National Aeronautics and Space Administration

Landsat Update

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April 3, 2012
LCLUC Meeting

LDCM
LANDSAT

data continuity mission

USGS

Agenda

- Landsat-5/7 Update
- LDCM / Landsat-8 Mission Status
- Landsat-9 Developments
- Landsat/Sentinel-2 Synergy

1. Landsat-5, 7 Status

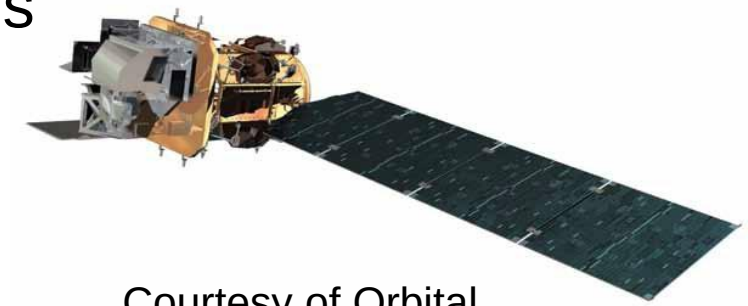
- **USGS suspended Landsat-5 TM operations in November 2011**
  - TM X-band transmitter began to fail regularly
  - Restart planned in April 2012, but low probability of success
  - Landsat-5 MSS being tested as “stop gap” data source

- **Landsat-7 ETM+ continues to operate nominally**
  - SLC-off problem hasn’t gone away
  - Fuel reserves sufficient through 2016

2012 is the 40th anniversary of the Landsat Program

2. Landsat Data Continuity Mission

- Partnership between NASA and USGS
- LDCM will fly two instruments
  - Operational Land Imager (OLI): 9 reflective bands @30m (Ball Aerospace Corp.)
  - Thermal Infrared Sensor (TIRS): 2 TIR bands @100m (NASA GSFC)
  - Acquisition of 400 scenes/day globally; 8 days out of phase with Landsat-7
- Spacecraft built by Orbital Sciences
- The LDCM is on schedule for a January 2013 launch



Courtesy of Orbital

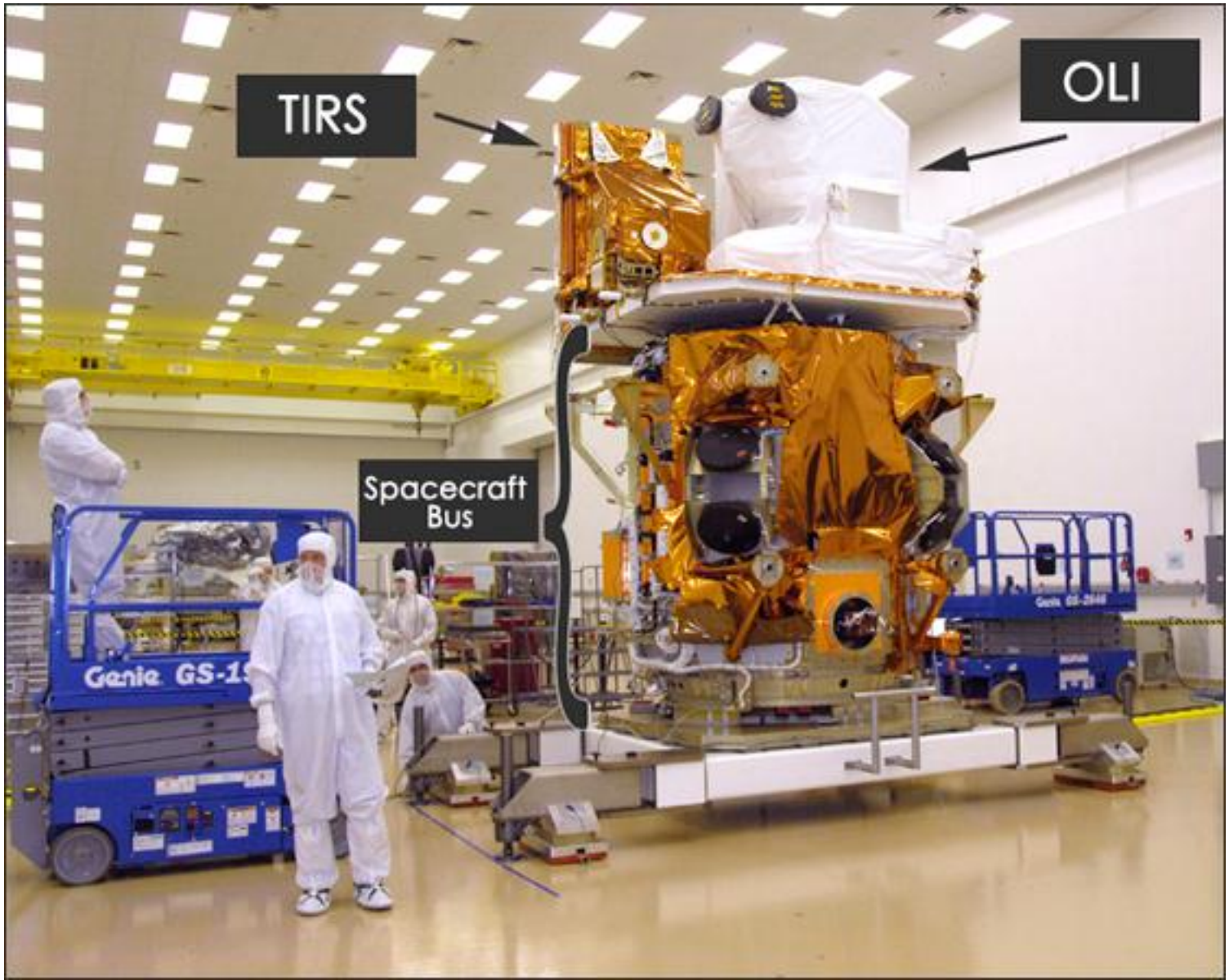
LDCM Status (April 2012)

- **OLI and TIRS have been integrated onto the spacecraft bus**
  - OLI, TIRS Sensor performance is excellent (OLI surpasses SNR requirements)
  - OLI Functional testing with the spacecraft completed

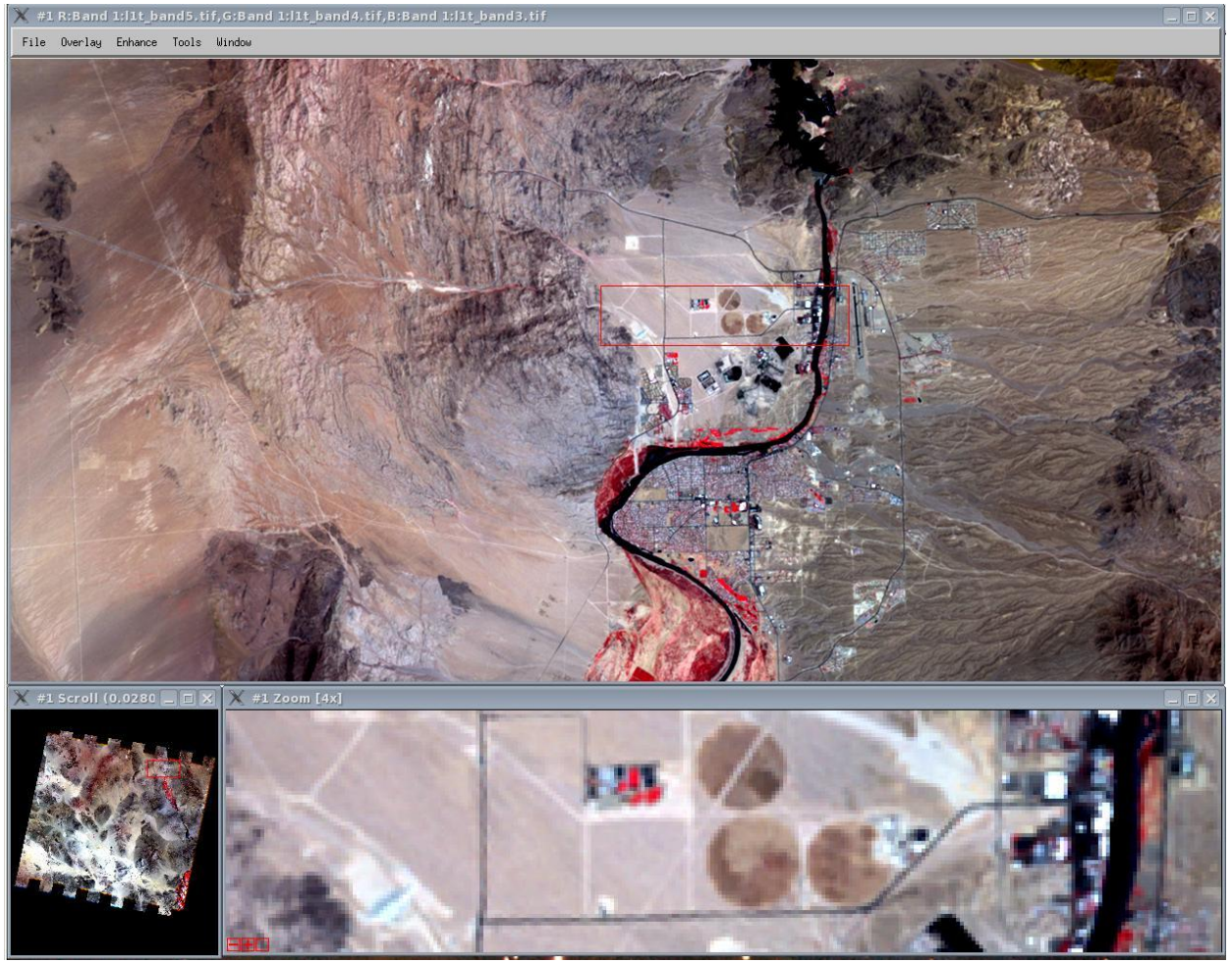
- **Spacecraft bus I&T almost complete**
  - Solar array scheduled for delivery early this year
  - Anomaly with TIRS discovered March 2012
    - TIRS cryo-cooler power anomaly traced to He leak
    - Leak traced to He tank fill valve – allows fix at Orbital and minimal disruption

- **Ground system I&T continuing on schedule**
  - EROS, Svalbard, Norway and Gilmore Creek, AK ground stations completed and integrated with Mission Operations Center (MOC)
  - Data Processing and Archive System (DPAS) Build 2.0 completed testing; Build 2 provides level 1 processing capability

LDCM "Family Portrait"



First L1T Image out of DPAS (ETM + data processed with OLI algorithms)



Landsat Science Team

- **USGS has issued a solictation for the next Landsat science team**
  - Conduct research pertinent to Landsat
  - Inform decisions regarding Landsat data, LDCM, and future missions

- **Non-USG participants are funded**
  - www.fedconnect.net -> Public Opportunities

- **USG/International participants not funded (except for travel)**

- **Due date: May 15, 2012. For more information contact Tom Loveland, USGS EROS**

3. Post-LDCM Continuity

- **President's FY12 budget requested $48M to begin implementation of Landsat-9**
  - L9 conceived as start of operational Landsat series, and would be near-clone of LDCM. Additional technology infusion beginning with Landsat-10.
  - FY12 request supported 2018 launch (end of LDCM design life)

- **Congress declined to provide funding for L9 implementation; FY12 appropriation of $2M for program development**
  "There is little doubt that resources will not be available within the Interior Appropriations bill to support these very large increases without decimating all other Survey programs"

- **OMB has recommended "strategic pause" to evaluate technical and programmatic options for Landsat continuity – only program funding ($250K) requested in FY13**

3. Post-LDCM Continuity (cont'd)

- **OSTP has asked DoI/USGS to evaluate alternative concepts for a Landsat-9 mission**
  - Request for Information (RFI) on new mission concepts issued by USGS March 2012
    - All options open: data buys, smallsat missions, gov't mission…
    - Responses due to USGS April 13
  - Survey of Federal Agencies to document Landsat requirements in support of National Earth Observation (NEO) Societal Benefit Areas
  - Report back to OSTP in June 2012 to support FY14 budget request

- **Given current funding situation, launch of Landsat-9 before 2020 is no longer feasible**

- **To be continued…**

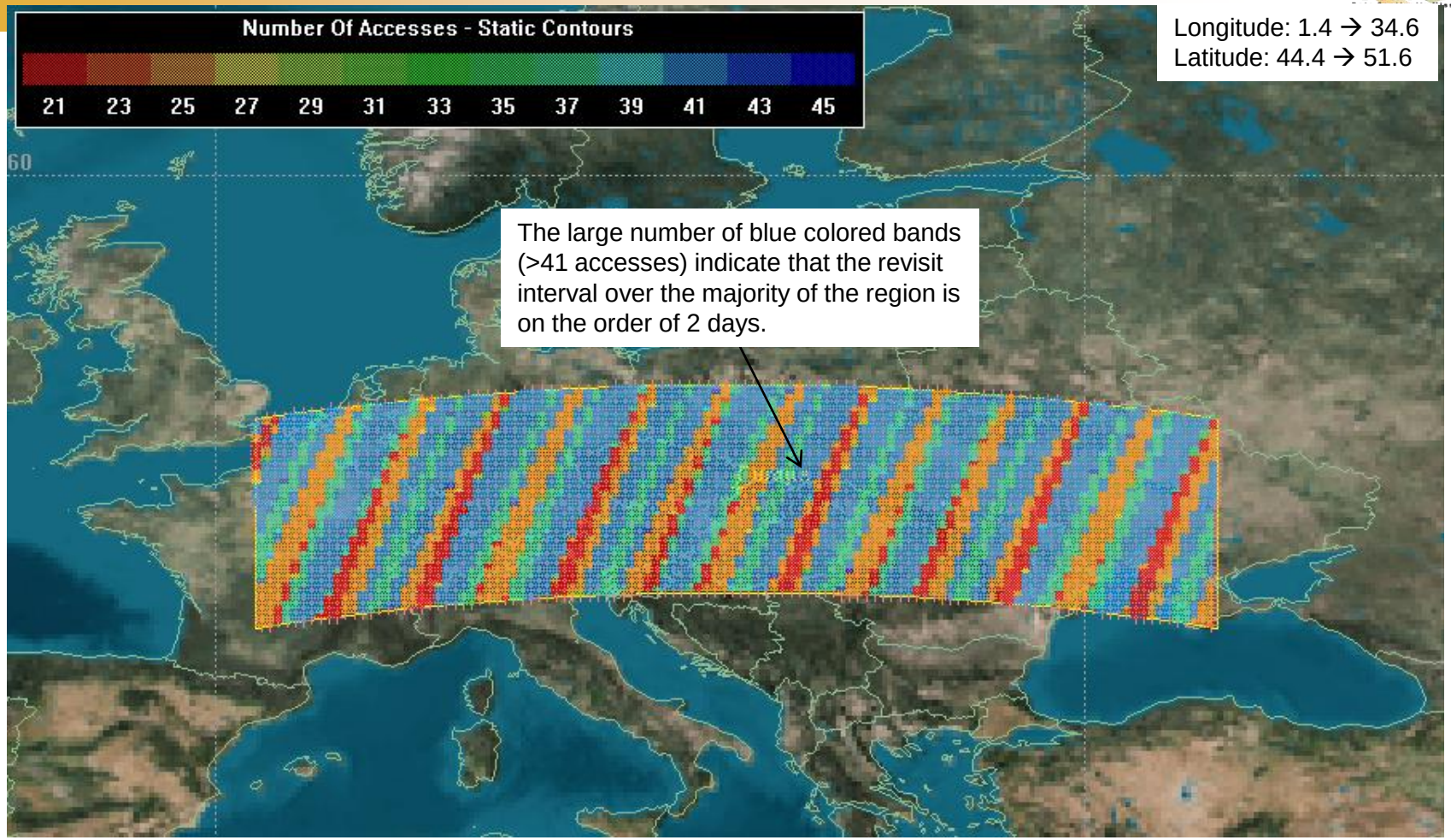
4. Landsat/Sentinel-2 Concept

- **Sentinel-2: "Landsat-like" ESA mission to support GMES program**
  - Sentinel-2a launches 2013, Sentinel-2b launches 2014
    - Landsat-like bands (VNIR-SWIR), 12-bit radiometry
    - 10-60m spatial resolution
    - Sun-synchronous, 786km orbit (MLT 10:30am)
  - 290km swath width
  - Each platform affords 10-day repeat

- **Combination of LDCM and Sentinel-2a,b can offer 1-2 day repeat coverage at ~30m resolution across all Landsat reflective bands**

- **ESA has committed to a free and open data policy; EU has not yet approved free access**

Sentinel 2A and B - LDCM Europe



- The picture shows the number of times LDCM and the Sentinel 2 satellites accessed areas on the ground over an 80 day period of time.
  - 21 accesses indicates a maximum revisit interval of ~3 days 19 hours
  - 46 accesses indicates a minimum revisit interval of ~1 day 18 hours

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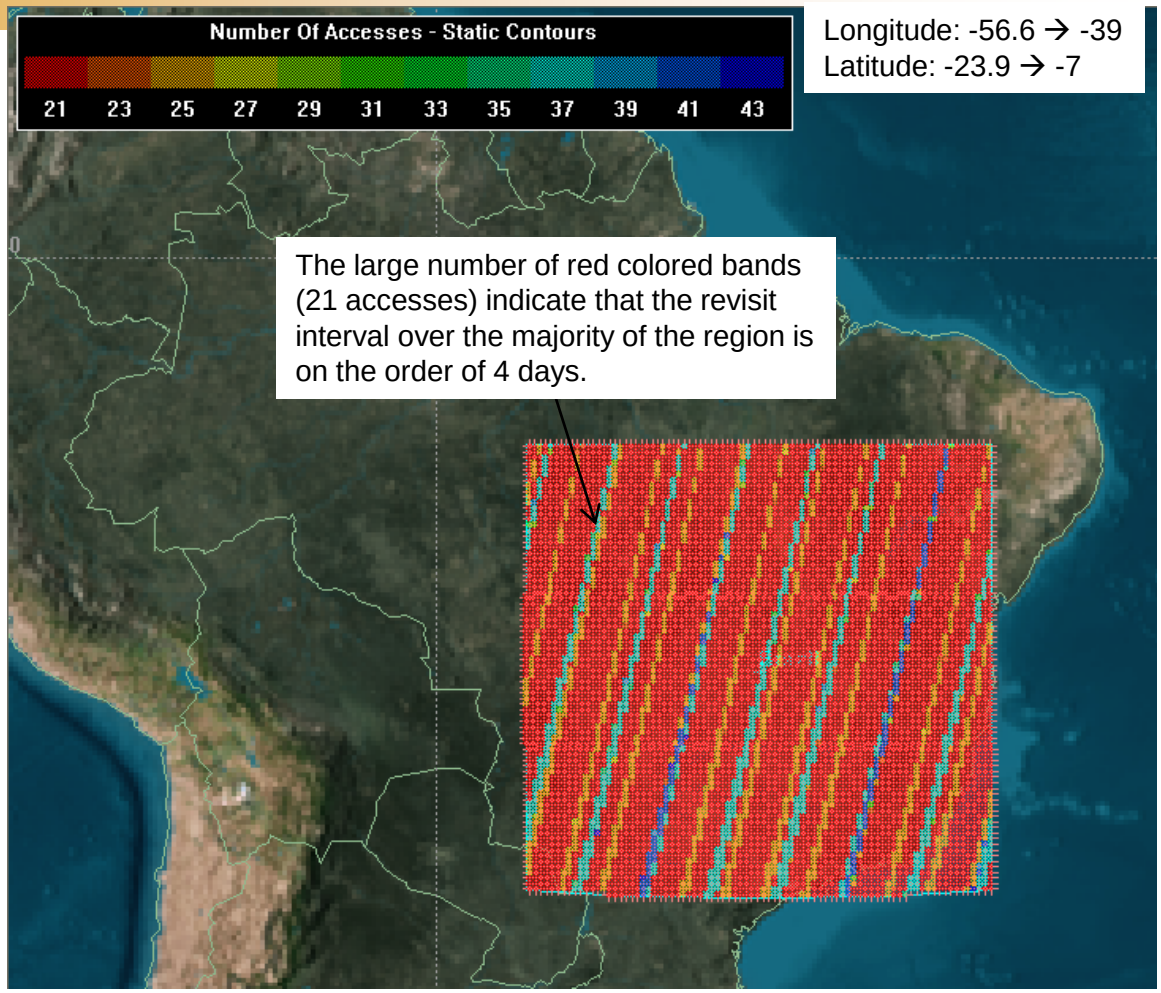
Sentinel 2A and B - LDCM Brazil



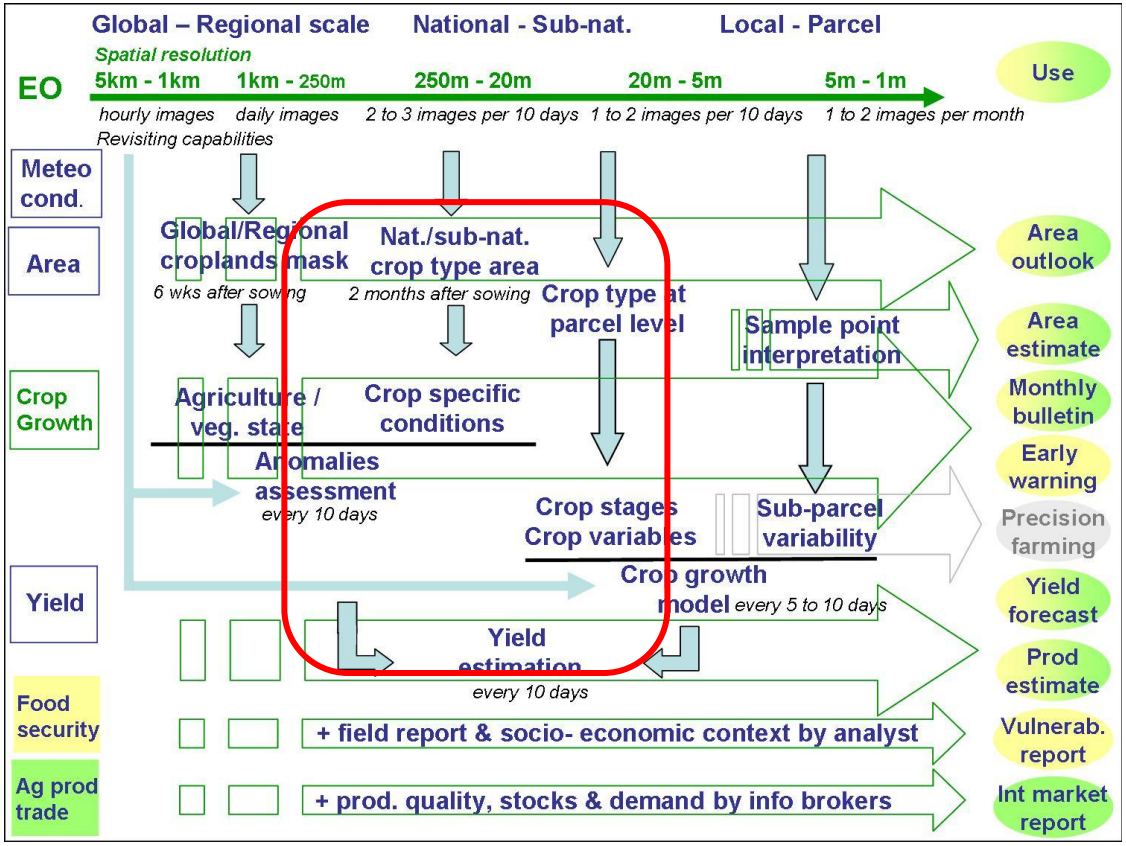
- The picture shows the number of times LDCM and the Sentinel 2 satellites accessed areas on the ground over an 80 day period of time.
  - 21 accesses indicates a maximum revisit interval of ~3 days 19 hours
  - 43 accesses indicates a minimum revisit interval of ~1 day 20 hours

Agricultural Monitoring Needs

- **G20 Ag Ministers requested creation of GEOGLAM (Global Agricultural Monitoring initiative to be implemented by GEO); ratified by CEOS (2011)**

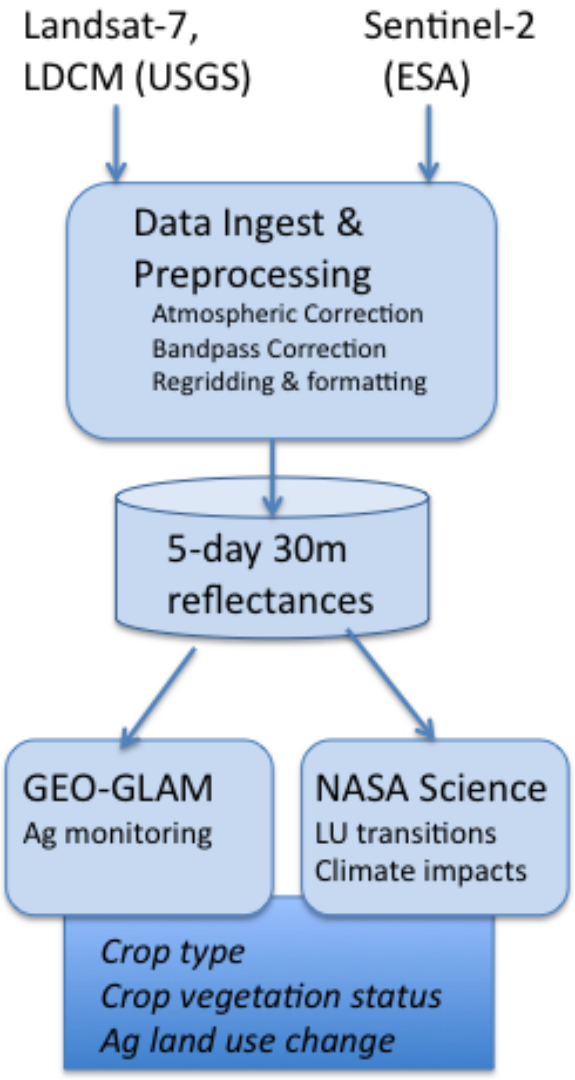
- **GEO requirements include <50m resolution data @ <5 day repeat**
  - crop type
  - field-scale phenology
  - crop health/productivity

moderate-resolution



LDCM-Sentinel Prototype Proposal

- **Goal 1: Prototype consistent, merged Landsat and Sentinel-2 reflectance dataset**
  - *Multi-agency partnership (w/ ESA, USGS, USDA)*
  - *Collaboration with science community*
- **Goal 2: Leverage new datasets for NASA science and GEOGLAM**
- **Goal 3: Support transition to operational agencies**
- **Four year effort (2013 – 2016)**
  - *Phase 1: prototype with limited geographic scope;*
  - *Phase 2: extend to global scales with demonstration of success*

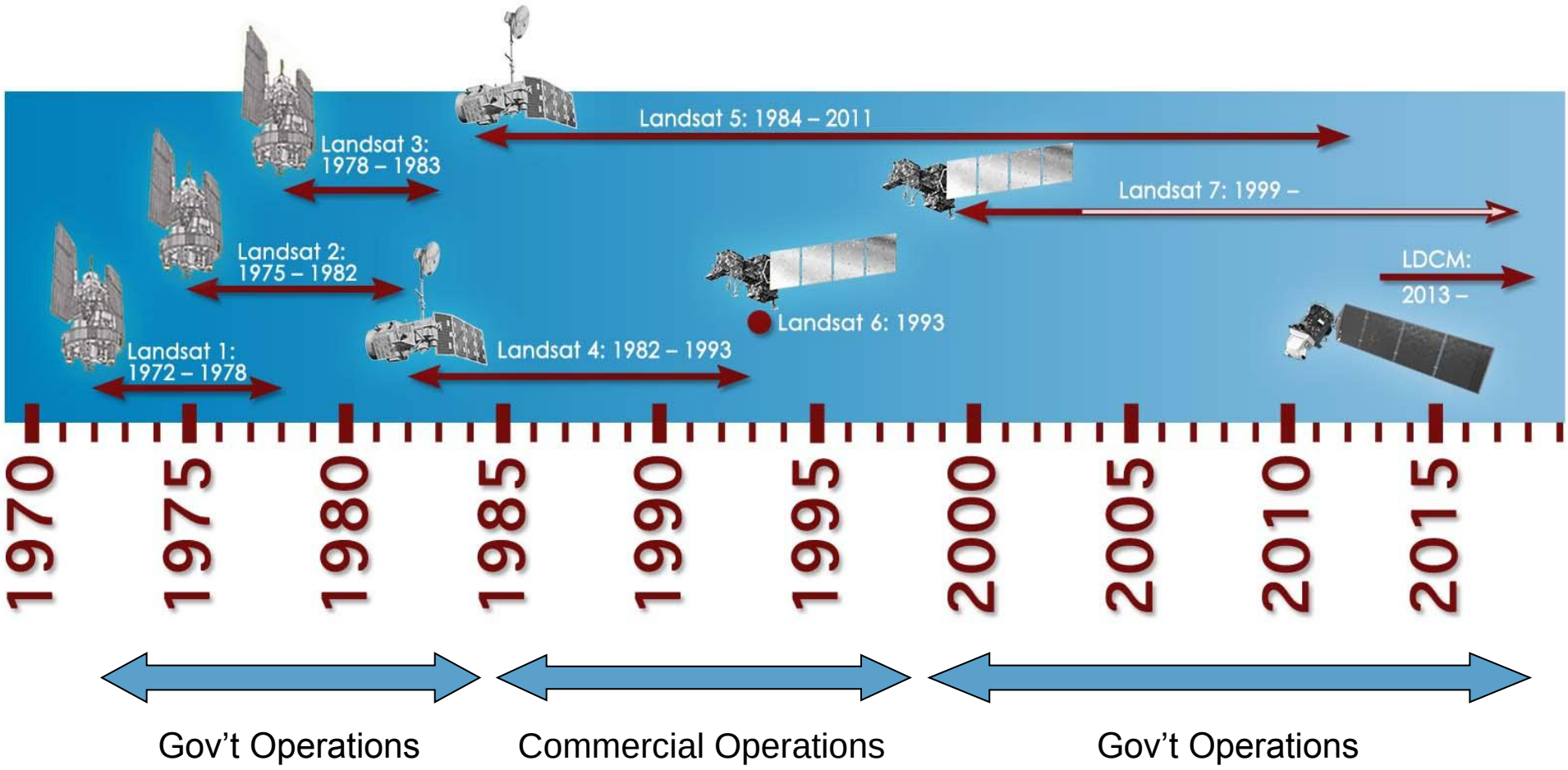


Conclusions

- **LDCM on schedule for January 2013 launch**
  - Successful launch should ensure continuity through 2018+
- **Planning for Landsat-9 continues but outcome is uncertain**
- **Considerable promise in merging Landsat with international data**
  - LDCM & Sentinel-2 launches offer first “daily 30m” opportunity
  - Prototype merged data set feasible, but requires clarification on ESA participation and data policy

Backup

40 Years of Global Land Surface Observations



OLI Spectral Bands