Landsat Science Team

Landsat Operations Report

29 October 2013

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U.S. Department of the Interior
U.S. Geological Survey

Landsat 7 and 8 Status

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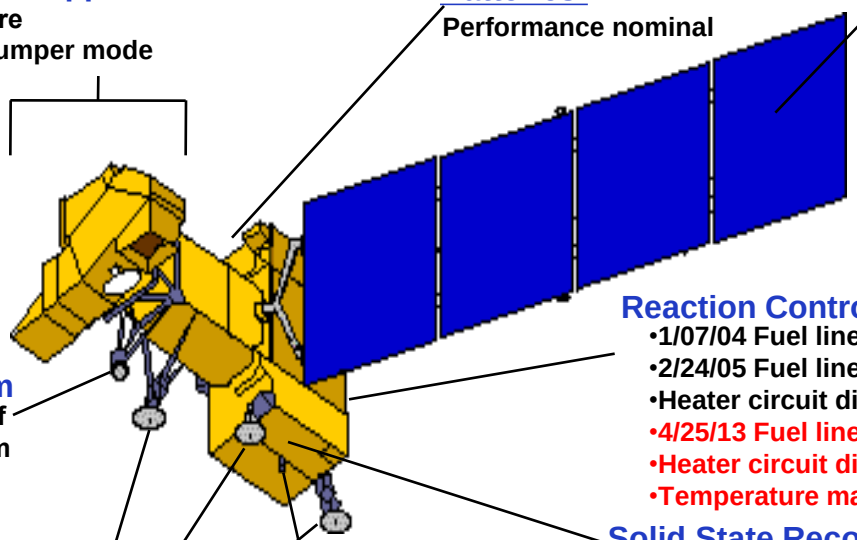
Landsat 7 Spacecraft Status

Launched 15 Apr 1999
> 14 years of on-orbit operations



Enhanced Thematic Mapper +
- 5/31/2003 SLC Failure
- 4/01/2007 SAM -> Bumper mode

Electrical Power System

Batteries:
Performance nominal

Solar array:
- 5/14/2002 Circuit #14 Failure
- 5/16/2005 Circuit # 6 Failure
- 8/13/2008 Circuit #14 partial recovery
- 14 circuits remain operating
- no impact to ops

Attitude Control System
- 05/05/2004 Gyro 3 Shut Off
- Single gyro control system in development

Reaction Control System
- 1/07/04 Fuel line #4 thermostat #1a failure
- 2/24/05 Fuel line #4 thermostat #1b failure; Primary
- Heater circuit disabled
- 4/25/13 Fuel line #2 thermostat 2a failure; Redundant
- Heater circuit disabled
- Temperature manually controlled

Solid State Recorder
- 11/15/1999 SSR PWA #23 Loss
- 02/11/2001 SSR PWA #12 Loss
- 12/07/2005 SSR PWA #02 Loss
- 08/02/2006 SSR PWA #13 Loss
- 03/28/2008 SSR PWA #22 Loss
- 09/03/2008 SSR PWA #23 Recovered
- 10/12/2013 SSR PWA #11 Loss
- Each PWA is 4% loss of launch capacity
- Boards are likely recoverable

X-band System
Performance nominal

S-band System
Performance nominal

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Landsat 8 Spacecraft Status

All systems good

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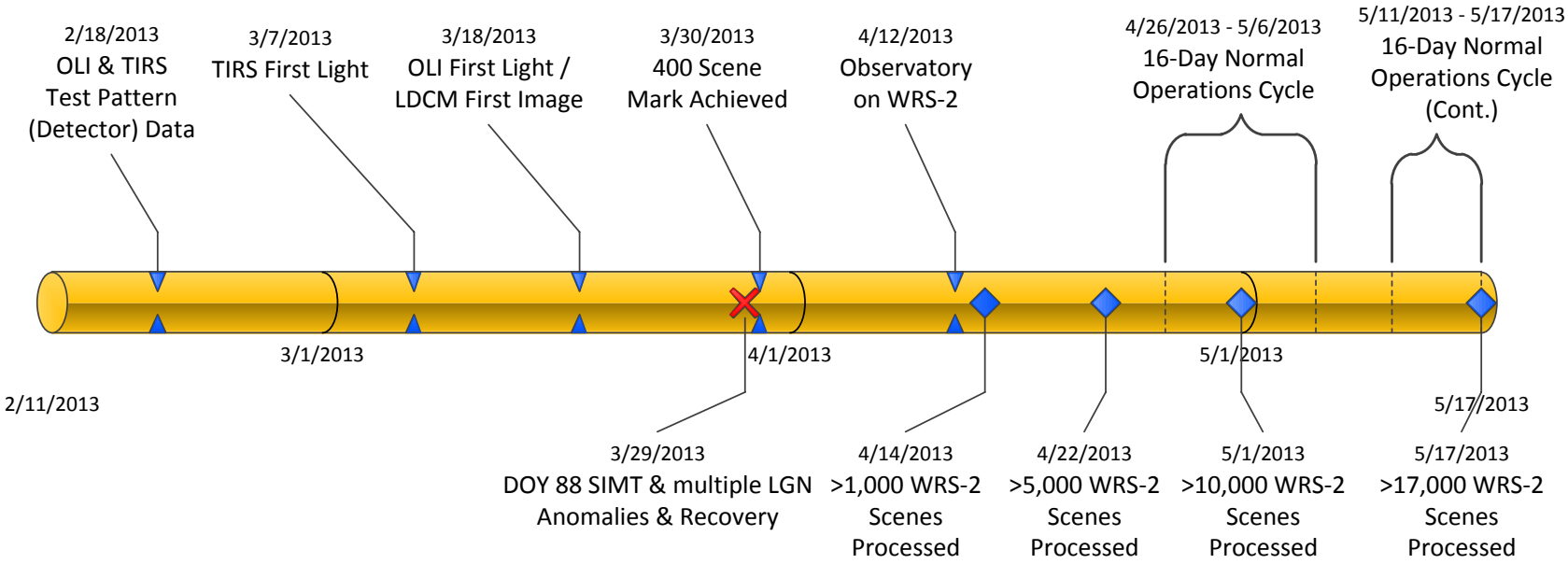
Data Operations Commissioning Summary

>17,000 OLI & TIRS scenes collected and processed by the conclusion of Commissioning



- **Acquired L7/LDCM coincident imaging (Friday March 29 (DOY 088) – Sunday March 31 (DOY 090)), total of 1256 images.**
- **Post Launch Assessment Review (PLAR) - May 29**
- **Mission Transition Review (MTR) - May 30**

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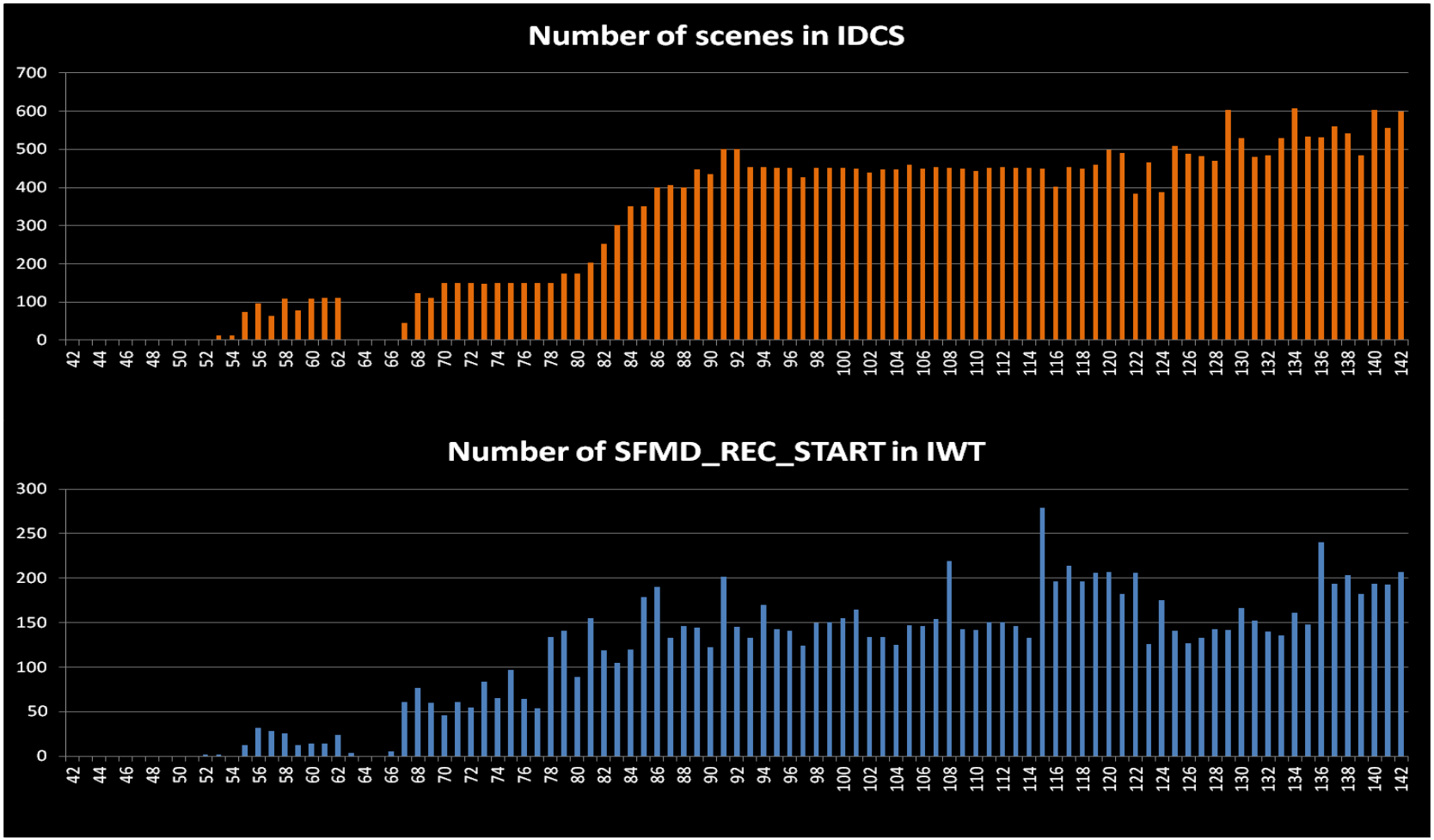
Collection Capacity Reported at PLAR



Stable Operations Demonstrated Beyond Required 400 Scenes/Day

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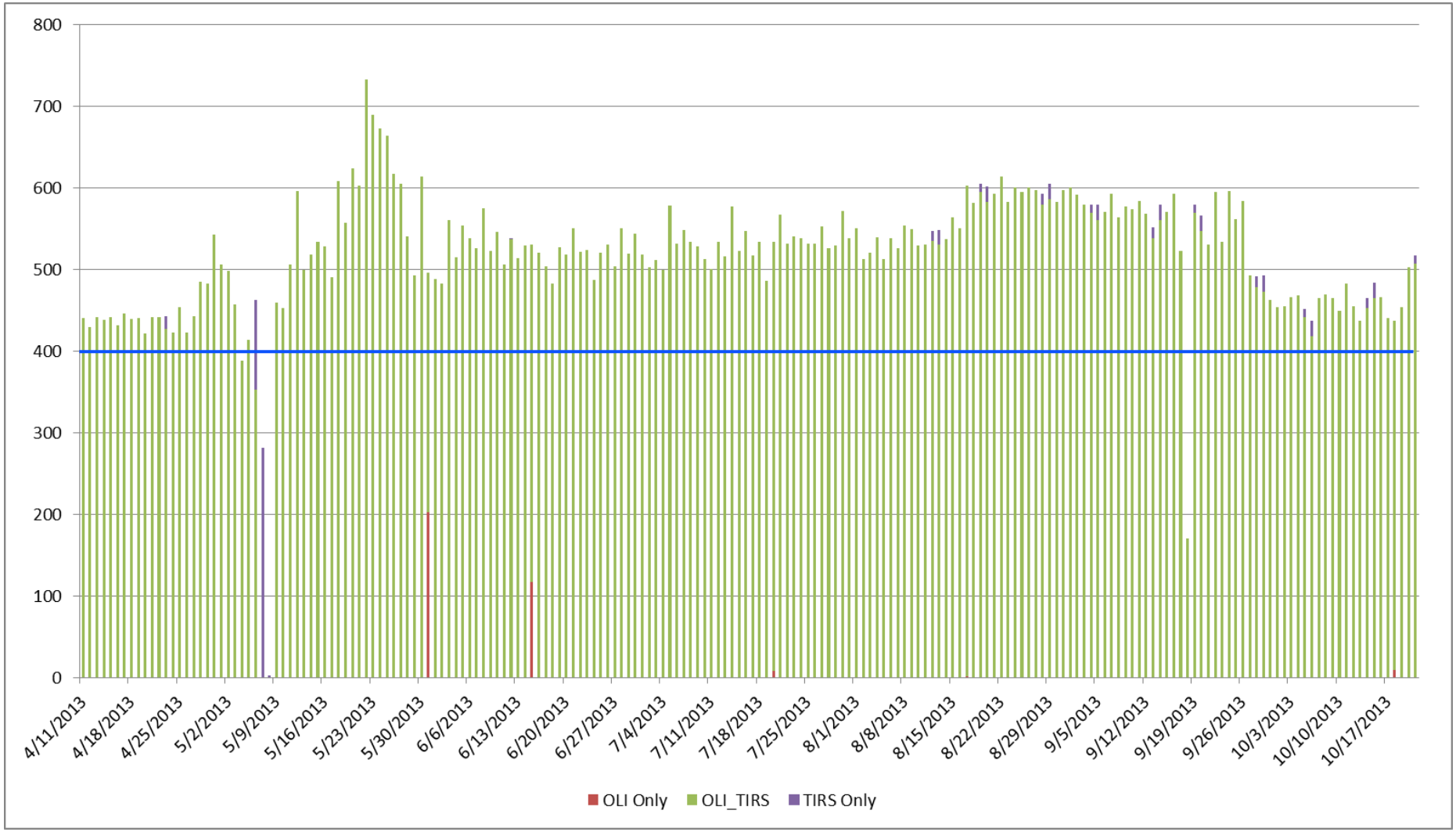
Landsat 8 Scenes Acquired per Day



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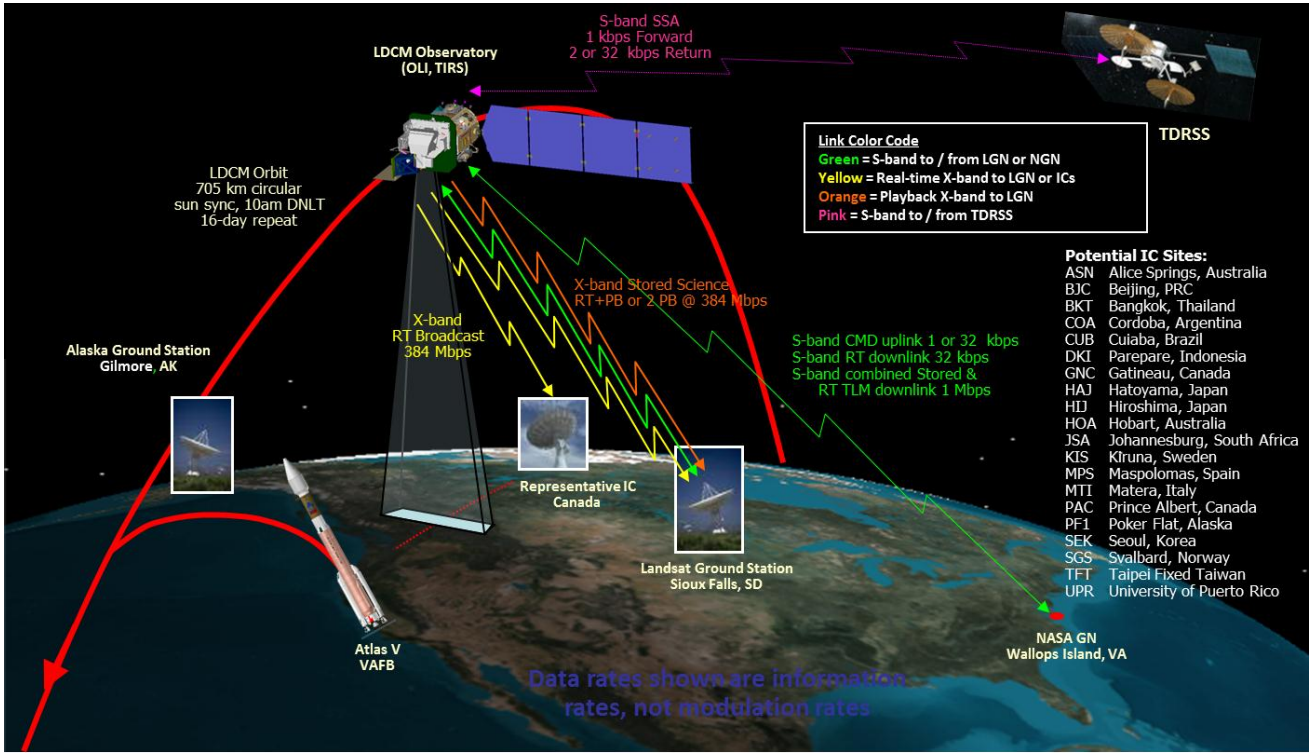
Unique Landsat 8 Operational Characteristics (Data)

- **Processing latency for real-time downlinks**
- **Average latency is ~ 5 hours from acquisition to product availability**
- **Closed loop between ground and space for data management**



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Landsat 8 Reprocessing Campaign

- The plan is to run the procedure through the test environment, pending the availability of a script to clean out all of the existing trending/histogram data from Earth collects.
- The Cal/Val Team (CVT) has written up a detailed explanation of how the data will be changed during the reprocessing campaign; this this be published to the Landsat Missions Web Site (LMWS).
- Once a successful test run is complete, the date of the cache purge can be finalized and published to the user community. We want to give the community at least a week (or two) of advance notice before we actually remove the Level 1 products.

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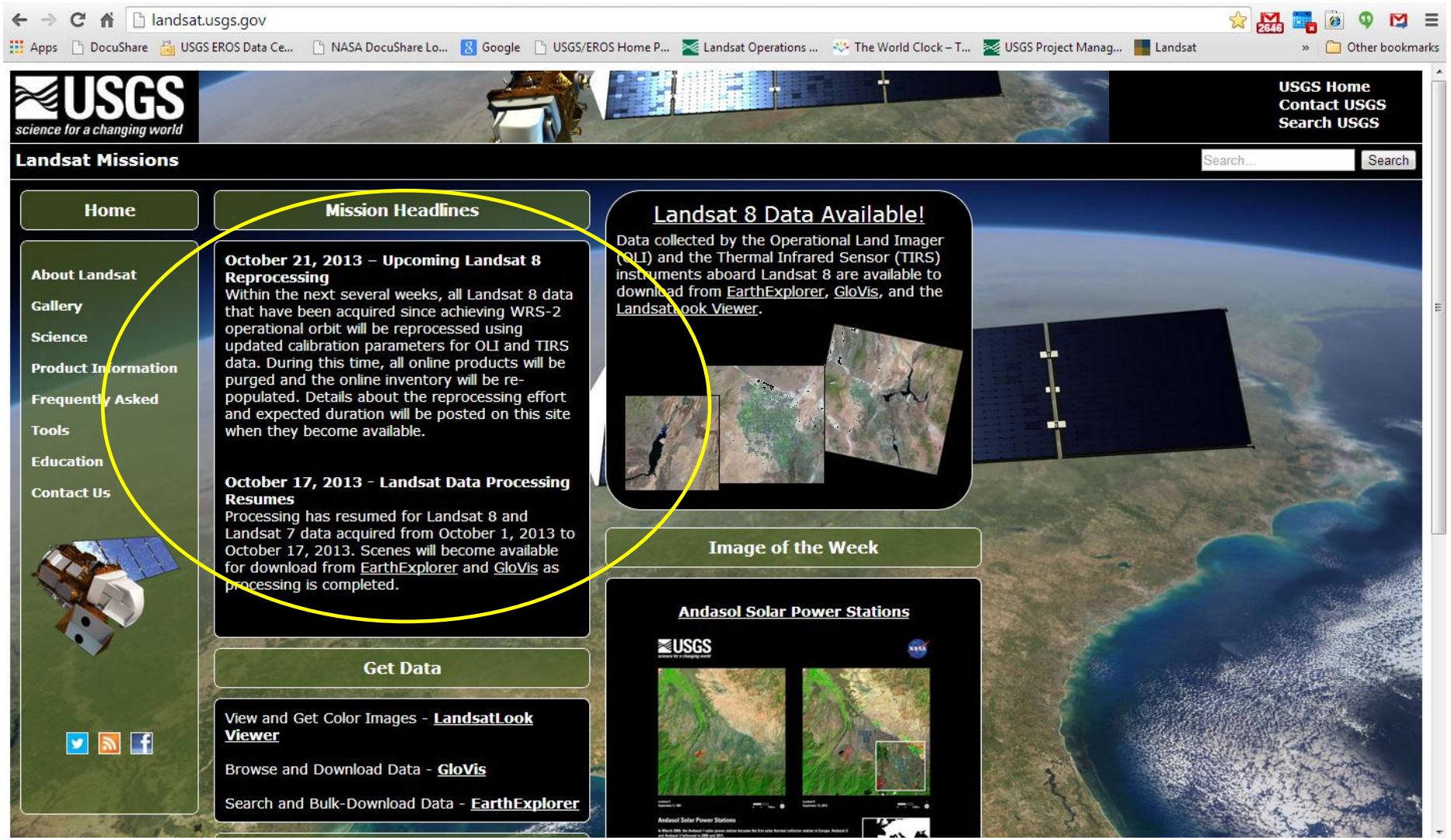
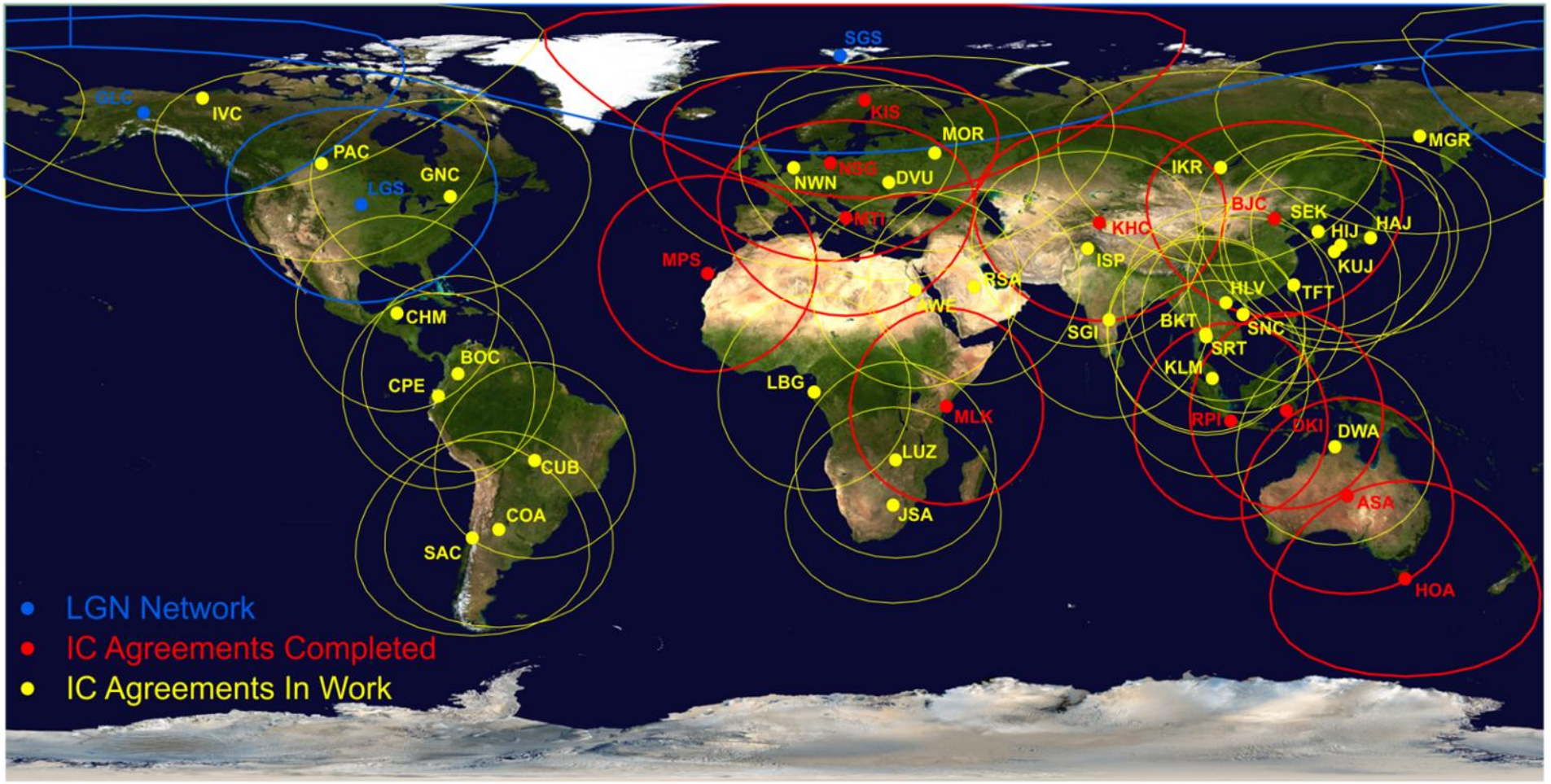
Check LMWS for Reprocessing Updates

http://landsat.usgs.gov



International Cooperator Network



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User Services – Kudos to USGS Landsat

- **“WELCOME BACK!!!! You were sorely missed!!! Your services, information source, reliable high-quality imagery products, and amazingly efficient turnaround time (as compared to commercial "equivalents") is invaluable! Thank you for what you are and doing what you do!!! “**
- **“Thank you for your help and i have no a word to say for your fast and fantastic response and for your active service deliverance system. I have access for the meta data of images and i have downloaded them since the site is open for customers. thank you again”**
- **“We are downloading and processing all the L7 and L8 images in the path row 199-33, Spain. We really appreciate your efforts processing the Landsat archive in near real time, and your wonderful work allow us to monitor important process in a lot of interesting areas.”**
- **“It is a great leaps on science advancement made by NASA by providing Satellite Data (Landsats) on no-charge basis. It is helping us a lot in developing countries that almost affordable to get the data by charge. I am using the Landsat data for educational purpose in my university. Once again thank you so much for NASA.”**
- **“Thank you very much for making the LANDSAT 8 data available - and so soon after each orbit. I was browsing through your site yesterday and found an image of Iceland from that same day, showing floods in rivers in N- Iceland as well as a mud flow that had fallen next to a farm earlier that day. These images have received quite an interest locally today, as they show the extent of these events and comparison with older images (from April) helps people understand these things better (to see how the rivers look normally). This is really important, and again, thank you very much for your fantastic work.”**

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Landsat Archive and Processing Topics

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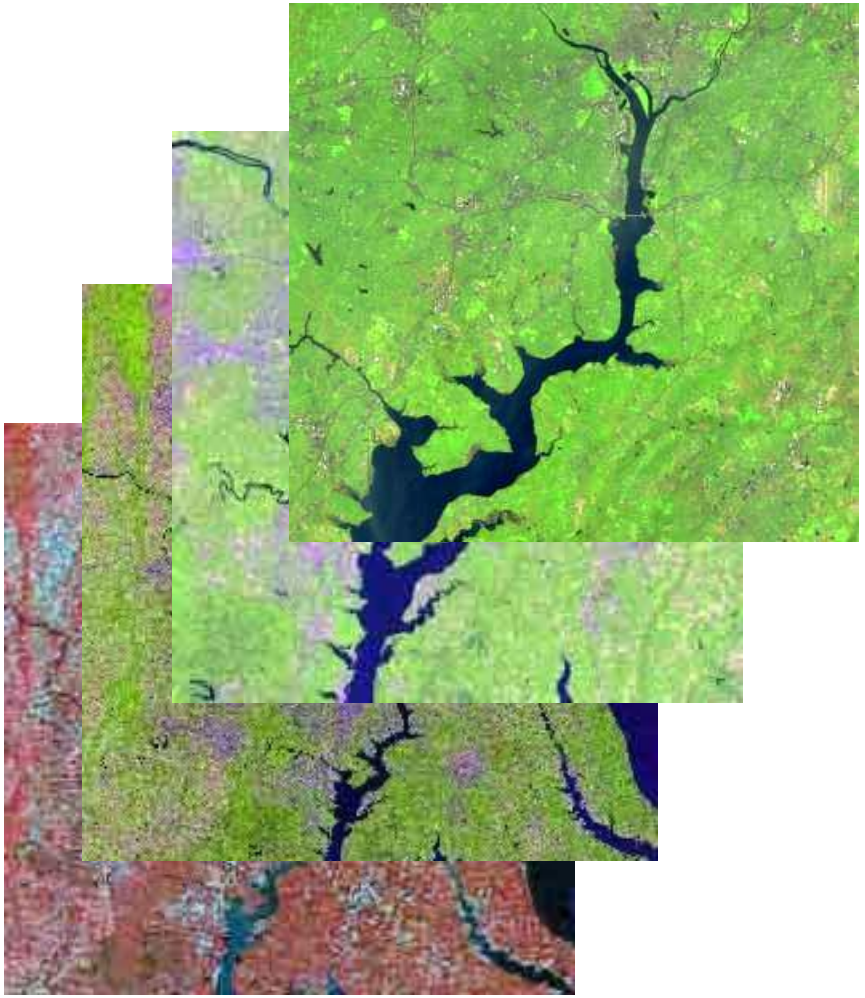
U.S. Landsat Archive Overview (October 17, 2013)

- **OLI-TIRS: Landsat 8**
  - **96,929 scenes**
    - **~ 335 TB Raw and L0Ra Data**
      average scene size 1813 MB
- **ETM+: Landsat 7**
  - **1,648,873 scenes**
    - **~ 1,531 TB Raw and L0Ra Data**
      average scene size 487 MB
- **TM: Landsat 4 & Landsat 5**
  - **1,770,791 scenes**
    - **~ 888 TB Raw and L0Ra Data**
      average scene size 263 MB
- **MSS: Landsat 1 through 5**
  - **1,142,352 scenes**
    - **~ 69 TB Raw and L0Ra Data**
      average scene size 32 MB
- **Total:**
  - **4,658,945 scenes**
    - **~ 2,823 TB Raw and L0Ra Data**



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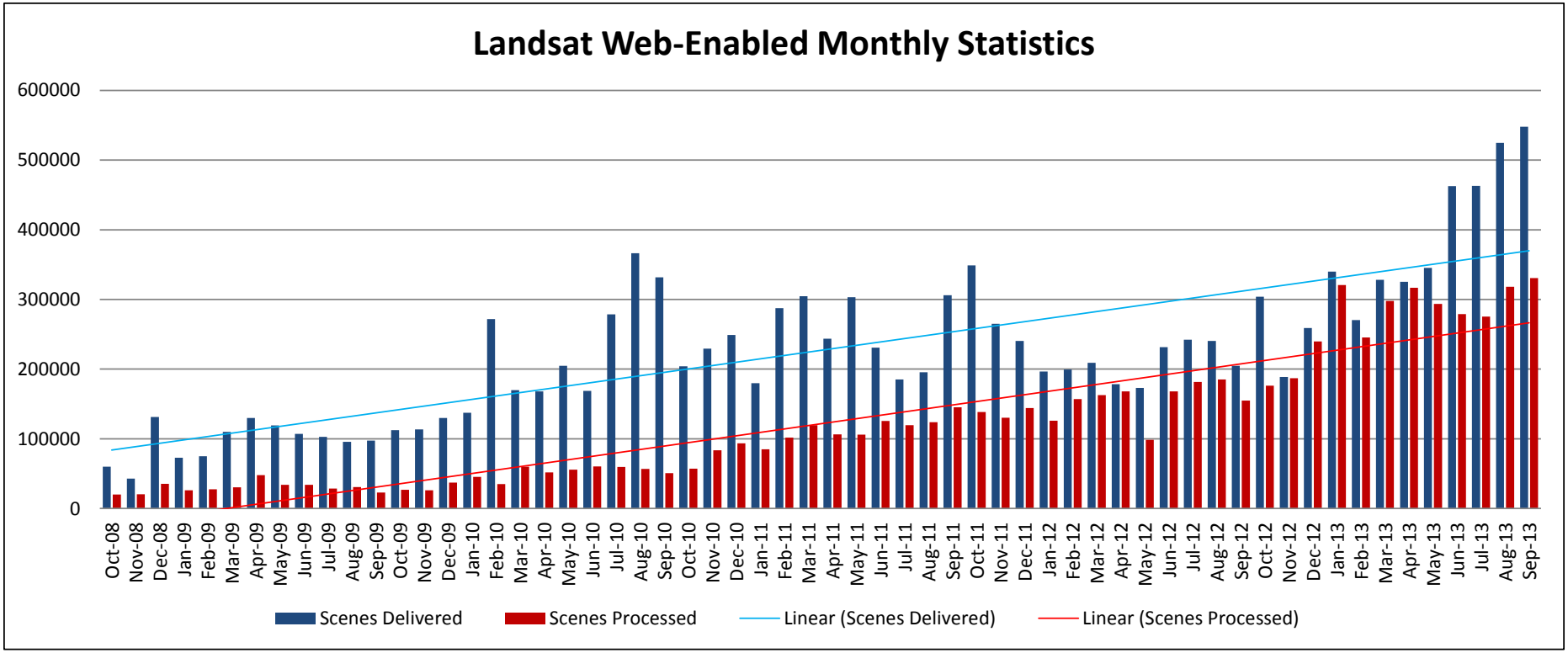
Monthly Downloads / Processed



FY09 (Oct '08–Sep '09)	FY10 (Oct '09–Sep '10)	FY11 (Oct '10–Sep '11)	FY12 (Oct '11–Sep '12)	FY13 (Oct '12–Sep '13)
Delivered: 1.14M	Delivered: 2.45M	Delivered: 2.92M	Delivered: 2.73M	Delivered: 4.36M
Processed: 358K	Processed: 567K	Processed: 1.27M	Processed: 1.82M	Processed: 3.28M

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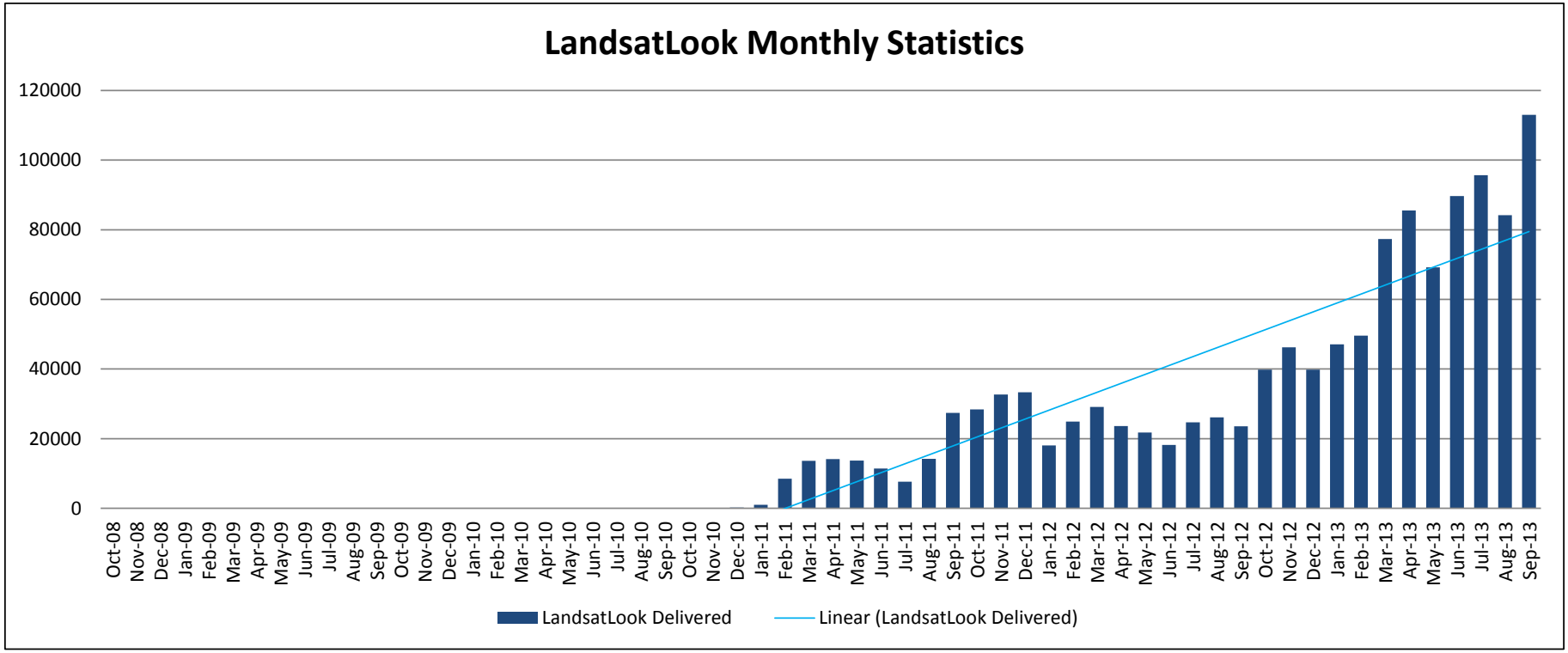
Full Resolution Browse Downloads



FY11 (Oct '10–Sep '11)
Delivered: 112K

FY12 (Oct '11–Sep '12)
Delivered: 304K

FY13 (Oct '12–Sep '13)
Delivered: 837K

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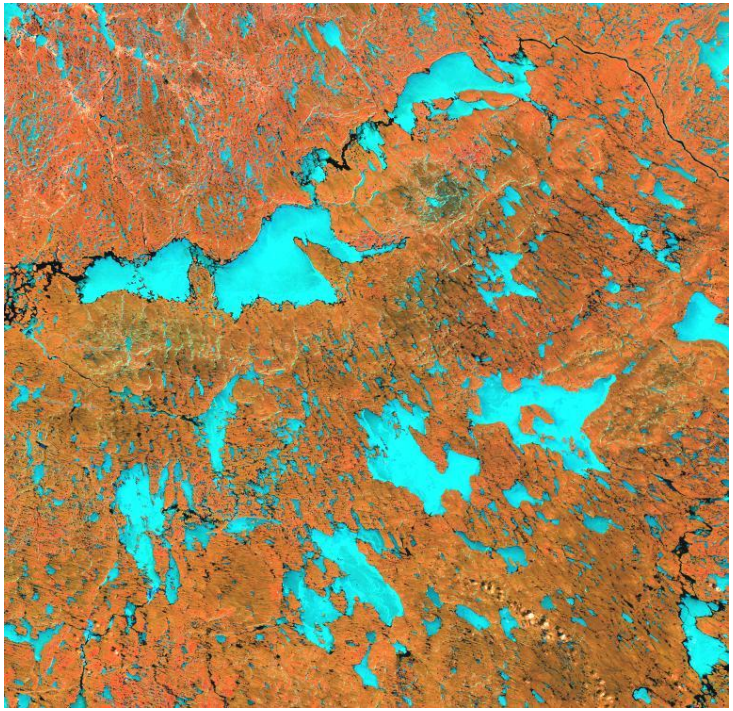
Landsat Global Archive Consolidation (LGAC)

- **Over 2.55 Million scenes collected as of 17 October 2013**
- **Previous "Woodcock Metric":**

  1,531,899
- **Current:**

  2,550,354



Landsat 5 TM image transcribed from CCRS D-1 tape – available in archive

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Where are we now? (1/3)

Country (Organization)	Ground Station	% LGAC Delivered	% LGAC Ingested
Argentina (CONAE)	COA	TM	TM
		ETM+	ETM+
Australia (GA-NEO)	ASA	MSS	MSS
		TM	TM
		ETM+	ETM+
Australia (GA-NEO)	HOA	TM	TM
		ETM+	ETM+
Brazil (INPE)	CUB	MSS	MSS
		TM	TM
		ETM+	ETM+
Canada (CCRS)	GNC	TM	TM
		ETM+	ETM+
Canada (CCRS)	PAC	MSS	MSS
		TM	TM
		ETM+	ETM+

- **Argentina (CONAE) – currently receiving data**
- **Australia (GA-NEO) - Received a copy of all Landsat MSS, TM, and ETM+ data and completed all ingest but L3 MSS**
- **Brazil (INPE) - Received a copy of all Landsat TM and ETM+ data and completed data ingest**

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Where are we now? (2/3)

Country (Organization)	Ground Station	% LGAC Delivered	% LGAC Ingested
China (CEODE)	BJC	TM	TM
		ETM+	ETM+
China (CEODE)	KHC	TM	TM
Ecuador (IEE)	CPE	TM	TM
Europe (ESA)	FUI	MSS	MSS
		TM	TM
		ETM+	ETM+
Europe (ESA)	KIS	MSS	MSS
		TM	TM
		ETM+	ETM+
Europe (ESA)	MTI	TM	TM
		ETM+	ETM+
Europe (ESA)	NSG	ETM+	ETM+
India (NRSA)	SGI	MSS	MSS
		TM	TM
Indonesia (LAPAN)	DKI	TM	TM
		ETM+	ETM+

- **China (CEODE) – currently receiving data**
- **Ecuador (IEE) – currently receiving data**
- **Indonesia (LAPAN) - Finished ingesting all ETM+ data**

See ESA update on next slide

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LGAC Status Update - ESA

- **ESA is currently processing Landsat archive to Level 1**
  - Freely accessible at http://landsat-ds.eo.esa.int/app with on-line registration
  - As ESA processes the data, the raw data will be made available to the USGS for repatriation
- **Plan to begin transfer of data in two stages**
  1. **Kiruna, Sweden data that has already been processed**
     - **~100,000 Thematic Mapper (TM) scenes (~50TB)**
     - **Will begin in the upcoming weeks**
     - **Final completion date will be calculated as data begins to flow**
  2. **Data from other stations as it is processed**
     - **Need to work on a schedule for this data**
- **There is an issue with some of the Thematic Mapper data in the ESA archive**
  - **Wilma format - Payload Correction Data (PCD) issue**
  - **~6 years of data from Kiruna and ~12 years from Fucino, Italy**
  - **USGS TSSC engineers have been working with ESA engineers to resolve the issue**
  - **May transfer the data to USGS and deal with the issue at EROS**
  - **Transferring lowest level of data**

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Where are we now? (3/3)

Country (Organization)	Ground Station	% LGAC Delivered	% LGAC Ingested
Indonesia (LAPAN)	DKI	ETM+	ETM+
Japan (HIT/HEEIC)	HIJ	ETM+	ETM+
Japan (JAXA/RESTEC)	HAJ	MSS	MSS
		TM	TM
		ETM+	ETM+
Kyrgyzstan (DLR)	BIK	TM	TM
Mongolia (DLR)	ULM	TM	TM
Pakistan (SUPARCO)	ISP	TM	TM
Saudi Arabia (KACST)	RSA	MSS	MSS
		TM	TM
South Africa (SANSA)	JSA	MSS	MSS
		TM	TM
		ETM+	ETM+
Taiwan (CSRSR-NCU)	CLT	TM	TM
Thailand (GISTDA)	BKT	MSS	MSS
		TM	TM
		ETM+	ETM+
US (Univ. Puerto Rico)	UPR	ETM+	ETM+

- **Japan (HIT/HEEIC) - Received a copy of all Landsat ETM+ data and completed data ingest**
- **Japan (JAXA/RESTEC) - Received a copy of all Landsat MSS, TM, and ETM+ data**
  - **TM and ETM+ data ingest completed; MSS ingest just started (Oct 2013)**
  - **Data ingest of TM in progress**
- **Pakistan (SUPARCO) – Received a copy of all Landsat TM data**
- **Saudi Arabia (KACST) – currently receiving data**
- **South Africa (SANSA) – currently receiving data**

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Remaining Work

- **Receive a copy of all Landsat data from ICs that have not yet delivered data or have not yet agreed to participate**
- **Complete ingest of all data received**
- **Overcome existing Obstacles**
  - **MSS data conversion and ingest**
    - **Many different format types**
    - **Handling partially processed data**
    - **Processing software upgrades in work**
  - **Read data off of old media**
    - **HDDTs**
    - **DCRSi tapes**

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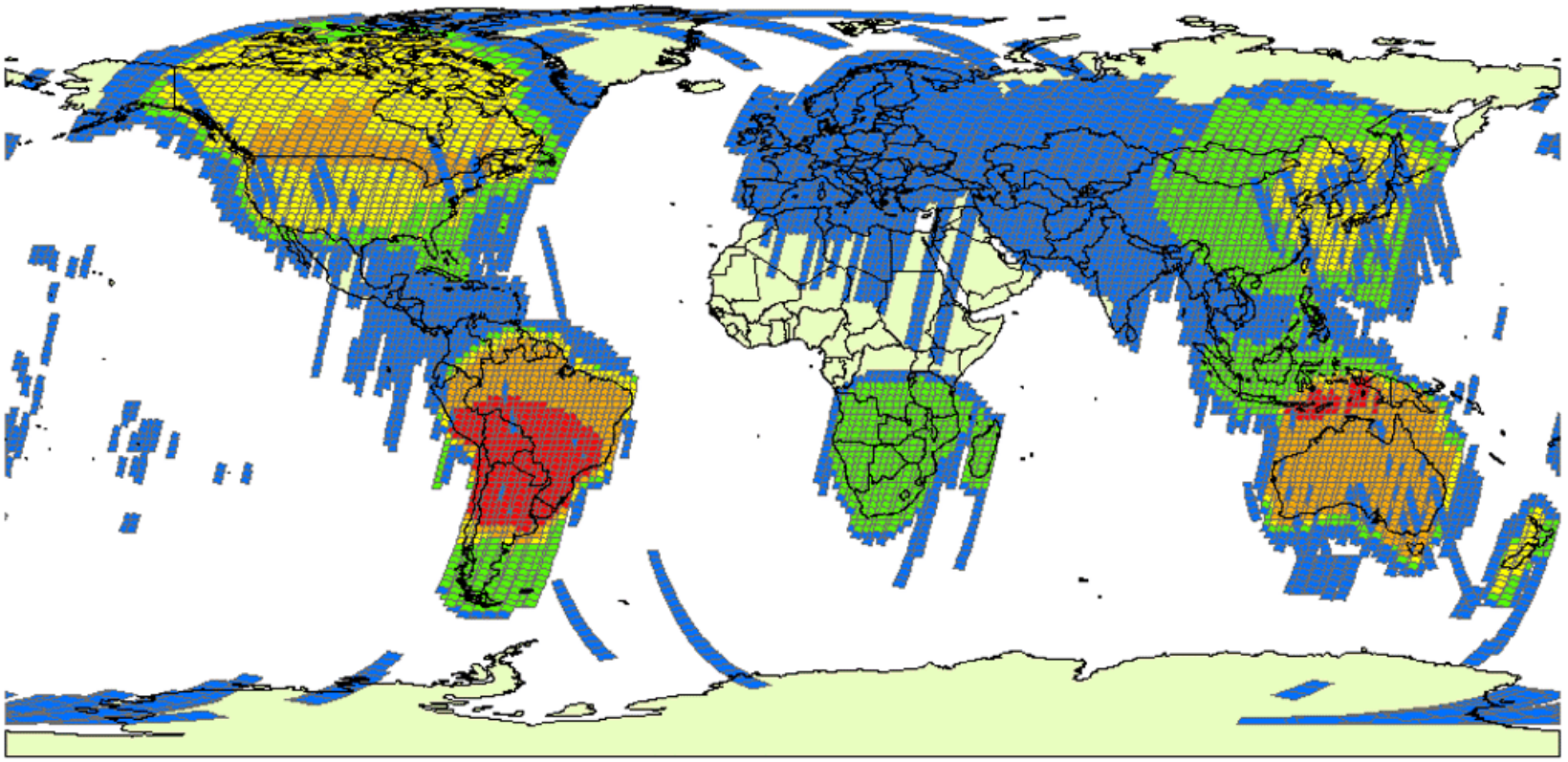
LGAC Ingest Summary



LGAC WRS2 Scenes
Status as of July 31, 2013
Acquisition Date Range: August 13, 1982 through July 29, 2013
2,179,344 Cumulative Scenes Delivered
2,065,450 Total Scenes Acquired
10,592 Unique Path/Rows

1 - 89 | 90 - 282 | 283 - 515 | 516 - 750 | 751 - 993

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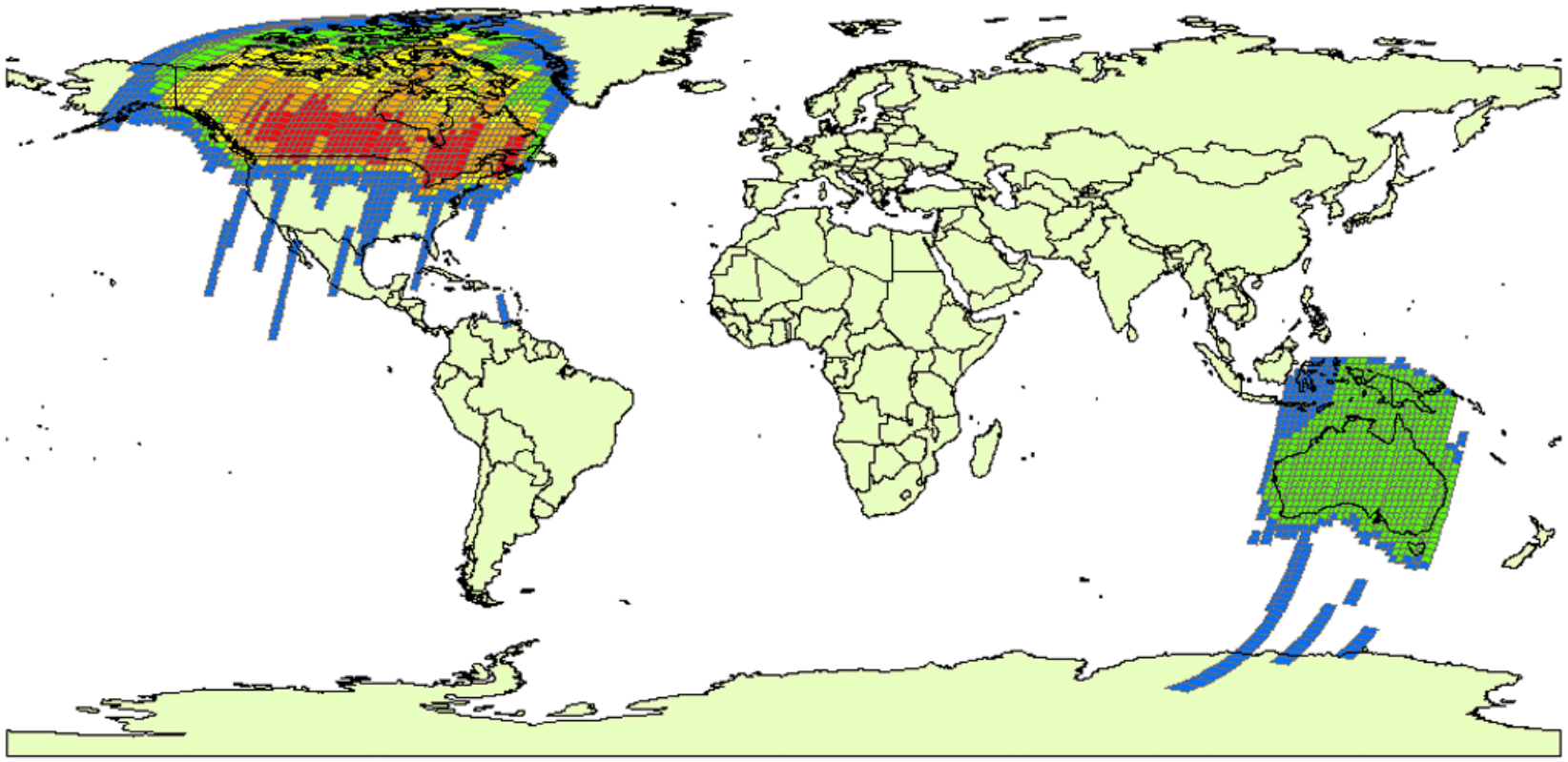
LGAC Ingest Summary



LGAC WRS1 Scenes
Status as of July 31, 2013
Acquisition Date Range: July 26, 1972 through June 07, 1892
2,179,344 Cumulative Scenes Delivered
113,894 Total Scenes Acquired
2,807 Unique Path/Rows

1 - 19 | 20 - 42 | 43 - 62 | 63 - 83 | 84 - 121

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LGAC Ingest Status (as of 10/17/2013)

LGAC Ingest

Updated 10/17/2013

GSID	Country	Location	Organization	Scenes Ingest During September			Total Scenes Ingested Since Sept. 2010		
				MSS	TM	ETM+	MSS	TM	ETM+
CUB	Brazil	Cuiaba	INPE	0	0	1,120	0	306,609	60,647
COA	Argentina	Cordoba	CONAE	0	56	3,781	0	103,564	66,465
ASA	Australia	Alice Springs	GA-NEO	166	0	1,269	193,751	184,684	184,643
HOA	Australia	Hobart	GA-NEO	0	0	0	0	5,812	13,110
GNC	Canada	Gatineau	CCRS	0	0	0	0	53,004	37,915
PAC	Canada	Prince Albert	CCRS	4,273	0	27	401,327	369,687	100,356
BJC	China	Beijing	CEODE	0	4,884	0	0	105,176	37
KHC	China	KaShi	CEODE	0	0	0	0	14,597	0
MTI	Italy	Matera	ESA	0	0	0	0	2,899	7
DKI	Indonesia	Parepare	LAPAN	0	0	462	0	15,975	33,958
HAJ	Japan	Hatoyama	RESTEC	0	0	2,349	0	120,744	13,361
HIJ	Japan	Hiroshima	HIT	0	0	73	0	0	39,365
JSA	South Africa	Hartebeesthoek	CSIR-SAC	0	0	24	0	63,925	2,754
BKT	Thailand	Bankok	GISTDA	0	0	0	0	5,365	23
NSG	Germany	Neustrelitz	DLR	0	0	0	5,132	0	183
FUI	Italy	Fucino	ESA	0	0	0	0	48	0
CPE	Ecuador	Copaxi	CLIRSEN	0	0	0	0	25,246	0
ISP	India	Shadnagar	NRSA	0	28	0	0	28	0
RSA	Saudia Arabia	Riyahd	KACST/MAW	0	0	0	0	327	0
CLT	Taiwan	Chung Li	EOSAT/FRSC	0	0	0	0	11,586	0
UPR	Puerto Rico	Mayaguez	UPR	0	0	0	0	315	0
ULM	Mongolia	Ulan Bator	DLR	0	0	0	0	556	0
BIK	Kyrgyzstan	Bishkek	DLR	0	0	0	0	2,340	0
KIS	Sweden	Kiruna	SSC	0	105	0	0	4,694	139
Grand total							**600,210**	**1,397,181**	**552,963**
Grand Total all Sensors									**2,550,354**

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