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25 Years of Landsat 5 – A Remarkable Satellite, A Unique Legacy

On March 1, 1984, Landsat 5 headed into space with an expected life span of three years. No one could have foreseen that this fifth satellite in the Earth-observing Landsat program would far exceed that expectation. For a quarter century, the Thematic Mapper (TM) sensor aboard Landsat 5 has captured images of Earth's changing surface and has amassed a legacy of Earth observation unmatched by any other satellite of its kind.

Keeping a Satellite Functioning for 25 Years...What Could Possibly Go Wrong?

Since its launch in 1984, a number of component failures and other malfunctions have beset Landsat 5 and challenged the knowledge of the staff working to fix the 1980s technology. Each time, the system has come back to life to continue as a necessary and important asset to the USGS Landsat program.

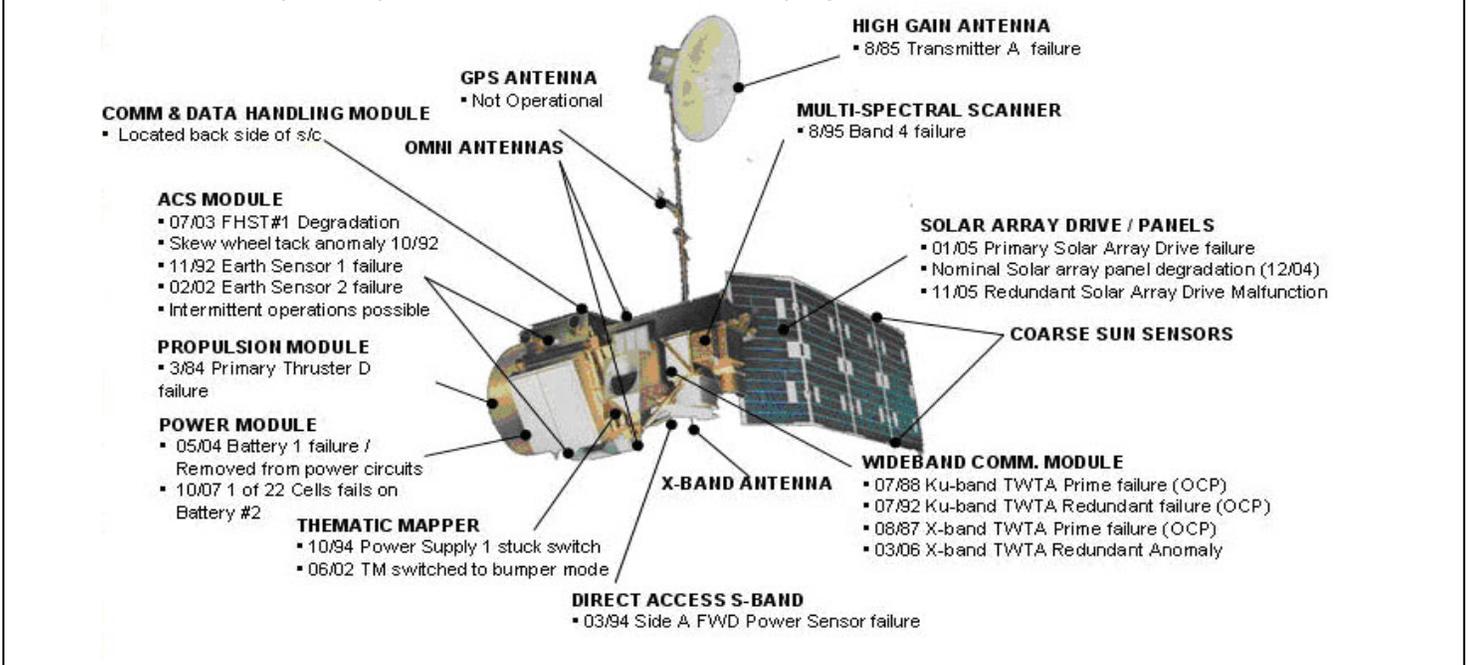
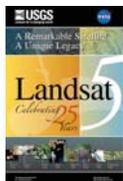


Figure 1: Landsat 5 Components

Landsat 5 celebration poster (.pdf)



Landsat Free Archive Update – Stats and Interesting Items

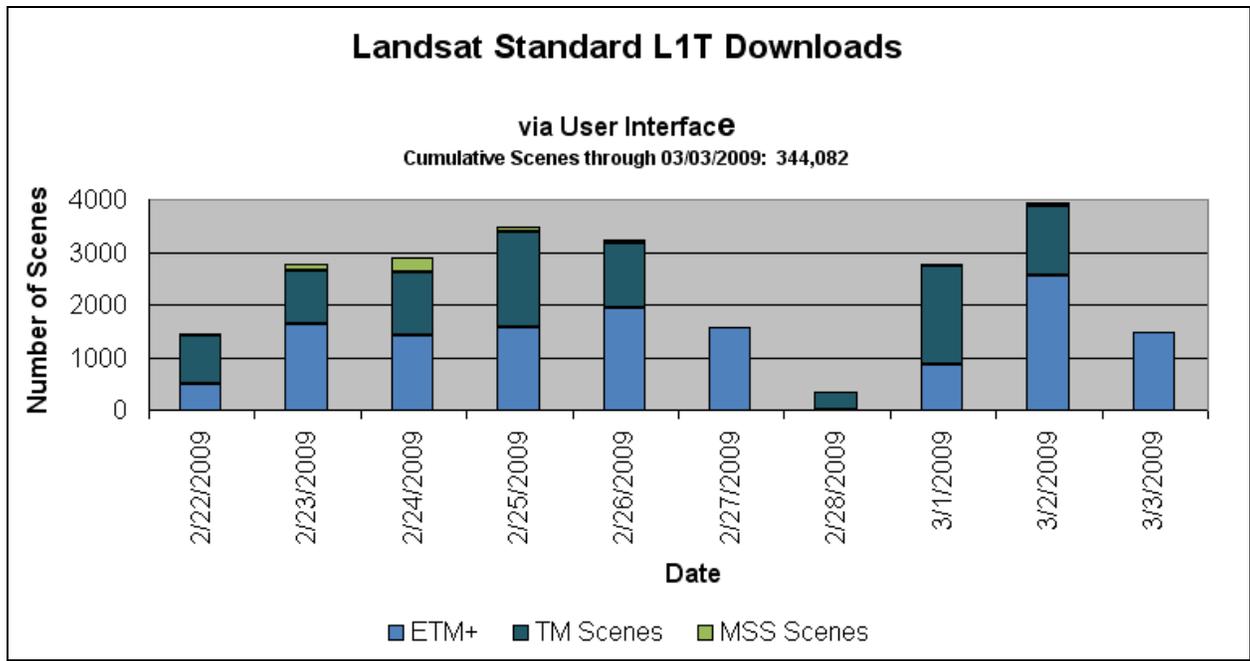


Figure 2: Landsat Standard L1T Downloads Through March 3, 2009

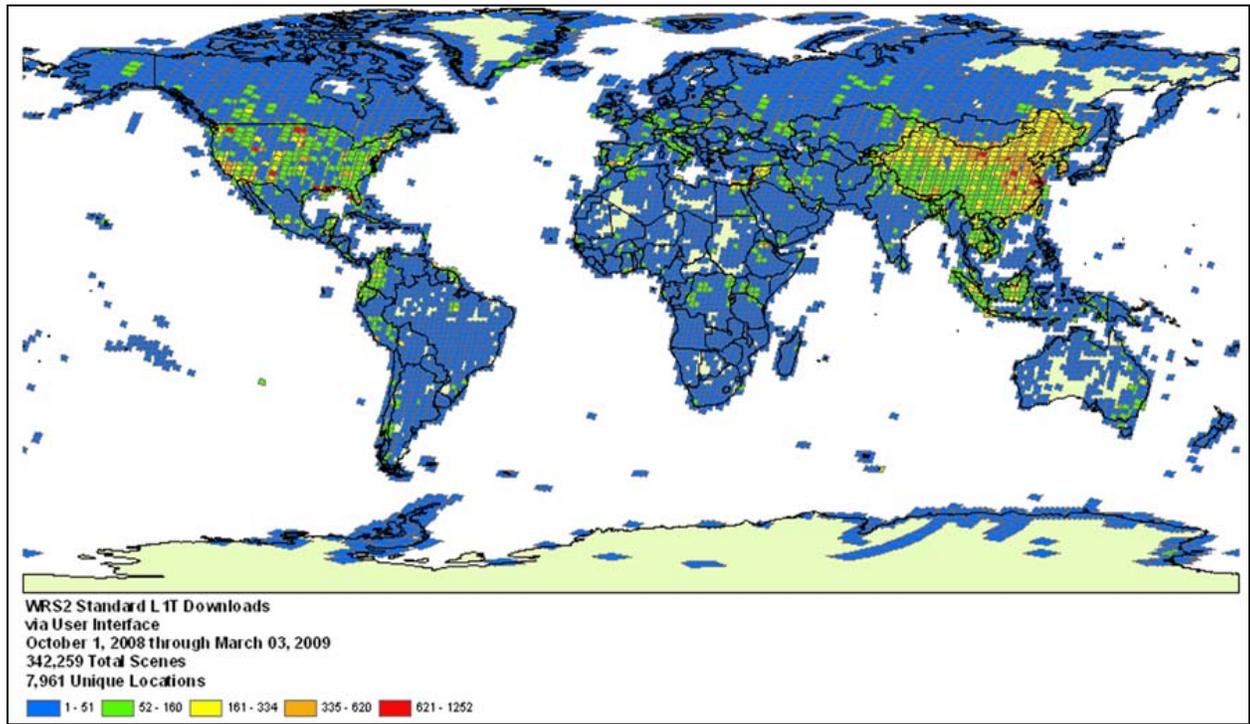


Figure 3: WRS-2 Standard L1T Downloads Through March 3, 2009

Landsat Science Team Spotlight – Dr. Warren Cohen, U.S. Forest Service



Figure 4: Dr. Warren Cohen

Dr. Warren Cohen brings over 25 years of remote sensing experience to the Landsat Science Team. He is a research forester for the U.S. Forest Service and is the Director of the Laboratory for Applications of Remote Sensing in Ecology (LARSE), located on the campus of Oregon State University in Corvallis, Oregon.

Cohen's research includes translating remotely sensed data into useful ecological information for process modeling and resource management applications. Primary applications include disturbance ecology, succession, inventory and monitoring, and carbon dynamics. He is actively engaged in exploiting newer sensor data, such as lidar, and in integrating data from multiple sensors with field data for effective use in ecology.

Change detection using historical Landsat data has become a mainstay of Cohen's research efforts, and he works to demonstrate that the rich global archive of data can be exploited to great advantage for change detection across regional to continental scales.

Cohen has published over 100 research articles in a variety of peer-reviewed journals. He was the guest editor for a special issue of the journal *BioScience* in 2004 that focused on remote sensing in ecology and biology. He has been a member of the editorial board of the journal *Remote Sensing of Environment* for the past 10 years.

LARSE Web site: <http://www.fsl.orst.edu/larse/>

Tips and Tricks – Creating a Gap Mask

Question: If gap mask files are not provided with the data, can I create my own?

Answer: Yes. Since pixels with missing data have digital number (DN) values of 0, you can differentiate between valid and missing data pixels using a number of different remote sensing software packages. A gap mask can then be created to show where valid and missing data pixels are located.

The process used to create a gap mask using ENVI is shown below. *(Please note that this does not signify an endorsement by the USGS EROS Center; we cannot endorse any specific remote sensing software. Other remote sensing software packages may also contain similar functionality.)*

- Open ENVI
- Click *File -> Open External File -> Landsat -> GeoTIFF*
- Select the file for which a gap mask is to be created and click *Open*
- From the Available Bands List select the file and click *Load Band*
- Within the band display, click *Tools -> Color Mapping -> Density Slice...*
- Select the band in the dialog box that is displayed and click *OK*
- The Density Slice box will be displayed and show eight defined density slice ranges
- Click *Delete Range* until only two ranges remain (it does not matter which ranges are deleted)
- Once there are only two ranges displayed, highlight the first range and click *Edit Range*
- Set the Range Min and Range Max values at 0
- Select a color you would like to use to display the missing data pixels and click *OK*
- Highlight the second range and click *Edit Range*
- Set the Range Min at 1 and the Range Max at 255
- Select a color you would like to use to display the valid pixels and click *OK*
- To view the output, click *Apply*
- If you would like to make changes to the colors used, select one of the ranges and click *Edit Range*
- To save the output, click *File -> Output Ranges to Class Image...*
- Click *Choose* and navigate to the location where you would like to save the file
- Name the file and click *Open*, then click *OK*
- The gap mask file will be added to the Available Bands list
- To view the gap mask and the original image at the same time, open two displays and load the images
- Within the band display of one of the images, click *Tools -> Link -> Geographic Link...*
- Click the arrow buttons next to Display #1 and Display #2 so that the box next to each changes to "On" and then click *OK*
- The gap mask and original data are now linked

Upcoming Meetings

ASPRS 2009 Annual Conference

March 8-13, 2009 – Baltimore, Maryland, USA

<http://www.asprs.org/>

AAG 2009 Annual Meeting

March 22-27, 2009 – Las Vegas, Nevada, USA

<http://www.aag.org/annualmeetings/2009/index.htm>

EROS Authors in Recent Publications

Senay, G.B., 2008, [Modeling landscape evapotranspiration by integrating land surface phenology and a water balance algorithm](#): *Algorithms*, v. 1, no. 2, p. 52-68.

Tan, Z., Tieszen, L.L., Tachie-Obeng, E., Liu, S., and Dieye, A.M., 2009, [Historical and simulated ecosystem carbon dynamics in Ghana—land use, management, and climate](#): *Biogeosciences*, v. 6, no. 1.

Li, M., Huang, C., Zhu, Z., Shi, H., Lu, H., and Peng, S., In Press, [Assessing rates of forest change and fragmentation in Alabama, USA, using the vegetation change tracker model](#): *Forest Ecology and Management*.

LDCM News - Ball Aerospace Completes CDR for Landsat's Operational Land Imager

November 26, 2008 - The Operational Land Imager (OLI) being built by Ball Aerospace & Technologies Corp. for the Landsat Data Continuity Mission (LDCM), the eighth in the Landsat satellite series, has successfully passed the Instrument Critical Design Review (ICDR).

The ICDR, a four-day process in Boulder, included more than 60 representatives from NASA's Goddard Space Flight Center project office and review team, members of the Landsat Data Continuity Mission (LDCM) Independent Review Board, Landsat scientists from the U. S. Geological Survey, and industry participants. The team reviewed OLI systems architecture and a detailed analysis of integration and the test approach including validation and calibration.

"We are focused on delivering an advanced instrument to support the government's continuation of the vital Landsat program," said David L. Taylor, president and CEO of Ball Aerospace. "Successful on-time completion of OLI will further complement Ball's strong legacy in both Earth science and remote-sensing missions."

ICDR participants noted Ball's heritage from similar instruments in congratulating the OLI team for retiring major risks and moving well beyond ICDR in most areas.

The OLI instrument provides 15-meter panchromatic and 30-meter multispectral Earth-imaging spatial resolution capability. OLI includes a 185-km swath allowing the entire globe to be imaged every 16 days.

(View the Ball Aerospace press release at <http://www.ballaerospace.com/page.jsp?page=30&id=314>)

LDCM News – Landsat Science Team Meeting Held January 6-7, 2009

The fifth meeting of the Landsat Science Team was held January 6–8, 2009, in Fort Collins, CO, and was hosted by the USDA Forest Service.

In addition to status reports on LDCM development and Landsat 5 and 7 operations, the meeting focused on technical issues associated with future Landsat data products and requirements for future missions. The Team also had the opportunity to tour Ball Aerospace facilities in Boulder, CO, and view OLI flight hardware.

Some actions from the meeting included:

Demonstrate the importance of the USGS no-cost Landsat data archive

Prioritize the International Cooperator's Global Landsat archive data acquisition

Define the characteristics of future Landsat missions

Document L1T product specifications

The meeting agenda and presentation materials can be found on the USGS Landsat Web site:

http://landsat.usgs.gov/science_LST_Team_Meetings.php.

The next Landsat Science Team meeting will be held June 22–24, 2009, in Rochester, New York.

Landsat Images of Interest

Osaka Bay Area, Japan, 2000 and 2008

These images show the land use change in Japan's Osaka Bay from 2000 to 2008. A collective population of over 16 million people reside in the cities of Osaka, Kobe, Sakai, and others around the Bay. A number of artificial islands have been created in the Bay. Expansion of Kansai International Airport can be seen in the right-center of the 2008 image.

2000, August 25 - Landsat 7 Enhanced Thematic Mapper Plus (ETM+) Path 110 Row 36

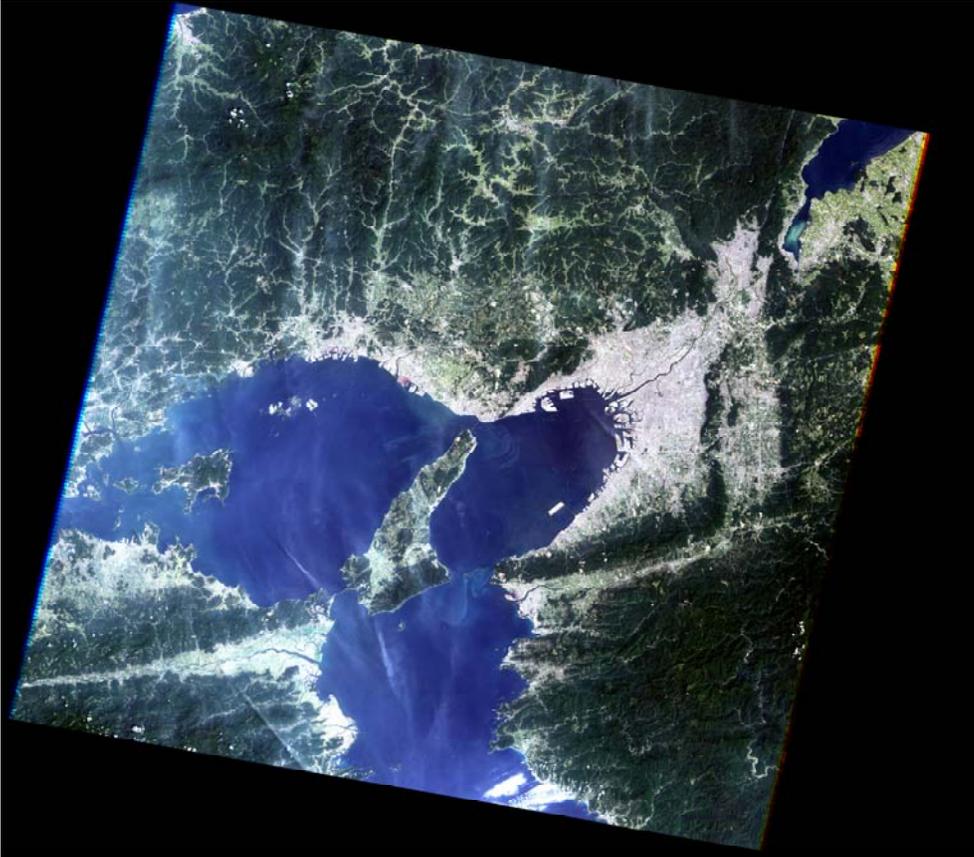


Figure 5: Osaka Bay, Japan area. Landsat 7 ETM+ Path 110, Row 36. Acquired August 25, 2000.

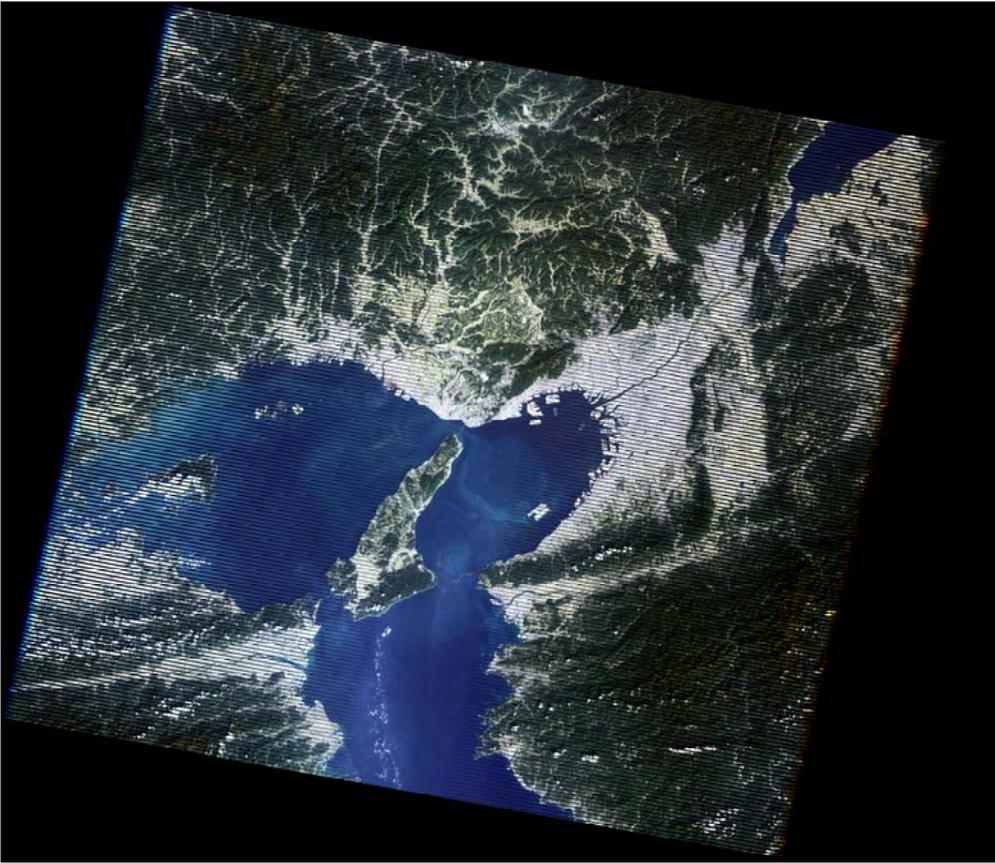


Figure 6: Osaka Bay, Japan area. Landsat 7 ETM+ Path 110, Row 36. Acquired October 18, 2008.