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Remotely Sensed Data Collections: Offerings from EROS

The U.S. Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS) maintains a wide variety of remotely sensed data collections that contain a wealth of information about the Earth's land surfaces. Acquired by special sensors carried aboard civilian satellites and aircraft, the images and other data in these collections provide a unique perspective of the terrestrial environment. They represent invaluable resources for scientists, resource managers, policy makers, and educators to use in studying such things as natural hazards, conservation issues, land use and economic development, and environmental change at local, regional, and global levels.

Different types of sensors record different types of information, resulting in diverse data products, each with its own particular strengths. Highlighted here are eight remotely sensed data collections that are currently available from EROS.

ASTER

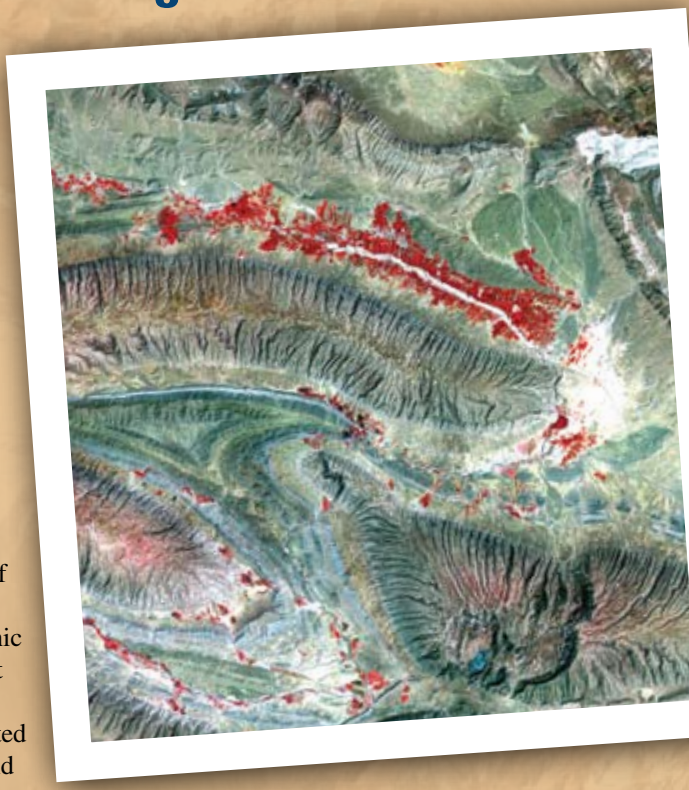
The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) is a sensor carried aboard Terra, the flagship satellite of the National Aeronautics and Space Administration (NASA) Earth Observing System (EOS). ASTER is a cooperative effort between the United States and Japan and began gathering data in early 2000. ASTER is composed of three telescopes that obtain multiresolution (15-, 30-, and 90-meter) images of the Earth's surface in 14 different wavelengths ranging from visible light to thermal infrared bands. The repeat cycle of ASTER images varies, as the satellite collects data on demand rather than continuously. ASTER data are particularly useful for applications in geology, glaciology, hydrology, urban ecology, and volcanology. ASTER stereoscopic data from bands 3N and 3B also are used to generate detailed Digital Elevation Models (DEMs) of the land surface.

http://eros.usgs.gov/products/satellite/aster.html

Aerial Photographs

EROS maintains a large collection of aerial photographs that includes images acquired by various Federal agencies from the 1940s to the present. Many of these photographs were used to create USGS 1:24,000 topographic quadrangle maps. They represent a high-resolution (although not georeferenced) set of images suited for detailed analyses of small land areas, localized mapping projects, and research on land cover change.

http://eros.usgs.gov/products/aerial.html



ASTER
This ASTER image of the Zagros Mountains in Iran depicts the sparse vegetation (shown in red) in this region. The image was acquired on May 15, 2005, and is displayed using ASTER VNIR Bands 3N, 2, and 1.

NAPP High-Resolution Scanned Image Aerial Photo
Boston, MA
Acquisition date: April 3, 1995
Such photos are used in the creation and revision of USA topographic maps, city planning, and change detection.

Declassified Satellite Image Subset
Navy Pier, Chicago, IL
Acquisition date: March 20, 1966
Historical satellite images can help measure and assess changes in local, regional, and global areas of the Earth.

Declassified Satellite Images

About 90,000 declassified satellite images are maintained in the EROS archive. The images were captured by a variety of intelligence satellites, including CORONA, ARGON, LANYARD, KH-7, and KH-9, between 1959 and 1980. Although coverage is global, it is somewhat sporadic. Some images are high resolution (although not georeferenced), while others extend the remotely sensed record of land surface change by more than a decade prior to the start of the Landsat satellite program.

http://eros.usgs.gov/products/satellite/declass1.html
http://eros.usgs.gov/products/satellite/declass2.html

EO-1 Imagery

Launched in 2000, NASA's Earth Observing-1 (EO-1) satellite is currently on an extended mission as a result of an agreement between NASA and the USGS. Data continues to be received from two of EO-1's state-of-the-art sensors. The Advanced Land Imager (ALI) is a multispectral instrument that improves on Landsat 7's Enhanced Thematic Mapper Plus (ETM+) sensor. ALI captures images with a 30-meter resolution in the multispectral bands and 10-meter resolution in the panchromatic band. ALI data are appropriate for a broad range of research topics, including agriculture, forestry, geology, and global change. Hyperion, the first civilian spaceborne hyperspectral imager, is the second instrument aboard EO-1. Hyperion can resolve land surface properties into hundreds of spectral bands, making Hyperion data an excellent choice for imaging and accurately classifying complex terrestrial ecosystems including tasks such as mapping individual species, revealing forest regrowth rates, or analyzing temperature distributions in lava flows.

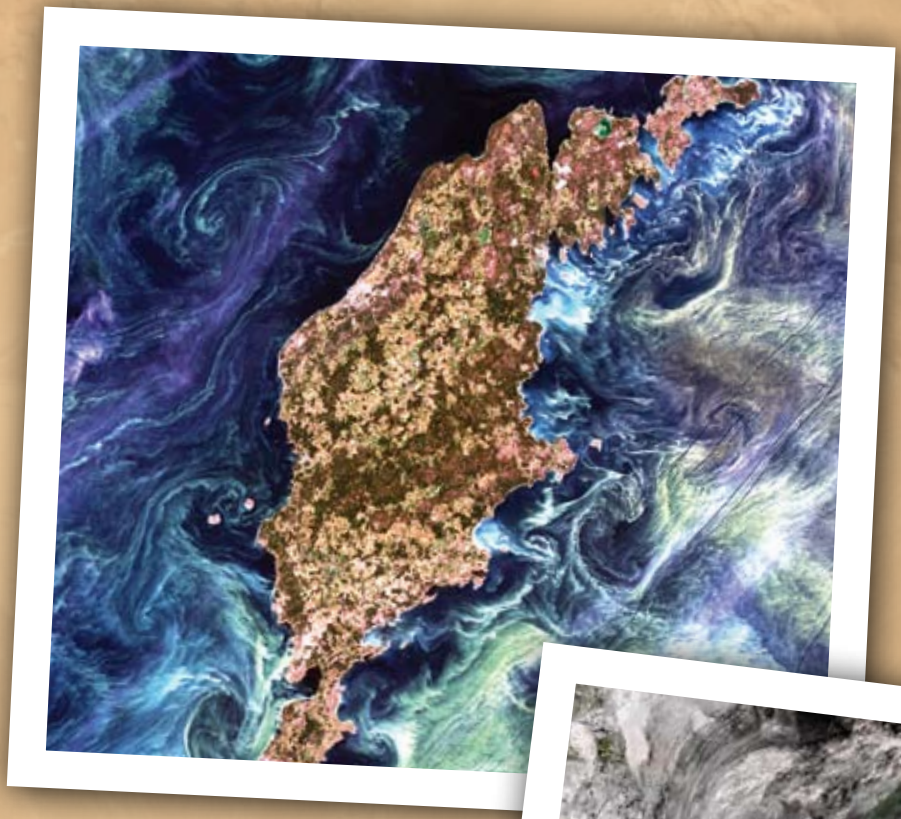
http://eros.usgs.gov/products/satellite/eo1.html

EO-1 Advanced Land Imager (ALI)
Tonopah, NV
Acquisition date: March 26, 2004
This image created from bands 8, 6, and 5 (RGB) reveals minerals, rock formations, and ephemeral streams in south-central Nevada.

Landsat 1–5 and 7

Landsat satellites have been collecting pictures of the Earth's surface since 1972. Sensors onboard these satellites have acquired millions of images that span more than three decades, making the Landsat collection the most historically complete remotely sensed dataset of the global terrestrial environment currently available. No other on-orbit system gathers, archives, and distributes global land data at the same spatial and temporal resolution. Landsat data are multispectral and can be processed using a variety of parameters and levels of correction. Currently, Landsat 5 (launched in 1984) and Landsat 7 (launched in 1999) continue to collect imagery. Landsat 7 carries the Enhanced Thematic Mapper Plus (ETM+) sensor, which captures a given area on the Earth's surface in relatively fine detail every 16 days. Landsat images provide a unique resource for education and mapping and for research on agriculture, geology, forestry, regional planning, and global environmental change. Selected Landsat images are available online at no charge.

http://eros.usgs.gov/products/satellite/landsat7.html
http://eros.usgs.gov/products/satellite/tm.html
http://eros.usgs.gov/products/satellite/mss.html

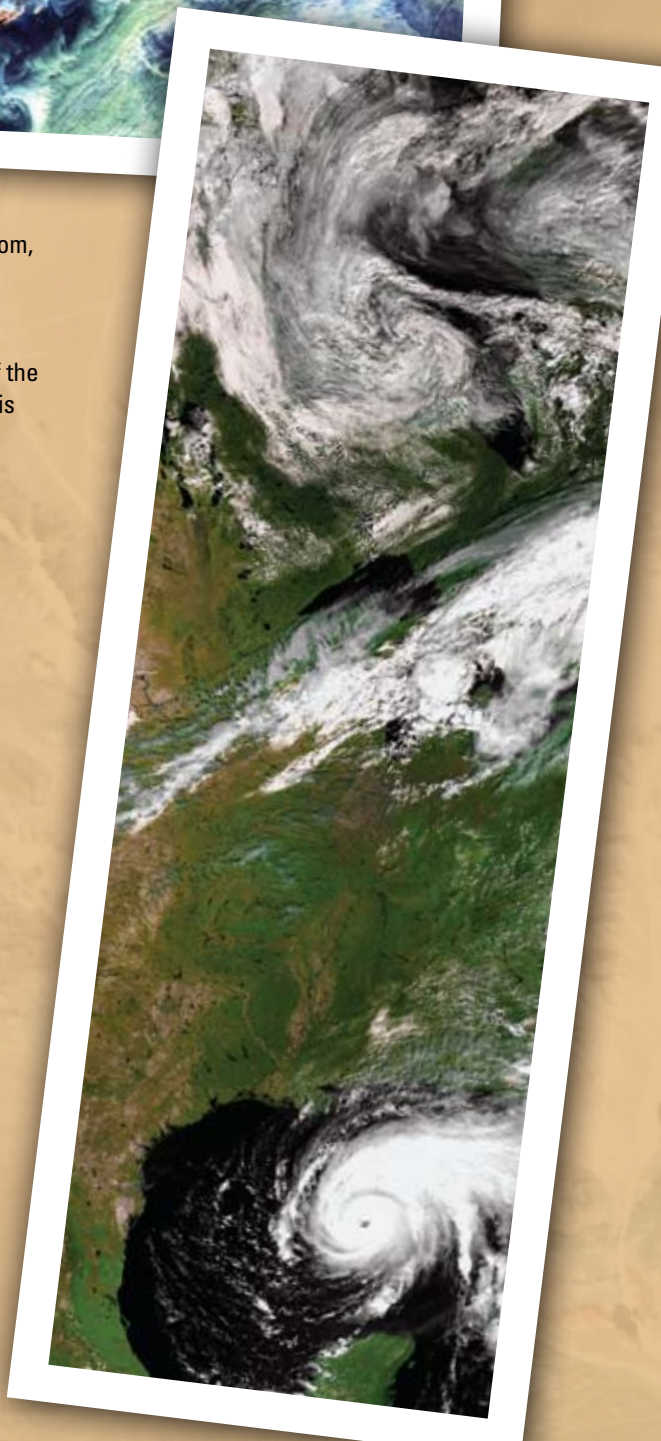


Landsat 7 ETM+ Gap-filled Subset
Gotland Island and phytoplankton bloom, Baltic Sea
WRS-2 Path/Row: 191/20
Acquisition date: July 13, 2005
This image captures the movement of the summer bloom of phytoplankton as it is swirled about by ocean currents.

MODIS

The Moderate Resolution Imaging Spectroradiometer (MODIS) is a sensor carried aboard both NASA's Terra (see ASTER above) and Aqua satellites. Terra's orbit takes it from north to south across the Earth's equator in the morning, while Aqua passes south to north over the equator in the afternoon. Terra MODIS and Aqua MODIS view the entire surface of the planet—continuously acquiring data—every 1 to 2 days. MODIS has a wide field of view and its data are acquired in 36 spectral bands and at three spatial resolutions: 250, 500, and 1,000 meters. These data are especially good for large-scale applications such as studying processes occurring on the land, in the oceans, and in the lower atmosphere as well as research on agriculture, forestry, and global environmental change. MODIS data are available at no charge.

http://eros.usgs.gov/products/satellite/modis.html



Terra MODIS
Southeastern United States
Acquisition date: September 22, 2005
This image shows the position of Hurricane Rita as it advances toward the Texas and Louisiana shoreline.

High Resolution Orthoimagery

The High Resolution Orthoimagery data collection consists of images of major U.S. urban areas, state capitals, famous landmarks, and other notable locations. The very high resolution (7.5 to 60 centimeters) of these images makes it possible to see features in great detail.

Orthoimagery combines the image characteristics of a photograph with the uniform scale and positional accuracy of a map. Distortions caused by camera tilt or topography are removed. These images are cloud free, seamless with all matching edges, and available in natural color, black-and-white, or color infrared.

High Resolution Orthoimagery is an invaluable tool for resource managers, city planners, and others who make land and urban development decisions. These images are potentially very useful to emergency responders for determining evacuation routes and planning safe access to relief supplies and emergency aid, and to law enforcement officials for selecting the best locations for surveillance equipment in high-traffic areas and at popular attractions. These images also provide detailed views of reservoirs, power plants, and similar facilities as well as spatial perspectives of possible entry points along the Nation's borders. High Resolution Orthoimagery is available from the online USGS Seamless Data Distribution System at no charge.

http://seamless.usgs.gov

SRTM

The Shuttle Radar Topography Mission (SRTM) data collection is the result of a partnership between the National Geospatial-Intelligence Agency (NGA) and NASA. Flown aboard the space shuttle *Endeavour* in 2000, SRTM used dual Spaceborne Imaging Radar (SIR-C) and dual X-band Synthetic Aperture Radar (X-SAR) to gather images over 80 percent of the Earth's land surface (almost everything between 60 degrees North and 56 degrees South latitude). SRTM data were used to create the most accurate and complete digital topographic map of the Earth's land surface yet assembled—a first-ever, near-global, 3-dimensional model of the world's terrestrial environment. SRTM images can be tailored to meet the diverse needs of different users and are available at no charge as FTP downloads.

http://eros.usgs.gov/products/elevation/srtmbil.html

For more information on these and other data collections at EROS, please contact:

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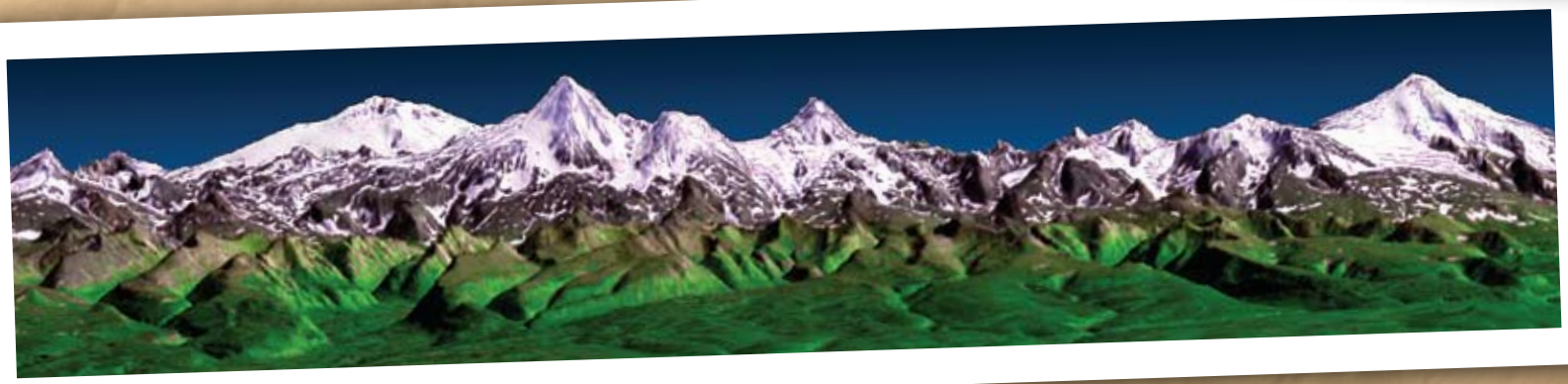
High Resolution Orthoimagery
Duck Key, Florida Keys
Acquisition date: February 2006
This 15-centimeter resolution image reveals remarkable detail of structures and features.



Combination of SRTM topographic data and an enhanced true-color image from the Landsat 7 ETM+ sensor
This image shows the western side of the volcanically active Kamchatka Peninsula in eastern Russia.