). The NED data are derived from topographic map data compiled in 1952. The SRTM data were collected in February 2000. This perspective view, looking to the northeast, covers an area of approximately 37 square miles.

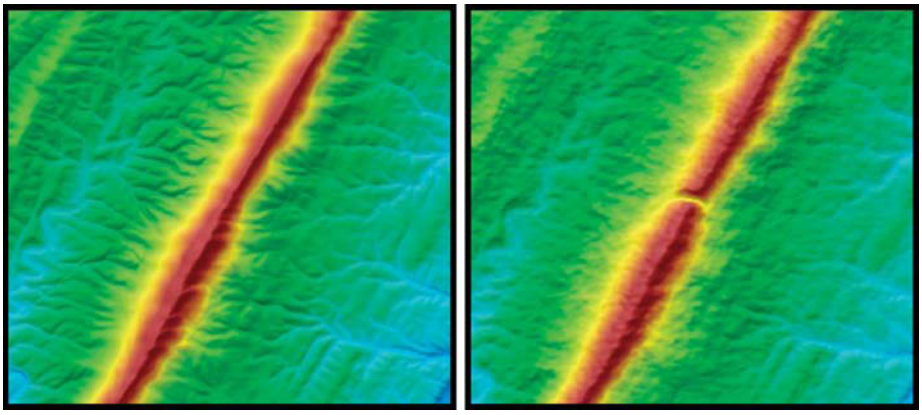

Figure 3: Interstate-68 road cut in western Maryland, as depicted by comparison of NED (left, preconstruction) and SRTM data (right, postconstruction, with the I-68 road cut in the middle of the image). The maximum depth of the road cut through the ridge is 322 feet. The NED data were derived from topographic map data compiled in 1947. The SRTM data were collected in February 2000. This view covers an area of approximately 15 square miles.

Satellite image data can be combined with SRTM elevation data for visualizations of the land surface:

Figure 4: Perspective view: Kamchatka Peninsula, Russia. The view shows a 20-mile-wide expanse of the Russian coastline, looking to the east, with the Sea of Okhotsk in the foreground (SRTM and Landsat 7 data acquired in August 1999).

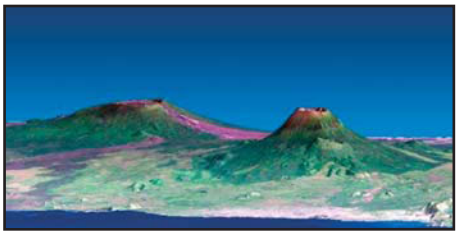

Figure 5: Preeruption perspective view of the Nyiragongo, Congo, volcano (peak on the right). This 13-mile-wide view, looking to the northeast, shows the city of Goma on the shore of Lake Kivu in the foreground (SRTM and Landsat 7 data acquired December 2001).

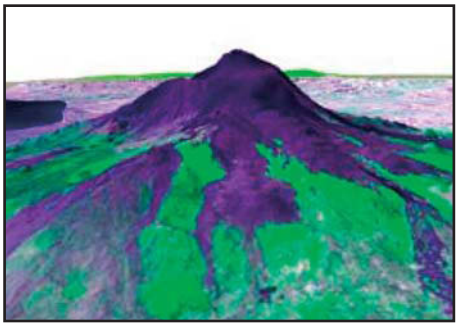

Figure 6: Perspective view: Mt. Etna, Italy (ASTER and SRTM), looking to the south. The ASTER data were acquired in July 2001.

Data Access

Preliminary 1-arc-second SRTM data of the conterminous United States, southern Alaska, Hawaii, and the island territories can be obtained through electronic file transfer from the USGS Seamless Data Distribution System (seamless.usgs.gov). An area of up to 30 square degrees of raster data (1.6 gigabytes), in 100-megabyte files, may be downloaded at no charge. SRTM data for any size area are available on CD-Recordable media for a cost-to-produce fee of $32 per CD, plus a $45 processing and a $5 handling fee per order. Each CD holds approximately 600 megabytes of data. Data are also available on DVD (4 gigabytes of data) for a cost-to-produce fee of $60 per DVD, plus a $60 processing and a $5 handling fee per order. Preliminary international 3-arc-second SRTM data are also available for download and on media as each continent is completed. Preliminary data will be replaced with validated "finished" data when received from NIMA. NIMA expects to complete final processing by July 2004.

Further Information

For further information about SRTM and radar interferometry, visit the NASA Web site: www.jpl.nasa.gov/srtm/index.html.

For additional information on SRTM data and ordering procedures, visit srtm.usgs.gov or contact USGS EROS Data Center Customer Services:

USGS/EROS Data Center
Attn.: Research
47914 252nd Street
Sioux Falls, SD 57198-0001
Tel: 800-252-4547
Tel: 605-594-6151
TDD: 605-594-6933
Fax: 605-594-6589
E-mail: custserv@usgs.gov

Other complementary elevation datasets from the USGS EROS Data Center include the following:

National Elevation Dataset (NED)
ned.usgs.gov/

Elevation Derivatives for National Applications (EDNA)
edna.usgs.gov/

Global 30-Arc-Second Elevation Dataset (GTOPO30)
edcdaac.usgs.gov/gtopo30/gtopo30.html

HYDRO1k Elevation Derivative Database
edcdaac.usgs.gov/gtopo30/hydro/index.html

For information on other USGS products and services, call 1-888-ASK-USGS, or visit the general interest publications Web site on mapping, geography, and related topics at erg.usgs.gov/isb/pubs/pubslists/.

For additional information, visit the ask.usgs.gov Web site or the USGS home page at www.usgs.gov.