



Landsat Update

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Upcoming Processing System Updates and Landsat Data Changes

Previous Landsat Updates (http://landsat.usgs.gov/about_Landsat_Updates.php) have provided details about processing system updates and changes to data products, which are planned to be implemented in late November 2015.

After extensive analysis and consultation with Landsat data users, it has been determined that many of the planned changes will not be implemented at this time. This will allow for further testing, data quality analysis, and user access to samples of the revised products in advance of the operational implementation. Since these changes will affect the use of the data, delaying these changes further allows the USGS to ensure that we continue to produce and distribute high quality data products. The consolidation of these changes into a more mature product will reduce the need for future incremental changes.

These changes will also provide the groundwork for a new Collection Management scheme for Landsat product generation. Employing a collections approach will create a stable archive in which 1) the absolute radiometry is well characterized and quantified and that data are inter-calibrated across Landsat sensors; 2) the georegistration of the Landsat scenes is consistent; and 3) the product format is stable. More information on the USGS Collection Management plans will be provided in a future Landsat Update and on the Landsat Missions Web site.

The summaries below provide details of what is included in the Level 1 Product Generation Systems (LPGS) releases in November 2015, and those items planned for future releases.

Items Included

1. Ground Control Points (GCP) Phase 2 Updates to Landsat 1-8 data

This will update 1,151 WRS-2 paths/rows, covering island areas and inland regions where the estimated absolute accuracy of the original Global Land Survey 2000 (GLS2000)-based ground control varied between 50-75 meters. See this webpage for more details: http://landsat.usgs.gov/about_LU_Vol_9_Issue_5.php#2c2.

2. Provide Landsat 5 Thematic Mapper (TM) scenes previously processed only through National Land Archive Production System (NLAPS) using LPGS

Over 10,000 Landsat 5 TM NLAPS-processed scenes will become available as LPGS-processed Level 1 products. Approximately 100 Landsat 4 TM will continue to be delivered as NLAPS-processed scenes until a future release. (See this webpage for more details: http://landsat.usgs.gov/USGS_Archive_and_Available_Scenes.php).

3. Landsat 8 Thermal Infrared Sensor (TIRS) Framing Changes

Changes are being implemented to align TIRS data to match the framing of OLI data. The TIRS data will be shifted to better align to the nominal WRS-2 scene center. This allows for sufficient data for framing at the top and bottom of the imagery, and the jagged edges along the scenes will be reduced. The change is limited to a few pixels along to the edge of the TIRS data. Data already archived will not be immediately reprocessed to reflect this change.

4. Landsat 7 scenes unable to process to a precision- and terrain-corrected L1T will process to systematic terrain-corrected L1Gt

A number of Landsat 7 scenes cannot be correlated to ground control. Before this release, such scenes will 'fallback' to systematic correction (L1G) without any terrain correction. The locational accuracy of Landsat 7 following systematic correction permits the application of terrain correction removing the significant terrain displacement that exists in many L1G products. These scenes will be processed to systematic terrain (L1Gt).

Items Not Included

1. Adding Angle Coefficient Files to Landsat 4- 5 TM, Landsat 7 and Landsat 8 data products

A file containing parameters needed to calculate the per-pixel solar illumination and sensor view angle bands, along with a Linux tool to generate angle bands was to be added. (Previously-published information about angle coefficients can be found on http://landsat.usgs.gov/about_LU_Vol_9_Issue_3.php)

2. Adding a Quality Assurance (QA) band to Landsat 1-7 data products

When implemented, this file will provide information for detecting clouds, cloud shadows, and snow/ice pixels for Landsat 4-5 TM and Landsat 7 ETM+. Landsat MSS will only include values for fill, non-cloudy, and cloudy pixels. Current information about the current Landsat 8 QA band can be found on <http://landsat.usgs.gov//qualityband.php>.

3. Add Land Cloud Cover Assessment to Landsat 4-7 Level 1 metadata

In a future release, cloud cover assessment (CCA) will provide an estimate of land in the scene that is cloud covered. The percentage of land pixels affected by clouds will be calculated and written to the metadata file (MTL.txt) as a scene-based score in a new parameter **CLOUD_COVER_LAND**. The land mask, used to determine land pixels included in the CCA score, is derived from the NOAA World Vector Shoreline dataset: <http://shoreline.noaa.gov/data/datasheets/wvs.html>.

4. Landsat 8 Cirrus Cloud Cover Algorithm Update

When implemented, this update will improve cirrus detection in higher elevations, using a logarithmic dependence on elevation in the algorithm, simulating the extinction profile of water vapor through the atmosphere. This upgrade will reduce the false positive cirrus cloud detections over high elevation terrain.

5. CFmask Implementation Plans

The CFmask (<https://github.com/USGS-EROS/espac-cloud-masking>) will be the planned primary algorithm for calculation of clouds, cloud shadows, snow/ice, and water in Landsat 4-5 TM, Landsat 7 ETM+, and Landsat 8 OLI data products. For clouds, confidence levels of low, medium, or high probability will be provided. The cloud shadow identification for Polar Stereographic and off-nadir scenes needs further assessment, and the cloud threshold for low counts of clear land and/or water pixels is still under investigation. Previously-published details about CFmask are noted on http://landsat.usgs.gov/about_LU_Vol_9_Issue_5.php#2c3.

6. Landsat 8 Thermal Infrared Sensor (TIRS) Stray Light Algorithm

Since the launch of Landsat 8 in 2013, thermal energy from outside the normal field of view (stray light) has affected the data collected in Bands 10 and 11 of the Thermal Infrared Sensor (TIRS). This stray light increases the reported temperature by up to four degrees Kelvin (K) in Band 10 and up to eight K in Band 11. The errors vary throughout the scene and depend upon radiance outside the instrument field of view, which users cannot correct in the Landsat Level 1 data product.

In order to correct the stray light, a mitigation algorithm has been created and tested – with the acknowledgement that this correction would not completely eliminate errors, but it may reduce them.

Further testing has shown that the algorithm is not producing the expected improvements. This algorithm has been removed from this release. Analysis continues and Stray Light corrections may be implemented in the future.

Previously published details about the TIRS Stray Light algorithm can be found on http://landsat.usgs.gov/about_LU_Vol_9_Issue_5.php#2c1, and it is also documented in Appendix A of the Landsat 8 Data User Handbook: http://landsat.usgs.gov/l8handbook_appendixa.php.

Please use the form on <http://landsat.usgs.gov/contactus.php> to send us your questions or comments regarding these plans.

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