

2005 Landsat Updates

March 2005

Pecora 16 Conference

Pecora 16, "Global Priorities in Land Remote Sensing," will be held in Sioux Falls, SD, from October 23-27. The Pecora conference series is designed to provide a forum for the exchange of scientific and resource management findings resulting from the use of remote sensing data. Major themes of this conference include advancing scientific and practical applications of remotely sensed data, data availability, access and preservation, advancing the technology of land remote sensing, and securing a stable future for satellite land remote sensing. Conference activities will include tours and a reception at the U.S. Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS). Please go to www.asprs.org/Pecora16 for detailed information about the conference and registration information.

On March 1, Landsat 5 completed 21 years of service. On April 15, Landsat 7 will complete six years of service.

Landsat Product Generation

After the successful release of two phases of Landsat 7 gap-filled data products, the USGS is now studying methods to further enhance the usability of Landsat data. The product improvements being studied for both Scan Line Corrector (SLC)-on and SLC-off data include approaches to remove the effects of clouds and cloud shadows from a Landsat scene and to add a surface reflectance type product to the Landsat data product lineup. For SLC-off data specifically, the USGS is analyzing methods to generate enhanced product metadata that measures the accuracy of the gap-filling process for a particular SLC-off gap-filled scene. Also, an additional SLC-off gap-filled data product for agricultural applications is being studied. This new gap-filled product identifies individual crop fields within an image and uses surrounding image data to fill the individual crop areas. All of these improvements will be studied in 2005 and will be considered for potential implementation as the technical details for each matures. In future issues of the Landsat update, the USGS will provide additional information on which product improvements will be released to the public and the projected release dates for those selected improvements.

Landsat 5 Anomaly Issues

Landsat 7 (L7) SSR Anomaly on January 26, 2005

On January 26, the L7 Solid State Recorder (SSR) experienced an anomaly. As part of the recovery effort, the SSR recorder was recycled. This event erased all SSR data onboard L7. One possible cause of the SSR anomaly may be attributed to solar activity. No known issues have been identified since the SSR was recycled. A total of 92 images were lost or not imaged.

Landsat 5 (L5) Solar Array Drive Anomaly on January 28, 2005

The L5 Mission Operation Center (MOC) discovered that the solar array had turned 180 degrees (i.e. completely) away from the sun. The batteries were draining to dangerously low power levels. Through a series of Tracking and Data Relay Satellite System (TDRSS) contacts, the anomaly team was able to reorient the array on the sun to recharge the batteries and thus achieve a positive power balance. The anomaly team concluded that the clutch assembly connecting the solar array drive motor to the array structure was slipping and not providing consistent control of the array. The

switch to redundant array components was successfully executed. The redundant motor and clutch assembly was successfully controlling the array in a normal operational mode.

Unfortunately, power was not restored to the Thematic Mapper (TM) sensor heaters after the switch to redundant motor and clutch. The heaters were off from January 29 through February 3, 2005. Release of the special Calibration Parameter File (CPF) allows these data to be corrected geometrically. Although data acquired during this time are considered marketable, the thermal band will be very suspect and should not be considered for radiometric applications. TM data acquired after heaters resumed operation are considered nominal.

July 2005

Landsat Legacy Project

Since the Project's inception in 1965, Landsat has stood at the forefront of space-based Earth observation and has been the trailblazer for remote sensing as we know it today. However, the forty-year history of Landsat has been tumultuous. Because the Project has been variously administrated by a multitude of government agencies and a private company, the Project documentation has become widely disseminated over the course of the seven Landsat missions.

In an effort to gather Landsat's technical documentation, the National Aeronautics and Space Administration (NASA) Landsat Project Science Office (LPSO) is teaming with the U.S. Geological Survey (USGS) and the NASA Goddard Space Flight Center (GSFC) Library to create an archive of essential Landsat documentation. The archive, dubbed the Landsat Legacy, will house technical-, policy-, and science-related documents, with an emphasis on internal technical papers. Journal articles and other privately copyrighted materials are outside of the Project's scope. It is the Project's ultimate goal to have an online freely-accessible archive of Landsat documentation accessible to the general public by late 2006.

In order to gather the forty years worth of documentation, the LPSO is soliciting those who have been involved with the Landsat Project for Landsat-related materials that have been stored in personal archives. This is where you come in! If you have materials you feel belong in this new repository, please consider registering them.

The registration process involves entering basic information about your documents into a web-based registration system. The LPSO will review these registration records, select appropriate materials, and subsequently contact potential donors to arrange a method of document submission.

Beginning this August, you can visit <http://library.gsfc.nasa.gov/landsat> for more details about the project and to find out how you can help make the Landsat Legacy a reality.

EROS Emergency Response Team Receives Award

Staff at the USGS Center for Earth Resources Observation and Science (EROS) have been recognized with a major award, based largely on work done using Landsat data. The EROS emergency response team's support of the tsunami relief/response/recovery efforts has won the Information Resources Management Conference (IRMCO) 2005 Team Award. The IRMCO Award is a prestigious award presented each year to those who have demonstrated exceptional ability to operate across organizational boundaries to improve the Government's services to its citizens. The selection was based on the following award criteria:

- Demonstrated leadership in operating across organizational boundaries;
- Willingness and ability to treat obstacles as challenges, and not barriers; and
- Measurable improvements in performance linked to mission objectives/results.

The team was recognized for providing emergency support to many federal and international organizations that were helping the victims of the December 2004 tsunami.

The tsunami event tested the EROS disaster response capabilities as never before. The work required an enormous amount of coordination and support, 24 hours a day, 7 days a week. In the eight weeks that followed the tragedy, over 600,000 files, 5 terabytes of data, were electronically downloaded from the EROS File Transfer Protocol (FTP) site. Another 1 terabyte of data was delivered on media. The global disaster relief community required over 70 percent of the EROS network bandwidth during the month of January.

The tsunami disaster validated a basic premises -- that there is a great need for remotely sensed data during disaster response operations. The tsunami's devastation was so vast that the Landsat 7 satellite, which provides multispectral 30-meter ground resolution imagery, once again became a prime source of remotely sensed imagery.

LTWG Held in April

The USGS Landsat Program held its 14th Landsat Technical Working Group (LTWG) meeting in Washington, DC during the last week of April. More than thirty people from nine countries participated in the five-day meeting. The standard topics covered included briefings to the International Cooperators (ICs) on the status of both the Landsat 5 and Landsat 7 missions as well as U.S. ground processing system developments. The international partners each gave presentations on the current activities at their respective stations as well.

In addition, special presentations were given on the continuing efforts of the U.S. Geological Survey (USGS) and NASA to develop new Enhanced Thematic Mapper Plus (ETM+) products that reduce the impact of that instrument's Scan Line Corrector (SLC) failure. Also covered were the results of a U.S. study on mitigation strategies for a potential data gap between the demise of the current Landsat missions and the follow-on Operational Land Imager (OLI) to be flown on a U.S. National Polar Orbiting Environmental Satellite System (NPOESS) mission around 2010.

The next international meeting is the Landsat Ground Station Operators Working Group (LGSOWG) meeting currently scheduled for the week of October 31, in the Los Angeles area.

Pecora 16

The Landsat user community is invited to join the USGS in Sioux Falls, South Dakota for the 16th William T. Pecora Memorial Symposium. This event will be held Sunday through Thursday, October 23 to 27, 2005. The event promises to be an exciting technical exchange, examining the full range of issues centered on a theme of "Global Priorities in Land Remote Sensing." The Symposium will continue the Pecora tradition of focusing on the applications of satellite and other land remote sensing data to study, monitor, and manage the Earth's land surface and its natural resources, while at the same time recognizing other important priorities related to effectively applying the science and technology of land remote sensing and to ensuring its stable future.

The conference organizers will present an exciting program that should be of great interest to remote sensing applications scientists, as well as many other remote sensing professionals and program managers. The combination of technical sessions, policy discussions, posters, workshops, and exhibits will make for a special opportunity for those involved in land remote sensing to share experiences, successes, and ideas.

The Symposium will also include an evening reception at the USGS National Center for Earth Resources Observation and Science (EROS). EROS will host a social event and an open house for conference participants.

The USGS and NASA established the Pecora Conference series in the 1970s as a means of sharing ideas and experiences resulting from the use of remotely sensed data. The objectives of the Pecora Conferences are 1) to foster the exchange of scientific information, resource management conclusions, and results of other practical applications derived from the use of land remotely sensed data; and 2) to provide a forum for discussing ideas, policies, and strategies on land remote sensing. This year, NOAA, BAE Systems, USDA Foreign Agriculture Service (FAS), CoE, SAIC, FGDC, and DOE, join the USGS and NASA in sponsoring Pecora 16. ASPRS is co-organizing the conference on behalf of the sponsors.

Please don't miss this opportunity to gather in the beautiful U.S. Upper Midwest in October. For more information, please visit <http://www.asprs.org/pecora16>

November 2005

Landsat Images Acquired for Disaster Response

The U.S. Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS) Disaster Response team has provided Landsat imagery to many federal and international organizations to assist those who have been devastated by [Hurricane Katrina](#), [Hurricane Rita](#), the [Pakistan earthquake](#), the [Alaskan fires](#), and the [Indonesian tsunami](#).

Landsat images are invaluable for emergency response and disaster relief. The advances made in data reception and processing permit rapid access to imagery in times of natural or man-made disasters. Within hours of data acquisition, the USGS EROS provides relief organizations worldwide with pre- and post-disaster satellite images. Relief organizations use these images to make practical, well-informed decisions as to where relief efforts are most urgently needed and how to best carry out those efforts.

Landsat 7 was a prime source of remotely sensed imagery for recent disasters. The Landsat 7 images to the left show the damage that New Orleans, Louisiana received as a result of Hurricane Katrina. The image on the left shows New Orleans and the surrounding area on April 24th, 2005, a few months before Hurricane Katrina. The image on the right shows New Orleans on the morning of August 30th, 2005, just one day after Katrina made landfall.

Remotely sensed data are greatly needed during disaster response operations. As a member of the [International Charter](#), USGS EROS provides satellite imagery to support the provisions of the Charter to mitigate the effects of disasters on human life and property. The International Charter aims at providing a unified system of space data acquisition and delivery, through authorized users, to those affected by natural or man-made disasters.

Pecora 16

The USGS held the 16th William T. Pecora Memorial Symposium from October 23 through 27, 2005, in Sioux Falls, South Dakota. The Symposium continued the Pecora tradition of focusing on the applications of satellite and other land remote sensing data to study, monitor, and manage the Earth's land surface. The event proved to be an exciting technical exchange, examining the full range of issues centered on a theme of "Global Priorities in Land Remote Sensing."

The Symposium keynote speaker was Dr. Gene Whitney, Senior Policy Analyst in the White House Office of Science and Technology Policy, on assignment from the USGS. Barb Ryan, Associate Director of Geography at the USGS,

presented Land Remote Sensing: A USGS Perspective. Other sessions included: Advancing Scientific and Practical Applications of Remotely Sensed Data; Data Availability, Access and Preservation; Advancing the Technology of Remote Sensing; and Securing a Stable Future for Satellite Land Remote Sensing.

The Pecora Symposium included several Landsat-related presentations and posters.

Pecora Presenters:

James Storey, SAIC, Under Contract to USGS EROS, Pasquale Scaramuzza, Julia Barsi, and Gail Schmidt — Landsat 7 SLC-Off Gap-Filled Product Development

Laura Rocchio, SSAI, NASA Goddard Space Flight Center, Gail Hodge, Terry Arvidson, Darrel Williams, and James Irons — The Landsat Legacy: Tracking Down Three Decades of Knowledge

Terry Arvidson, Lockheed Martin — The Landsat Long Term Data Record: Characterization and Compilation

Cheryl Greenhagen, SAIC, Under Contract to USGS EROS — U.S. Geological Survey Preserves the National Archive of Landsat Data

Michael Choate, SAIC, Under Contract to USGS EROS, Michael Coan, Gregory Stensaas, and Jon Christopherson — Performing Geometric Assessment of Remote Sensed Data Sets

Susan Maxwell, SAIC, Under Contract to USGS EROS — A multi-scale segmentation approach to filling Landsat SLC-off imagery (poster)

Rynn M. Lamb, SAIC, Under Contract to USGS EROS, Brandy K. Adams, Jeffrey J. Danielson, and Linda D. Jonescheit — Landsat Data Products from USGS/EROS: Recent Updates and Future Enhancements (poster)

Sriharsha Madhavan, South Dakota State University (SDSU) and Dennis Helder — Study on the Relative Radiometric Gain Correction over the Dynamic Range of all Reflective Channels of the Landsat 5 Thematic Mapper

For more information regarding the presentations and posters, please visit <http://www.asprs.org/pecora16>.

The Pecora 16 “Prairie Fest” reception was held at the USGS Center for EROS on October 26, 2005. EROS hosted a social event and an open house for conference participants that included a presentation of the 2005 William T. Pecora Award.

The USGS and the National Aeronautics and Space Administration (NASA) established the Pecora Conference series in the 1970s as a means of sharing ideas and experiences resulting from the use of remotely sensed data. The objectives of the Pecora Conferences are 1) to foster the exchange of scientific information, resource management conclusions, and results of other practical applications derived from the use of land remotely sensed data; and 2) to provide a forum for discussing ideas, policies, and strategies on land remote sensing.

This year, National Oceanic and Atmospheric Administration (NOAA), BAE Systems, United States Department of Agriculture (USDA) Foreign Agricultural Service (FAS), United States Army Corps of Engineers (CoE), Science Applications International Corporation (SAIC), Federal Geographic Data Committee (FGDC), and Department of Energy (DOE) joined the USGS and NASA in sponsoring Pecora 16. The American Society of Photogrammetry and Remote Sensing (ASPRS) co-organized the conference on behalf of the sponsors.

For more information on the 16th William T. Pecora Symposium, please visit <http://www.asprs.org/pecora16>.

Partnership Formed to Capture Landsat 5 Alaska Imagery

The USGS EROS, NOAA, the National Environmental Satellite Data and Information Service (NESDIC), the Fairbanks Command & Data Acquisition Station (FCDAS), and the University of Alaska Geographic Information Network of Alaska (GINA) have teamed up to provide Landsat 5 data for Alaska.

Landsat 5 is an Earth imaging satellite with many applications, including resource management, crisis response, and hazard monitoring. The Landsat 5 satellite, launched in 1984, has lasted longer than anticipated and has established a tremendous record of reliability. The Landsat Program has gathered a continuous set of data since 1972, making it one of the most successful and widely used satellite remote sensing programs.

On June 21, 2005, Landsat 5 captured a scene of the Sheenjek River fire near Fort Yukon, Alaska. The data were received at FCDAS, which is at Gilmore Creek just outside of Fairbanks, Alaska, and were transmitted by GINA via high speed network to EROS for processing. In fewer than 24 hours, this scene was captured, processed, and available for wildfire managers in the Alaska Fire Service.

The Landsat 5 data captured over Alaska through this agreement are archived at EROS and available to any user through [EarthExplorer](#) or [GloVis](#).

December Special 2005

Landsat 5 Experiencing Technical Difficulties

On November 26, 2005, the back-up solar array drive on Landsat 5 began exhibiting unusual behavior. The solar array drive maintains the proper pointing angle between the solar array and the sun. The rotation of the solar array drive became sporadic and the solar array was not able to provide the power needed to charge the batteries. Maintaining power to the batteries is critical to sustain proper operation of the spacecraft. The primary solar array drive failed under similar circumstances last January. As a result of this current situation, imaging operations will be suspended for at least the next two weeks or until attempts to solve the problem have been resolved.

Landsat 5, launched in March 1984, has performed far beyond its three-year design lifetime and has continued to collect global land surface coverage. Over 125,000 images, from the Chernobyl disaster to Hurricane Katrina, have proven invaluable for identifying the impact of natural and human-induced changes. Landsat 5 and Landsat 7 together provided full global coverage of the Earth's surface every eight days.

The Landsat Program is the longest running program providing vital images of the Earth's surface from space. The first Landsat satellite was launched in 1972 and since then, Landsat satellites have been providing a constant stream of moderate-resolution images. In 1999, the Landsat Program took a giant leap forward technologically with the launch of Landsat 7. The instruments on the Landsat satellites have acquired millions of images of the surface of the planet, providing a unique resource for scientists who study agriculture, geology, forestry, regional planning, education, mapping and global change research.

The Landsat Program is a joint initiative of USGS and NASA to gather Earth resource data using a series of satellites including Landsats 5 and 7. NASA is responsible for developing and launching the spacecrafts, while the USGS is responsible for flight operations, maintenance, and management of all data reception, processing, archiving, product generation, and distribution. The primary objective of the Landsat Program is to ensure a consistent, calibrated collection of Earth imagery that can be used to scientifically measure change over decades and beyond. Landsat's

global survey mission is to repeatedly capture images of the Earth's land mass, coastal boundaries, and coral reefs; and to ensure the data acquired are of maximum utility in supporting the scientific objectives of monitoring changes in the Earth's land surface and associated environment.

Further information will be posted on the [Landsat website](#) as it becomes available. You may also [View the official press release](#)

The USGS serves the nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.