



Eruption of Cleveland Volcano, Aleutian Islands, Alaska is featured in this image photographed by an Expedition 13 crewmember on the International Space Station. This most recent eruption was first reported to the Alaska Volcano Observatory by astronaut Jeffrey N. Williams, NASA space station science officer and flight engineer, at 3:00 p.m. Alaska Daylight Time (23:00 GMT). This image, acquired shortly after the beginning of the eruption, captures the ash plume moving west-southwest from the summit vent. The eruption was short-lived; the plume had completely detached from the volcano summit two hours later. Photo credit: NASA



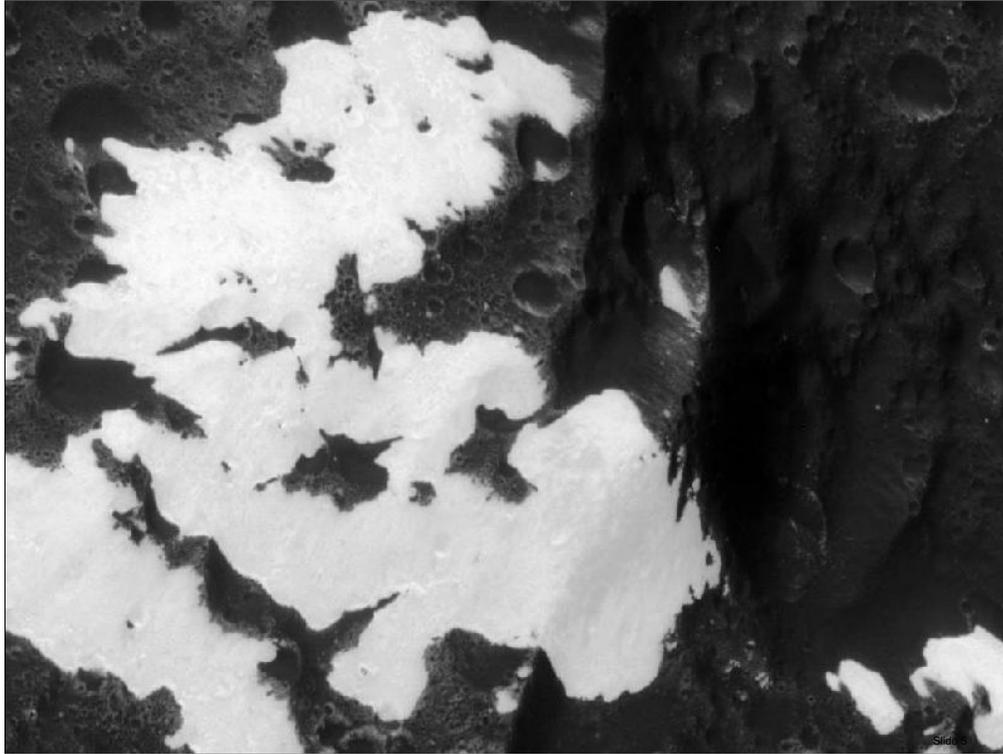
(27 July 2003) --- Photographed by an Expedition 7 crewmember onboard the International Space Station (ISS), this image shows the limb of the Earth at the bottom transitioning into the orange-colored troposphere, the lowest and most dense portion of the Earth's atmosphere. The troposphere ends abruptly at the tropopause, which appears in the image as the sharp boundary between the orange- and blue-colored atmosphere. The silvery-blue noctilucent clouds extend far above the Earth's troposphere. The sliver of the setting moon is visible at upper right. Photo credit: NASA



(10 March 2003) --- This nighttime view of Los Angeles, California was captured by one of the Expedition Six crewmembers on board the International Space Station (ISS). In the north, Hollywood is nestled against the south side of the Santa Monica Mountains. On the coast, Los Angeles International Airport (LAX) and the port facilities at Long Beach Naval Shipyards are also bright spots. The bright lights of Disneyland in Anaheim are also a standout feature. Photo credit: NASA



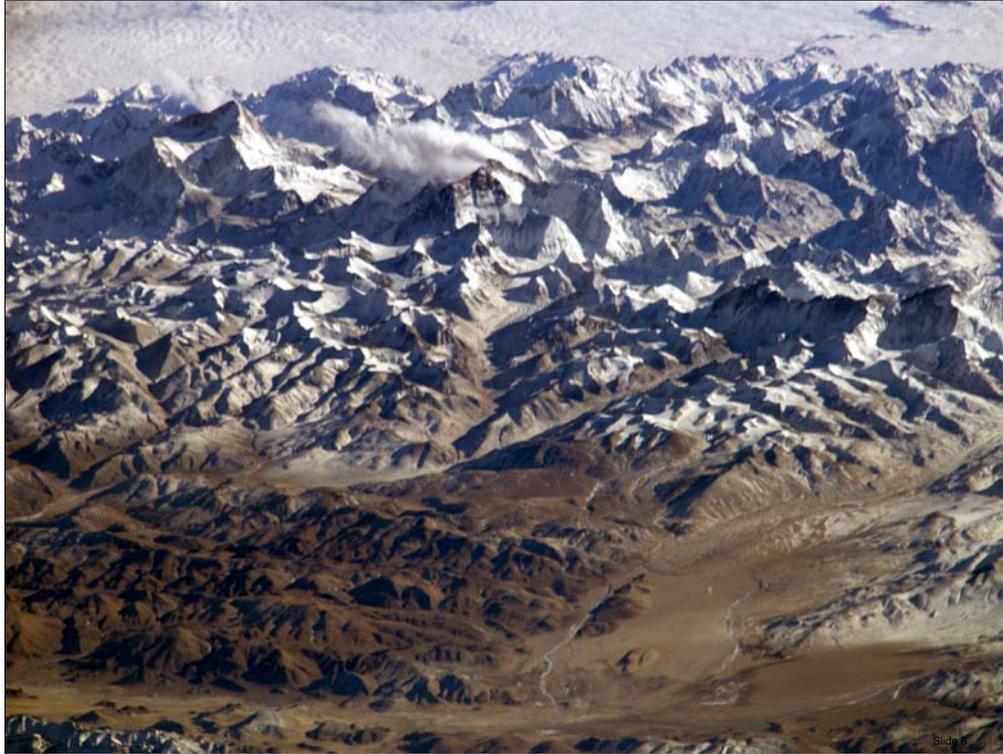
(31 August 2005) --- Aurora Borealis and lights in Finland, Russia, Estonia and Latvia are featured in this digital still picture taken by the Expedition 11 crew aboard the International Space Station. If it were daylight parts of the Eastern Baltic Sea would be visible. The station was over a point on Earth located at 50.6 degrees north latitude and 15.1 degrees east longitude at the time. The cluster of stars to the lower right of the thin crescent Moon is the Praesepe or Beehive Cluster in Cancer. Just to the right of that is the planet Saturn. Photo credit: NASA



The Voyager Mountains

Cassini zooms in, for the first time, on the patchy, bright and dark mountains originally identified in images from NASA's Voyager spacecraft taken more than 25 years earlier. The image was acquired during Cassini's only close flyby of Iapetus, a two-toned moon of Saturn. The terrain seen here is located on the equator of Iapetus, in the transition region between the moon's bright and dark hemispheres. The image was taken on Sept. 10, 2007, with the Cassini's narrow-angle camera at a distance of approximately 9,240 kilometers (5,740 miles) from Iapetus.

Image Credit: NASA/JPL/Space Science Institute



(28 January 2004) --- This image featuring Mt. Everest and Makalu was taken by an Expedition 8 crew member on the International Space Station (ISS). Crew members on board the Station have a unique view of the world because of their position in a low orbit (200 nautical miles, 360 kilometers) relative to satellites and their ability to look at any angle out the windows of the spacecraft. ISS crew members recently took advantage of their vantage point to photograph this oblique view of the Himalayas looking south from over the Tibetan Plateau. At first glance, one might think that the image looks like a picture taken from an airplane; until you remember that the summits of Makalu [left (8,462 meters; 27,765 feet)] and Everest [right (8,850 meters; 29,035 feet)] are at the heights typically flown by commercial aircraft, and could never be seen this way from an airplane. Photo credit: NASA



(16 Feb. 2003) --- The Expedition Six crew enjoyed this green aurora dancing over the night side of the Earth just after sunset on February 16, 2003. The reds and blues of sunset light up the air layer to the west. The image was recorded with a 58 mm lens on a digital still camera. Because auroras follow Earth's magnetic field, they are observed at Earth's poles when the oxygen and nitrogen atoms start to glow when bombarded by charged particles coming from the sun. In a sense, auroras are the "neon lights" of the poles. Photo credit: NASA



(5 Sept. 2006) --- Bernese Alps, Switzerland is featured in this image photographed by an Expedition 13 crewmember onboard the International Space Station. The formidable mountain system of the Alps stretches across much of central Europe, with seven countries claiming portions of the mountains within their borders (Germany, France, Switzerland, Italy, Liechtenstein, Austria, and Slovenia). The glacial landscape of the Bernese Alps, located in southwestern Switzerland, is well illustrated by this view. The image was taken by a crewmember looking north-northwest while the station was located over the Mediterranean Sea between Corsica and Italy -- this oblique viewing angle imparts a sense of perspective to the image. This type of viewing angle complements more nadir (downward)--viewing imagery of the region. Three of the higher peaks of the central Alps are visible--Jungfrau (4,158 meters), Moench (4,089 meters), and Eiger (3,970 meters). To the east and south of the Jungfrau is the Aletsch Glacier, clearly marked by dark medial moraines extending along the glacier's length parallel to the valley axis. The moraines are formed from rock and soil debris collected along the sides of three mountain glaciers located near the Jungfrau and Moench peaks -- as these flowing ice masses merge to form the Aletsch Glacier, the debris accumulates in the middle of the glacier and is carried along the flow direction. According to geologists, Lake Brienz to the northwest was formed by the actions of both glacial ice and the flowing waters of the Aare and Lutschine rivers, and has a maximum depth of 261 meters. The lake has a particularly fragile ecosystem, as demonstrated by the almost total collapse of the whitefish population in 1999. Possible causes for the collapse, according to the scientists, include increased water turbidity associated with upstream hydropower plant operations, and reduction of phosphorus (a key nutrient for lake algae, a basic element of the local food web) due to water quality concerns. Photo credit: NASA



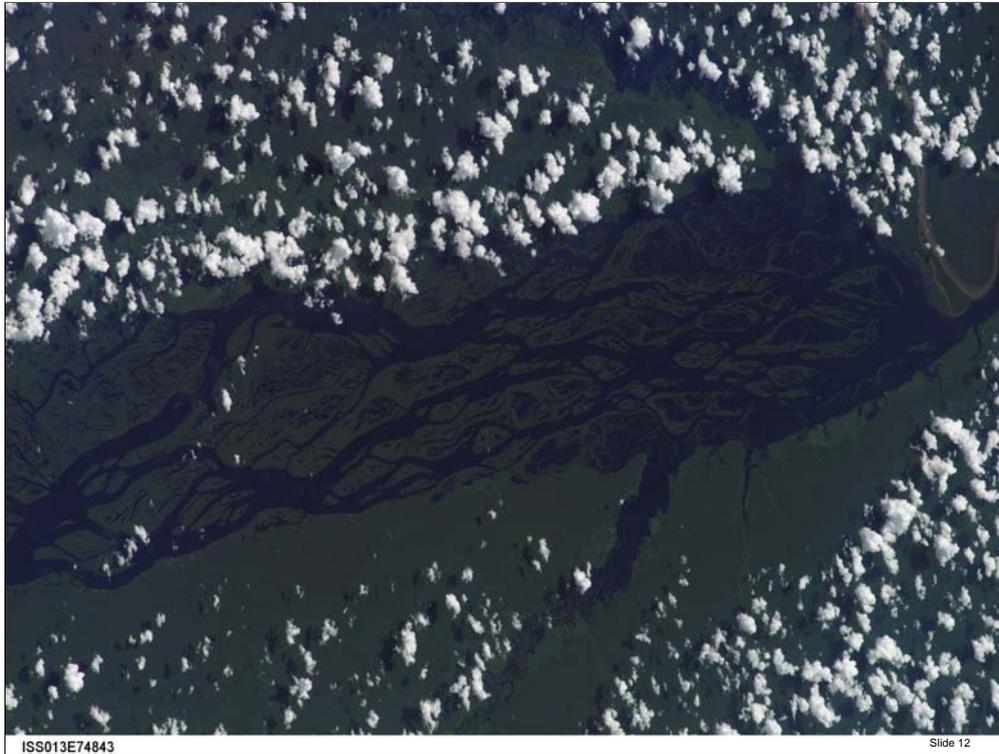
(31 May 2006) --- Nukuoro Atoll, Federated States of Micronesia is featured in this image photographed by an Expedition 13 crewmember on the International Space Station. Located just north of the equator (3.85 degrees N, 154.9 degrees E), this classically-shaped atoll is part of the Caroline Island chain, which stretches northeast of Papua New Guinea in the western Pacific (roughly north of Guadalcanal, and southeast of Guam and Truk Islands). Nukuoro is one of 607 islands that make up the Federated States of Micronesia, a United Nations Trust Territory under US administration. About 900 people live on the atoll whose lagoon is 6 kilometers in diameter. The image shows the sandy atoll with 42 distinct patches of vegetation. These patches are located on the northeast and east portions of the atoll that face the dominant Easterly winds. The image shows the larger fields and settlement on the inland side of the largest forest patch protected from the wind. The land surface is probably slightly higher above sea level here because dunes build up preferentially on wind-facing slopes where beach sand is mobilized by wind. Swells driven by these winds can be seen approaching from the east-southeast (right) and wrapping around the atoll to produce an interference pattern on the downwind side. Water in the lagoon is notably calm in comparison. Coral heads appear in the lagoon, one dead center of the image. Photo credit: NASA



(31 March 2008) --- Harrat Khaybar, Saudi Arabia is featured in this image photographed by an Expedition 16 crewmember on the International Space Station. The western half of the Arabian peninsula contains not only large expanses of sand and gravel, but extensive lava fields known as haraat (harrat for a named field). One such field is the 14,000-square kilometer Harrat Khaybar, located approximately 137 kilometers to the northeast of the city of Al Madinah (Medina). According to scientists, the volcanic field was formed by eruptions along a 100-kilometer long north-south linear vent system over the past 5 million years; the most recent recorded eruption took place between 600 - 700 A.D. Harrat Khaybar contains a wide range of volcanic rock types and spectacular landforms, several of which are represented in this view. Jabal al Quidr is built from several generations of dark, fluid basalt lava flows; the flows surround the 322-meter high stratovolcano (Jabal is translated as "mountain" in Arabic). Jabal Abyad, in the center of the image, was formed from a more viscous, silica-rich lava classified as a rhyolite. While Jabal al Quidr exhibits the textbook cone shape of a stratovolcano, Jabal Abyad is a lava dome -- a rounded mass of thicker, more solidified lava flows. To the west (top center) is the impressive Jabal Bayda'. This symmetric structure is a tuff cone, formed by eruption of lava in the presence of water. This leads to the production of wet, sticky pyroclastic deposits that can build a steep cone structure, particularly if the deposits consolidate quickly. White deposits visible in the crater of Jabal Bayda' (and two other locations to the south) are formed from sand and silt that accumulate in shallow, protected depressions. The presence of tuff cones -- together with other volcanic features indicative of water -- in the Harrat Khaybar suggest that the local climate was much wetter during some periods of volcanic activity. Today, however, the regional climate is hyperarid -- little to no yearly precipitation -- leading to an almost total lack of vegetation. Photo credit: NASA



Iceberg A22A in the South Atlantic Ocean broke off Antarctica in 2002. It was photographed on May 30, 2007 one third of the distance from South America to Cape Town, South Africa. It is one of the largest icebergs to drift as far north as 50 degrees south latitude. Dimensions in early June were 49.9 by 23.4 kilometers, an area of 622 square kilometers, or seven times the area of Manhattan Island.



(2 Sept. 2006) --- Rio Negro in Amazonia, Brazil is featured in this image photographed by an Expedition 13 crewmember onboard the International Space Station. The wide, multi-island zone in the Rio Negro (Black River) shown in this image is one of two, long "archipelagoes" upstream of the city of Manaus (not shown) in central Amazonia. Ninety kilometers of the total 120 kilometers length of this archipelago appear in this view. On the day the photo was taken, air temperatures over the cooler river water of the archipelago were just low enough to prevent cloud formation. Over the neighboring rainforest, temperatures were warm enough to produce small convection-related clouds, known to pilots as "popcorn" cumulus. Several zones of deforestation, represented by lighter green zones along the river banks, are also visible. Two different types of river appear in this image. Flowing east-southeast (left to right) is the multi-island, Rio Negro, 20 kilometers wide near the right of the view. Two other "black" rivers, Rio Caures and Rio Jufari, join Rio Negro downstream. The second river type is the Rio Branco (White River; right) which is the largest tributary of the Rio Negro. The difference in water color is controlled by the source regions: black-water rivers derive entirely from soils of lowland forests. Water in these rivers has the color of weak tea, which appears black in images from space. By contrast, white-water rivers like the Branco carry a load of sand and mud particles, mudding the waters. The reason for the tan color is that white-water rivers rise in mountainous country where headwater streams erode exposed rock. The Amazon itself rises in the Andes Mts., where very high erosion occurs, and it is thus the most famous white river in Amazonia. This image was taken in September, near low-water stage. Pictures taken at other times show the channels much wider during high-water season (May--July) when water levels rise several meters. It was discovered recently, from



Thinning Upper Atmosphere: From a vantage point about 360 km (225 miles) over the Earth, Space Station crewmembers photographed the crescent moon through the upper layers of Earth's atmosphere. At the bottom of the image, a closed deck of clouds is probably at about 6 km (3 miles). The shades of blue grading to black are caused by the scatter of light as it strikes gas molecules of the very low density upper atmosphere. Models predict that emissions of carbon dioxide are causing the upper atmosphere to cool and contract, and therefore reduce the density of gases in the layer spanning from 90 to 649 km (60 to 400 miles) above the surface-known as the thermosphere. According to a study by the Naval Research Laboratory, the density of the thermosphere has decreased about 10 percent over the last 35 years. These findings are important both for space science and for Earth science. Spacecraft in orbit, such as the International Space Station, experience less drag and need fewer boosts to maintain their orbit. At the same time, space debris also remains in orbit longer, which increases hazards to spacecraft. Most importantly, the study validates models of the "greenhouse effect" of increased carbon dioxide release on the dynamics of the atmosphere.



This picture is a shot taken during Increment 6 of an Aurora with the Manicouagan impact crater on the surface. The Manicouagan Crater in northern Canada is one of the oldest impact craters known. Formed during a surely tremendous impact about 200 million years ago, the present day terrain supports a 70-kilometer diameter hydroelectric reservoir in the telltale form of an annular lake



Photo of Hurricane Frances taken by Astronaut Mike Fincke aboard the International Space Station as he flew 230 statute miles above the storm at about 9 a.m. CDT Friday, Aug. 27, 2004. At the time, Frances was located 820 miles east of the Lesser Antilles in the Atlantic Ocean, moving west-northwest at 10 miles per hour, with maximum sustained winds of 105 miles per hour.



The Isthmus of Corinth has played a very important role in the history of Greece. It is the only land bridge between the country's north (Attica) and south (Peloponnese). It is a 6 km wide tongue of land separating the Gulf of Corinth from the Saronic Sea. Populations, armies and commodities have got to move through it. In the 6th century BCE, the Greeks built the Diolkos, a 10 meter-wide stone roadway to pull ships across the Isthmus on wooden cylinders and wheeled vehicles. In 1882, a canal was started and completed 11 years later. It is 6343 meters long, 25 meters wide, and 8 meters deep.

With its 14 spectral bands from the visible to the thermal infrared wavelength region, and its high spatial resolution of 15 to 90 meters (about 50 to 300 feet), ASTER images Earth to map and monitor the changing surface of our planet.

ASTER is one of five Earth-observing instruments launched December 18, 1999, on NASA's Terra satellite. The instrument was built by Japan's Ministry of Economy, Trade and Industry. A joint U.S./Japan science team is responsible for validation and calibration of the instrument and the data products.

The broad spectral coverage and high spectral resolution of ASTER provides scientists in numerous disciplines with critical information for surface mapping, and monitoring of dynamic conditions and temporal change. Example applications are: monitoring glacial advances and retreats; monitoring potentially active volcanoes; identifying crop stress; determining cloud morphology and physical properties; wetlands evaluation; thermal pollution monitoring; coral reef degradation; surface temperature mapping of soils and geology; and measuring surface heat balance.

The U.S. science team is located at NASA's Jet Propulsion Laboratory,



(26 March 2005) --- Manhattan Island and its easily recognizable Central Park are featured in this image photographed by an Expedition 10 crewmember on the International Space Station. Some of the other New York City boroughs (including parts of Queens and Brooklyn) are also shown, as are two small sections of the New Jersey side of the Hudson River (left). (Image credit: NASA)



Atlantic City Area, New Jersey, U.S.A. October 1995

This is a color infrared image of the Atlantic City area in coastal, southeast New Jersey. The bright red area that dominates the scene is a sizable region of elevated forested land. This densely wooded area is interrupted by three major drainage features in this scene: the Maurice River that flows southward into Delaware Bay (left), the Great Egg Harbor River (darker drainage in the middle of the picture), and the Mullica River (dark, winding feature along the right edge of the image). The sharp linear boundary that extends northeast-southwest across the scene along the coast is a physiographic boundary between the coastal barrier beach-lagoon landscape and the forested uplands. The darker red region just inland from the brighter sandy beach is the marsh vegetation in the coastal lagoons. The sandy beaches of southeast New Jersey have been a major tourist attraction for almost 100 years. The general location of Atlantic City can be identified near the right middle edge of the image where a broad section of the beach extends into the Atlantic Ocean



Clark Hill Lake, Georgia and South Carolina, U.S.A. March 1994

The Savannah River flows southeasterly through the longer northwest arm of Clark Hill Lake, which receives muddy sediment plumes from numerous tributary streams. Below Strom Thurmond Dam at the lake's southeast end, the vegetated floodplain of the Savannah River widens, and the meandering main channel of the river passes north and eventually east of Augusta. Some street patterns of northern Augusta are discernible (upper left corner). Linear, light Interstate Highway 20 enters the western suburbs of Augusta. The general terrain consists of rolling, wooded areas and lighter agricultural fields.



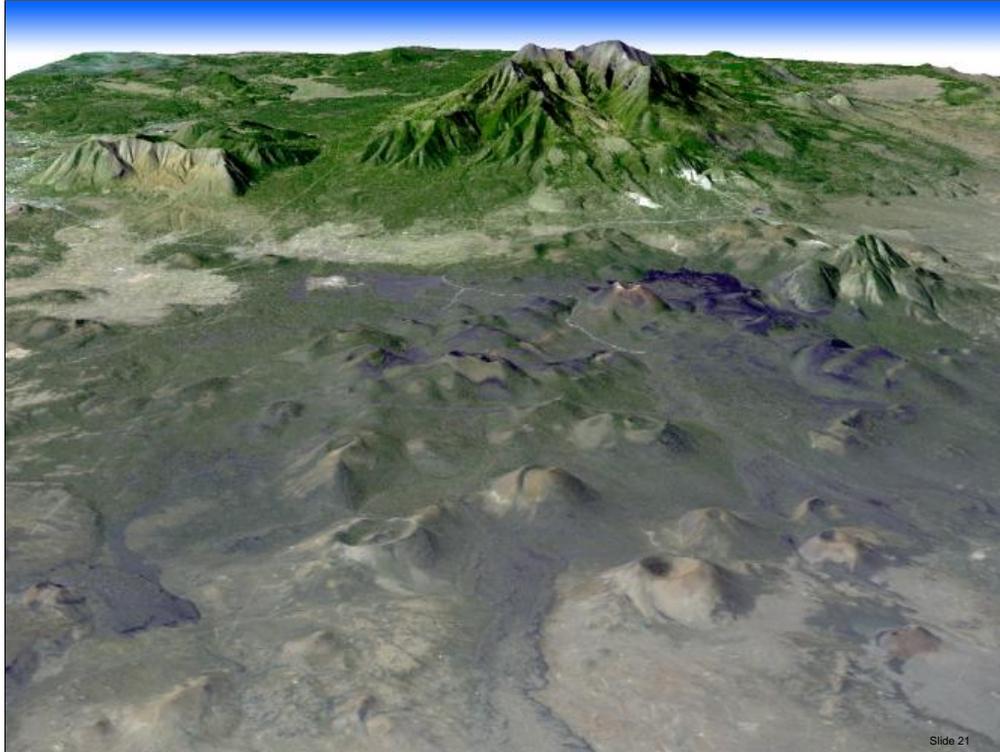
This is neither an impact crater nor a volcano. It is a perfect circular intrusion, about 10 km in diameter with a topographic ridge up to 600 m high. The Kondyor Massif is located in Eastern Siberia, Russia, north of the city of Khabarovsk. It is a rare form of igneous intrusion called alkaline-ultrabasic massif and it is full of rare minerals. The river flowing out of it forms placer mineral deposits. Last year 4 tons of platinum were mined there. A remarkable and very unusual mineralogical feature of the deposit is the presence of coarse crystals of Pt-Fe alloy, coated with gold. This 3-D perspective view was created by draping a simulated natural color ASTER composite over an ASTER-derived digital elevation model.

The image was acquired on June 10, 2006, and is located at 57.6 degrees north latitude, 134.6 degrees east longitude.

The U.S. science team is located at NASA's Jet Propulsion Laboratory, Pasadena, Calif. The Terra mission is part of NASA's Science Mission Directorate.

Image Credit:

NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team



Northern Arizona is best known for the Grand Canyon. Less widely known are the hundreds of geologically young volcanoes, at least one of which buried the homes of local residents. San Francisco Mtn., a truncated stratovolcano at 3887 meters, was once a much taller structure (about 4900 meters) before it exploded some 400,000 years ago a la Mt. St. Helens. The young cinder cone field to its east includes Sunset Crater, that erupted in 1064 and buried Native American homes. This ASTER perspective was created by draping ASTER image data over topographic data from the U.S. Geological Survey National Elevation Data.

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Size: 20.4 by 24.6 kilometers (12.6 by 15.2 miles)

Location: 35.3 degrees North latitude, 111.5 degrees West longitude

Orientation: North at top

Image Data: ASTER Bands 3, 2, and 1

Original Data Resolution: Landsat 30 meters (24.6 feet); ASTER 15 meters (49.2 feet)

Dates Acquired: October 21, 2003



Since last spring, the U.S. Geological Survey's Alaska Volcano Observatory (AVO) has detected increasing volcanic unrest at Augustine Volcano in Cook Inlet, Alaska near Anchorage. Based on all available monitoring data, AVO regards that an eruption similar to 1976 and 1986 is the most probable outcome. During January, activity has been episodic, and characterized by emission of steam and ash plumes, rising to altitudes in excess of 9,000 m (30,000 ft), and posing hazards to aircraft in the vicinity. An ASTER image was acquired at 12:42 AST on January 12, 2006, during an eruptive phase of Augustine. The perspective rendition shows the eruption plume derived from the ASTER image data. ASTER's stereo viewing capability was used to calculate the 3-dimensional topography of the eruption cloud as it was blown to the south by prevailing winds. From a maximum height of 3060 m (9950 ft), the plume cooled and its top descended to 1900 m (6175 ft). The perspective view shows the ASTER data draped over the plume top topography, combined with a base image acquired in 2000 by the Landsat satellite, that is itself draped over ground elevation data from the Shuttle Radar Topography Mission. The topographic relief has been increased 1.5 times for this illustration. Comparison of the ASTER plume topography data with ash dispersal models and weather radar data will allow the National Weather Service to validate and improve such models. These models are used to forecast volcanic ash plume trajectories and provide hazard alerts and warnings to aircraft in the Alaska region.

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The U.S. science team is located at NASA's Jet Propulsion Laboratory, Pasadena, Calif. The Terra mission is part of NASA's Science Mission Directorate.

Size: Roughly 25 km (15 miles) across; scale varies in this perspective view

Location: 59.3 deg. North latitude, 153.4 deg. West longitude

Orientation: View from southwest towards the northeast

Vertical Exaggeration: 2

Eruption plume and Elevation: 30 m ASTER, (1-arcsecond)

Image Data: Landsat bands 7, 4 and 2

Ground Topography Data: SRTM 90 m data, acquired January 2000

Date Acquired: ASTER: January 12, 2006; Landsat: September 17, 2000

Image Credit:

NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team



Norilsk, a major city in Krasnoyarsk Krai, Russia, and the northernmost city in Siberia, was founded in the 1930s as a settlement for the Norilsk mining-metallurgic complex, sitting near the largest nickel-copper-palladium deposits on Earth. Mining and smelting of nickel, copper, cobalt, platinum and palladium are the major industries. The smelting is directly responsible for severe pollution, generally acid rain and smog. By some estimates, 1 percent of the entire global emissions of sulfur dioxide comes from this one city. Heavy metal pollution near Norilsk is so severe that it is now economically feasible to mine the soil, which has been polluted so severely that it has economic grades of platinum and palladium.

The image was acquired July 21, 2000 by ASTER on NASA's Terra satellite.

Image Credit: NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team



Storm Clouds - First Space Station Image

A mass of storm clouds was observed and recorded from the International Space Station (ISS) by Expedition 1 crew members. The picture, made with an Electrical Still Camera (ESC), was the first Earth observation still image downlinked by the three-man crew. Expedition 1 crew members were cosmonaut Sergei Krikalev, flight engineer; astronaut William Shepherd, mission commander; and cosmonaut Yuri Gidzenko, Soyuz commander.

Because the station's communication system was still under construction, the image files had to be compressed at high levels for downlink, resulting in the loss of information.

Image Credit: NASA



(23 January 2005) --- Egypt's Lake Nasser, centered roughly at 22.64 degrees north latitude and 32.45 degrees east longitude, was captured with an electronic still camera by Expedition 10 Commander Leroy Chiao onboard the International Space Station. Sunlint on the lake makes it more easily visible. (Image credit: NASA)



Las Vegas, Nevada, U.S.A. October 1989

The city of Las Vegas, which sits in a basin, is visible in the center of this low-oblique, north-looking photograph. The drainage into this basin can be identified northwest of the city (whitish area between two mountain ranges). During occasional heavy rainfall, downtown streets flood—especially the street known as the "Strip," where most of the large hotels and gambling casinos are located. Las Vegas is famous worldwide as a tourist and recreation area and has expanded greatly in the last few decades with the growth of tourism. New residential areas appear west and northwest of the city as expansion continues. The dark blue waters of Lake Mead, one of the largest reservoirs in the United States, are seen east of Las Vegas. Hoover Dam, a white dot at the southern end of the lake, shows where the Colorado River continues its southward flow toward the Gulf of California. Between Lake Mead and Las Vegas are parallel ridges (reddish-white) of the Valley of Fire State Park. Visible are the reddish mountains of Red Rock Canyon west of the city and the dark, forested Spring Mountains to the northwest.



North Saskatchewan River, Alberta, Canada August 1989

White, snow capped peaks visible towards the bottom of the image exceed 10000 feet (3050 meters) above sea level in this section of the Canadian Rocky Mountains west of Red Deer. Many deeply incised streams and valleys present a spectacular appearance in this mountain setting. The darker valley areas are the result of topographically lower, forested slopes. Highway 11 is visible as a light-colored, linear feature along the north (left) side of the river near the center of the image. Several tributary streams can be seen flowing into the North Saskatchewan River (center of image) as it flows northeast (upper left) through the mountains.



San Francisco Bay Area, California, USA April 1998

The conurbation that almost encircles San Francisco Bay (south) and San Pablo Bay (north) clearly contrasts with the rugged, vegetated hills and low mountains around the bays. Several highways (thin, light-colored lines) can be traced through the lower elevations of the vegetated hills east of Berkeley, Oakland, and Hayward along the east side of San Francisco Bay. These highways serve Concord, Walnut Creek, and other cities in the valley corridor east of the hills. Four major bridges (Golden Gate, San Francisco-Oakland Bay, San Mateo, and Dumbarton) that connect the various cities around the bay area are visible. Treasure Island, Golden Gate Park, and salt ponds northeast of San Jose are also visible. There appears to be more sediment (light color) in San Pablo Bay than in San Francisco Bay. Notice that sediment in San Francisco Bay is concentrated along the shoreline, especially south of Oakland. Montara Mountain is the very dark, heavily forested region south of San Francisco and a small segment of the San Andreas Fault is visible along the eastern margin of the mountain.



Astronauts aboard the International Space Station (ISS) recently photographed the San Francisco Bay area. The gray urban footprint of San Francisco, Oakland, San Jose, and their surrounding suburbs contrast strongly with the green hillsides. Of particular note are the Pacific Ocean water patterns that are highlighted in the sun glint. Sets of internal waves traveling east impinge on the coastline south of San Francisco. At the same time, fresher bay water flows out from the bay beneath the Golden Gate Bridge, creating a large plume traveling westward. Tidal current channels suggest the tidal flow deep in the bay. Because the ISS orbits are not synchronous with the sun, astronauts view the Earth with variable solar illumination angles. This allows them to document phenomena such as the sun reflecting differentially off surface waters in a way that outlines complicated water structures.



Fort Myers, Florida, U.S.A. November 1985

This photograph of Fort Myers covers a comparable geographic area as photographs STS069-718-053 and STS070-712-063; however, features are more easily discernible in this photograph's sediment plume from Charlotte Harbor (upper right) into the Gulf of Mexico; gridded street patterns within the urban area; the size and shape of Sanibel and Pine Islands; and bridges that cross the Caloosahatchee River connecting Fort Myers, North Fort Myers, and Cape Coral.