

# NASA Agency Report

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# NASA Landsat Cal-Val Activities

## Summary of Accomplishments

- Completed 40-year calibration for Landsat MSS/TM/ETM+ **reflective bands**
- Completed 30-year calibration for Landsat TM/ETM+ **thermal bands**
- Maintenance of TM/ETM+ absolute calibration through campaigns, special sites, and on-board sources

# First Complete MSS/TM Historical Calibration of Landsat Reflective Record

- Landsat 7 ETM+ serves as the 'Gold Standard'
- Landsat 5 TM cross-calibration to ETM+
- Landsat 4 TM cross-calibrated to Landsat 5 TM
- Landsat MSS series cross-calibrated  
MSS 1→MSS 2→MSS 3→ MSS 4→ MSS 5
- MSS 5 cross-calibrated to Landsat 5 TM

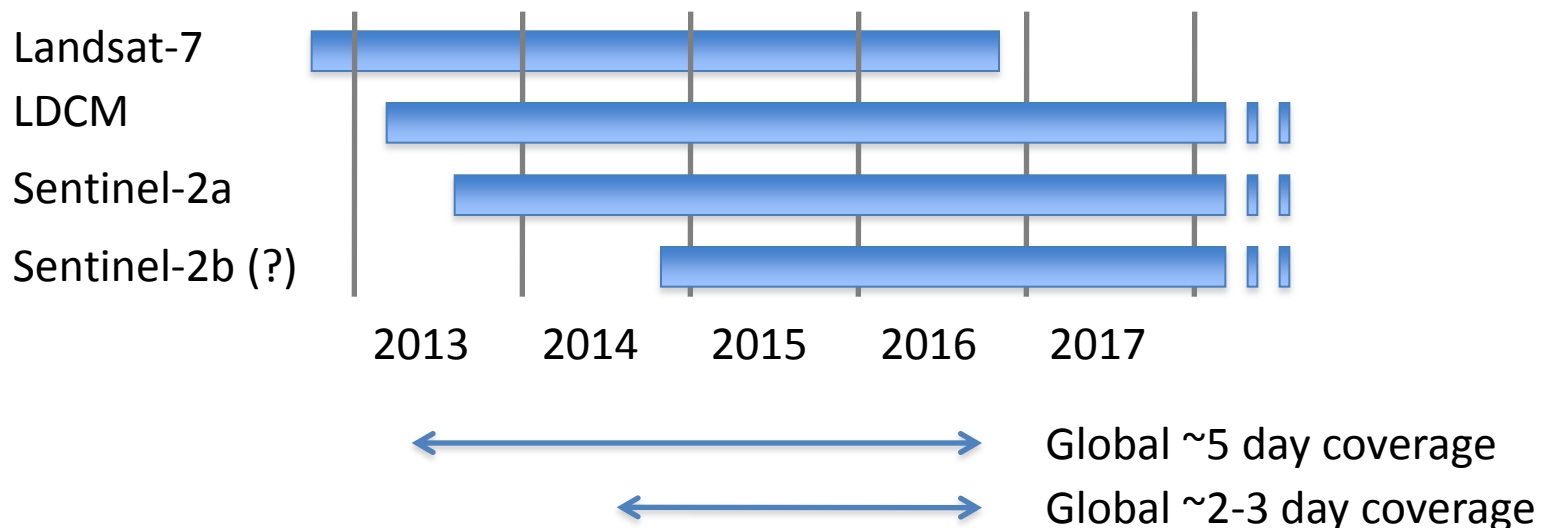
***The new calibration has been incorporated into the USGS EROS Landsat processing system to benefit users***

***-Recalibrated TM data distributed from USGS starting in 2008 and MSS starting October 2010***

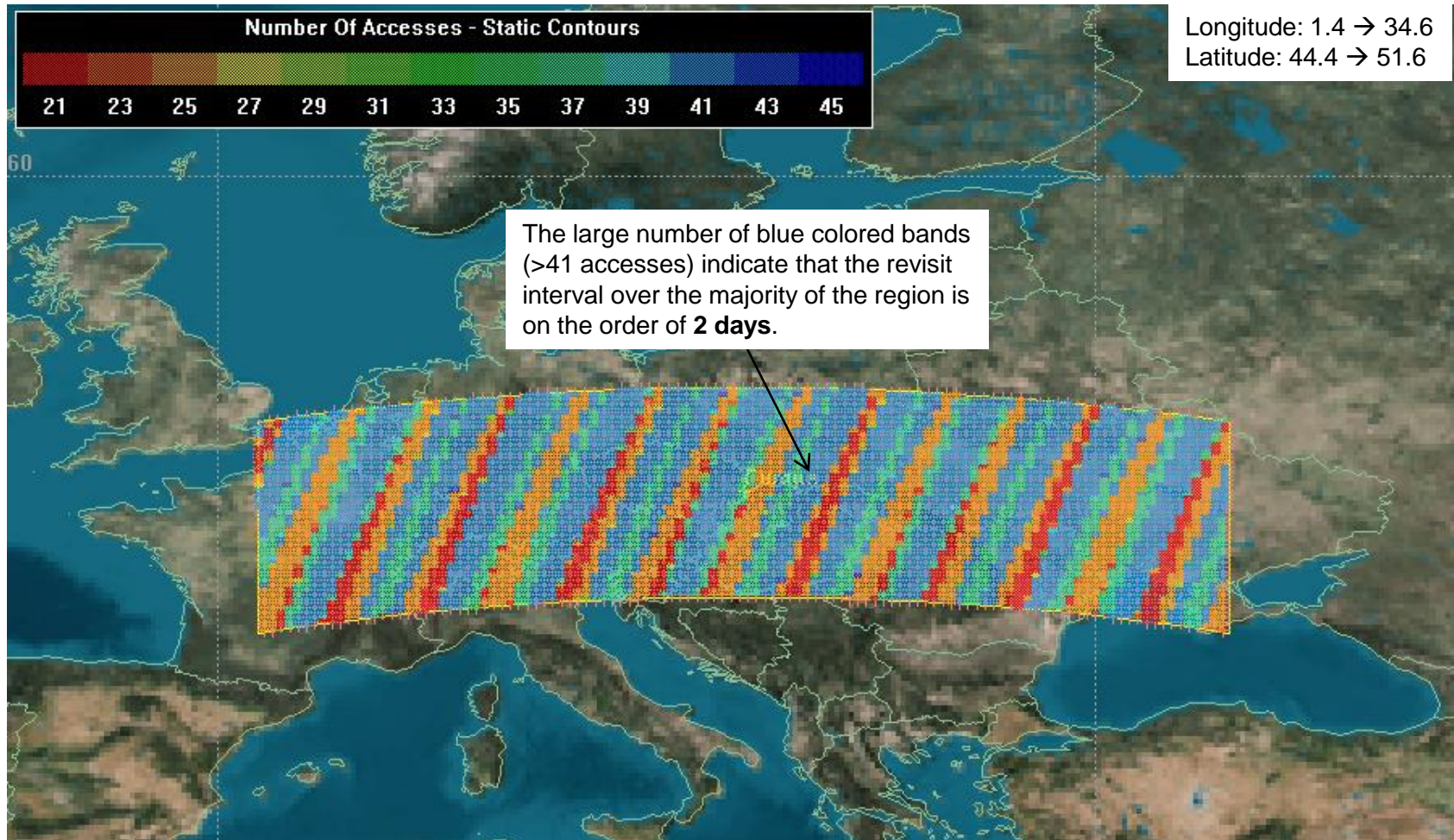
# Sentinel-2 and Landsat Fusion

**Merging Sentinel-2 and Landsat data streams could provide < 5-day coverage required for Ag monitoring**

- Both sensors have 10-30m coverage in VNIR-SWIR
- Satellite orbits complementary
  - Landsat-7 & LDCM 8 days out of phase (16-day revisit each)
  - Sentinel-2a & 2b 5 days out of phase (10-day revisit each)
  - Landsat and Sentinel sun-synch orbits precess relative to each other
- Note that S2 Data Policy and Operations Budget remain TBD



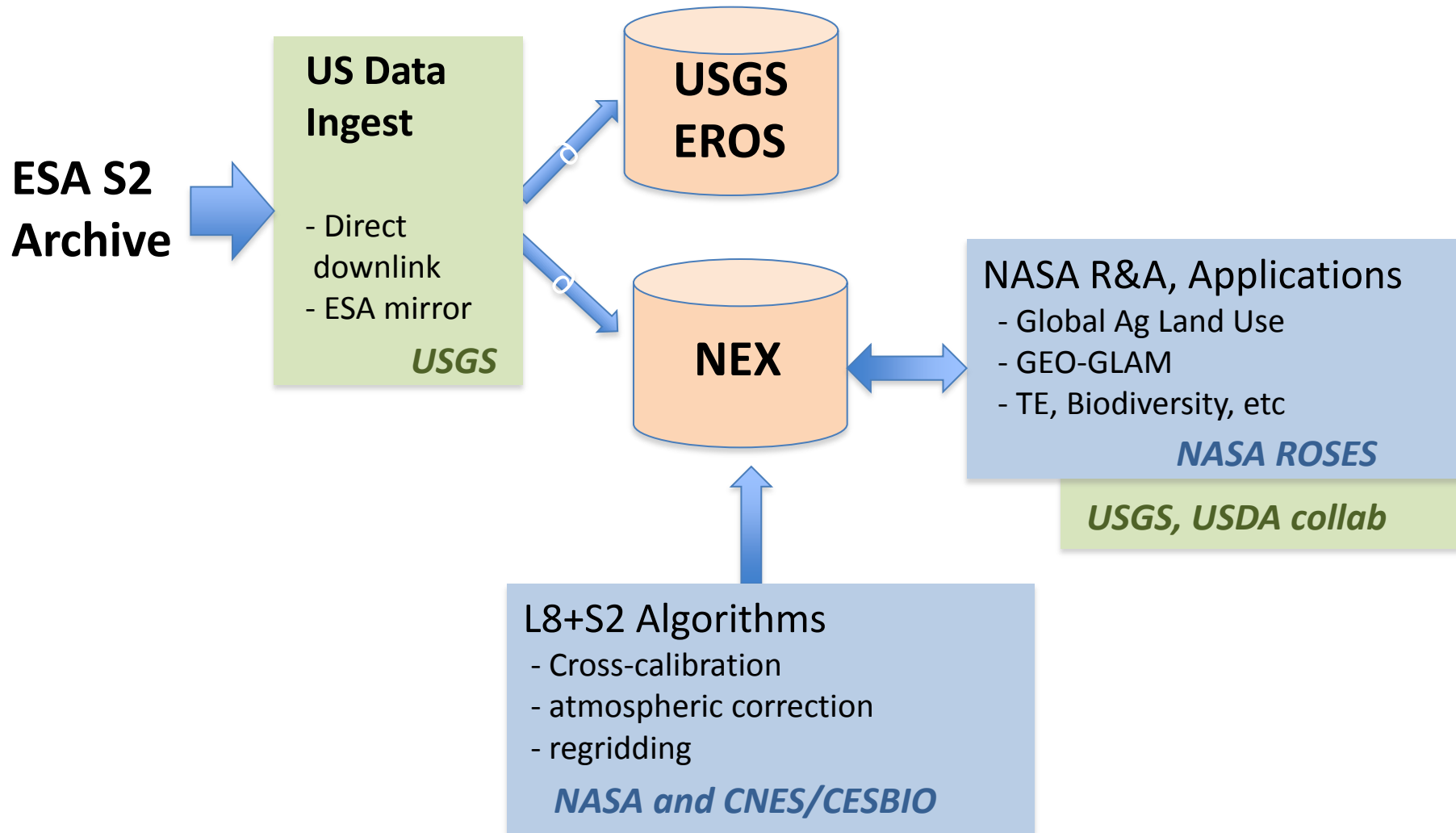
# Sentinel 2A+2B+LDCM over Europe



- 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

*Courtesy Brian Killough,  
CEOS SEO, NASA LARC*

# Proposed Sentinel-2 / Landsat Architecture



# Proposed Activities

1. Develop algorithms to make Sentinel-2 and Landsat/LDCM data *compatible*
  - X-cal, atmospheric/bandpass corrections, regridding; goal is “seamless” near-daily 30-m reflectance record
  - Collaboration with CESBIO/CNES
  - Initial prototyping with Landsat-7, LDCM, and 5-day SPOT-4
2. Support USGS in securing access to Sentinel-2 data for US investigators
  - Discussions between USGS and ESA ongoing
  - Option to mirror ESA archive at EROS & NEX (NASA Ames; ~1TB/day L1C data)
3. Pursue prototyping GEOGLAM agricultural monitoring (crop area, type, condition)
  - Collaborate with USDA FAS, USGS, JRC MARS
  - Phased approach: test sites -> large-area

# Backup Charts



# ESA

- Access to MSI Radiometric Calibration Sources used for radiance calibration of MSI with current radiance calibration information for 2 two week periods: one near the focal plane calibration time; one near the instrument calibration time.
- With multiple radiometers viewing the calibration source at different radiance levels; it helps to have a translatable mounting surface that can move the radiometers in front of the source in a reproducible manner, so that each radiometer does not need to be realigned for each radiance level.

# NASA

- Transfer radiometers covering the visible, near-infrared and short-wave infrared spectrum
  - NASA/GSFC Landsat Transfer Radiometer (visible – NIR)
  - University of Arizona VNIR Transfer Radiometer
  - University of Arizona SWIR Transfer Radiometer
  - NIST Visible Transfer Radiometer
  - NASA, University of Arizona and NIST ASD Spectrometers
  - NIST spectrometer
- NIST NPR portable integrating sphere source with current radiometric calibration
- Calibration history for each instrument and source and results of comparison to OLI calibration source
- Set up measurement plan; sphere levels to measure (at least one that is useful in each spectral band), instruments to use, alignment/mounting techniques to use

# Calibration Schedule

- Pre-deployment activities
  - NPR calibration at FASCAL on Sep 18
  - US radiometers calibration measurements / pre-ship equipment checkout on Oct 9-12
- Equipment to be shipped from GSFC on Oct 18
- Deployment dates: Nov 12 – Dec 7