

## LANDSAT DATA CONTINUITY MISSION

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The Landsat Data Continuity Mission (LDCM) [1] is currently under development and is on schedule to launch the 8<sup>th</sup> satellite in the Landsat series in December of 2012. LDCM is a joint project between the National Aeronautics and Space Administration (NASA) and the United States Geological Survey (USGS). NASA is responsible for developing and launching the flight hardware and on-orbit commissioning and USGS is responsible for developing the ground system and operating the system on-orbit after commissioning. Key components of the flight hardware are the Operational Land Imager (OLI), nearing completion by Ball Aerospace & Technologies Corp in Boulder, CO, the Thermal Infrared Sensor (TIRS), being built by NASA's Goddard Space Flight Center and the spacecraft, undergoing integration at Orbital Sciences Corp in Gilbert, Arizona. The launch vehicle will be an Atlas-5 with launch services provided by NASA's Kennedy Space Center. Key ground systems elements are the Mission Operations Element, being developed by the Hammers Corporation, and the Collection Activity Planning Element, Ground Network Element, and Data Processing and Archive System, being developed internally by the USGS Earth Resources Observations and Science (EROS) Center. The primary measurement goal of LDCM is to continue the global coverage of moderate spatial resolution imagery providing continuity with the existing Landsat record. The science goal for this imagery is to monitor land use and land cover, particularly as it relates to global climate change. Together the OLI and TIRS instruments on LDCM replace the ETM+ instrument on Landsat-7 with significant enhancements.

The OLI is a pushbroom design instrument where the scanning mechanism of the ETM+ is effectively replaced by a long line of detectors. The OLI has 9 spectral bands with similar spatial resolution to ETM+: 7 of them similar to the reflective spectral bands on ETM+ and two new bands. The two new bands cover (1) the shorter wavelength blue part of the spectrum to help with coastal studies and aerosol analyses/atmospheric correction and (2) an atmospheric water absorption band, where the Earth surface

is generally not visible, but Cirrus clouds are, to aid in cloud detection and screening. The radiometry of OLI benefits from improved SNR, dynamic range and quantization. OLI is undergoing system testing with a delivery scheduled for Spring 2011.

The TIRS is also a pushbroom design and used QWIPS detectors that require cooling to 43K using a cryocooler. It has two spectral bands, effectively splitting the ETM+ band 6 in half, that can be used as a split window to aid in atmospheric correction. It has nominally 100 m spatial resolution as opposed to the 60 m of Landsat-7 ETM+. TIRS has commenced integration and test, with a delivery to the spacecraft vendor scheduled for Winter 2011-2012.

The Orbital spacecraft currently being integrated for LDCM will have improved capabilities for pointing over previous missions. These capabilities will allow the OLI and TIRS instruments to point off-nadir the equivalent of one WRS-2 path to increase the chances of coverage for high priority targets, particularly in the event of natural disasters. Also, the pointing capability will allow the calibration of the OLI using the sun (roughly weekly), the moon (monthly), stars (during commissioning) and the Earth (at 90° from normal orientation, a.k.a., side slither) quarterly. The solar calibration will be used for OLI absolute and relative calibration, the moon for trending the stability of the OLI response, the stars will be used for Line of Sight determination and the side slither will be an alternate OLI and relative gain determination methodology. The spacecraft is scheduled to begin integration with the OLI instrument in Summer 2011.

The LDCM data processing and archive system (DPAS), located at USGS EROS, generates the products for distribution to users. Like Landsat-7 this includes an image assessment system for characterizing instrument performance and updating calibration parameters. Products will be generated that include the spectral bands from both instruments, terrain corrected and registered to the geoid. Also, like Landsat-7, data products will be distributed at no charge to the user.

The current status and plans of the space and ground segments of the LDCM project will be presented along with performance predictions as available. More detailed information on the two instruments is intended to be presented in separate papers.

## Bibliography

- [1] 2006, Irons, J.R. and Masek, J.G., *Requirements for a Landsat Data Continuity Mission*, Photogrammetric Engineering and Remote Sensing, October 2006: 1102-1108.