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LANDSAT MONTHLY UPDATE

July 2003

The Landsat Program is managed by the U.S. Geological Survey under authority established by Presidential Decision Directive NSTC-3.

Editor's Note:
The Landsat Monthly Update will be used as one of many mechanisms to keep interested parties informed about the efforts underway to deal with the Landsat data anomaly. This issue highlights the analysis being done by the Anomaly Resolution Team and a group formed to evaluate the viability of the post anomaly data. Both reports cited below represent preliminary indications. Much work remains to be done and recommendations on future actions will follow soon; meanwhile, interested parties are encouraged to go to landsat7.usgs.gov for up-to-date information.

The Anomaly Resolution Team

The Anomaly Resolution Team (ART), which is composed of representatives from the USGS, NASA, and the instrument manufacturer, is now finishing the SLC Anomaly Investigation and is preparing for the recovery phase. The ART is preparing their recommendation to USGS and NASA as to the probable failure mode(s) and the next corrective action. The ART will formalize their recommendation to USGS and NASA in early September and request approval for taking the next steps toward the resumption of operations of Landsat 7.

At this time no specific failure mode has been identified. The leading failure theories are:

- The SLC motor is jammed somewhere within the mechanism, restricting freedom of movement. This jam may have been caused by some form of electronics failure resulting in the motor cage to overdrive into a hard stop. If this happened it might be possible that the beryllium motor housing cracked, creating debris that found its way into an area that restricts the free movement of the motor. The signatures from the anomaly have revealed that this is the most likely failure scenario; however, testing with an Engineering Test Unit (ETU) has shown that this would be very unlikely.
- The motor and the mirror cage are attached by a glue or epoxy to a small shaft. A possibility is that the bond was broken. This failure theory fits most of the anomaly signatures but not all. This theory could not be tested with the ETU; however, should the decision be made to test with the redundant electronics and if a de-bonding did occur, then the redundant tach would provide a signature to support this.
- A failure of the electronics has not been completely ruled out even though a particular failure cannot be identified to explain all of the anomaly signatures. Re-enabling the SLC on the primary electronics (A-side), or the redundant side (B-side), or both, will be necessary to vindicate the electronics.

The team is evaluating the possible test scenarios. Pending the ART's final recommendation and USGS and NASA approval, this testing will likely take place in mid-September. Once the test data have been evaluated, future operations plans will be formulated and communicated.

Anomaly Data Testing

A diverse group of scientists, with ongoing experience using Landsat 7 data, evaluated the scientific usability and validity of Landsat 7 products containing the SLC anomaly. The disciplines represented by these scientists include Geography, Agriculture, Forestry, Rangeland Ecosystems, Glaciology and Ice Cap Monitoring, Ecological Remote Sensing, Phenological Characterization, Coastal/Oceanographic Remote Sensing and Coral Reef Monitoring, Tropical Forest Monitoring, Water Quality Monitoring, Remote Sensing

Methodology and Techniques Development, and Global Change Monitoring. EDC scientists and engineers also performed evaluations of the radiometric and geometric validity of these products. While it is not possible to correct for the missing data caused by the scan line corrector malfunction, it is possible to modify the processing algorithms to produce imagery containing roughly 80 percent of the expected pixels. Initial evaluation indicates that the processed post-anomaly data maintain expected radiometric and geometric fidelity. It is also possible, using basic interpolation algorithms, to “fill in” some of the missing pixels; however, the data produced with interpolation techniques require further research and may not be useful for all science applications.

Anomalous Landsat 7 data products retain significant and important utility for scientific applications. The presence of the anomaly and associated missing pixels does degrade the usefulness of the imagery; however, the majority of scientists who have examined these anomalous data concluded that the data were still quite useful for their particular application. Additionally, the potential to develop new tools or methods of compensation for this anomaly, may enable even more scientific use of these data (for example, developing a mosaic of overlapping scenes or data from subsequent imagery to “fill in” missing pixels.)

LGSOWG-32

The Landsat Ground Station Operators Working Group (LGSOWG)-32 meeting is scheduled to take place the week of October 13, 2003 in Hiroshima, Japan. Meeting participants will spend considerable time discussing the activities surrounding the Landsat 7 scan line corrector (SLC) anomaly and the efforts to recover the mechanism.

Depending on the status of the SLC at that time, USGS will discuss the effects to the Landsat 7 Project, International Cooperators, and expectations for the coming year. Also, given the resurgence of interest and importance of the Landsat 5 operation, presentations will be made on that mission's status, future plans and the opportunities for International Cooperators to participate.

The hosting team, National Space Development of Japan (NASDA), Remote Sensing Technology Center of Japan (RESTEC), Hiroshima Institute of Technology (HIT), and Hiroshima Earth Environmental Information Center (HEEIC), have been working very hard to put together the meeting site and some wonderful group events. Specific information regarding the meeting and logistics will be sent out in the next several weeks.

The Landsat monthly update is an informal communication tool, prepared monthly and distributed electronically to USGS Landsat partners, to provide information about Landsat activities and related topics of interest. If you have any ideas, comments, corrections, or successes you would like to share with the Landsat community, please contact Ronald Beck, USGS Landsat team, at the following e-mail address: beck@usgs.gov.