Landsat Calibration and Validation Activities, Status, and Issues

Landsat Science Team Meeting January 9th, 2007

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Landsat Cal Val Task Lead

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Topics

- Landsat Calibration Team
- Landsat Calibration Overview
- Image Assessment System (IAS)
- Landsat 7 Calibration
- Landsat 5 Calibration
- Future Calibration Efforts
- IGS Data Validation and Exchange
- Spacecraft / Sensor Anomaly Investigations

Landsat Cal Val Personnel

- **USGS EROS Calibration Team**
  - Radiometry / Thermal
  - Geometry
  - Spatial
  - IGS DV&E
- **GSFC LPSO**
  - Radiometry / Thermal
  - Vicarious Calibration
- **Vicarious Calibration**
  - Ground Truth
- **South Dakota State University**
  - TM Cal Development
  - MSS Cal Development
  - TM & MSS Operations

Radiometry

Pat Scaramuzza

Gyanesh Chander

Esad Micijevic

Geometry / Spatial

Jim Storey

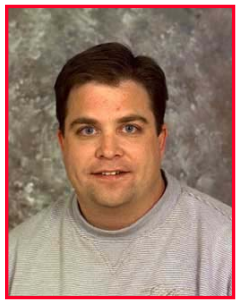
Raj Rengarajan

Mike Choate

IGS DV&E

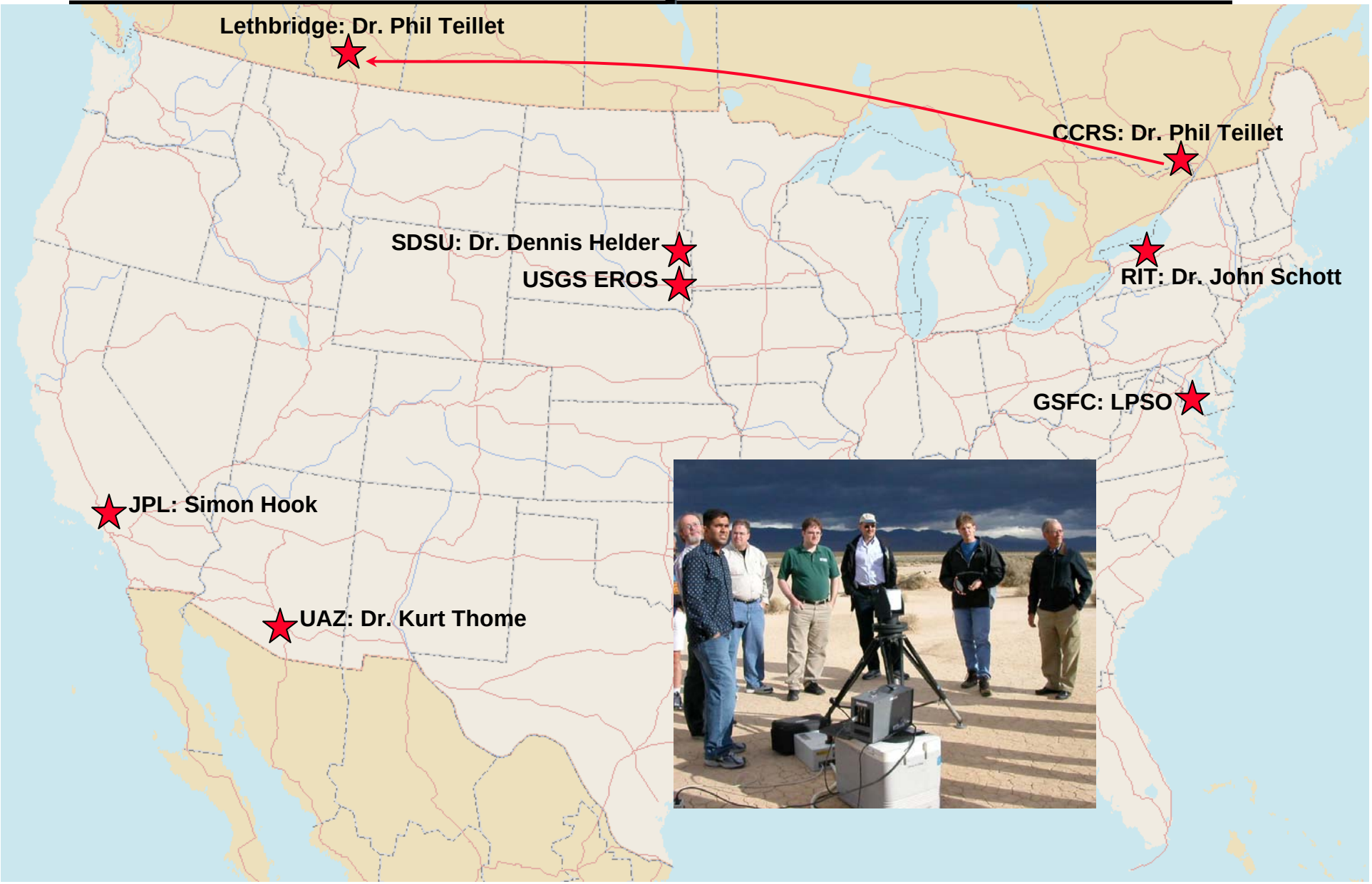
Rynn Lamb

Task Lead



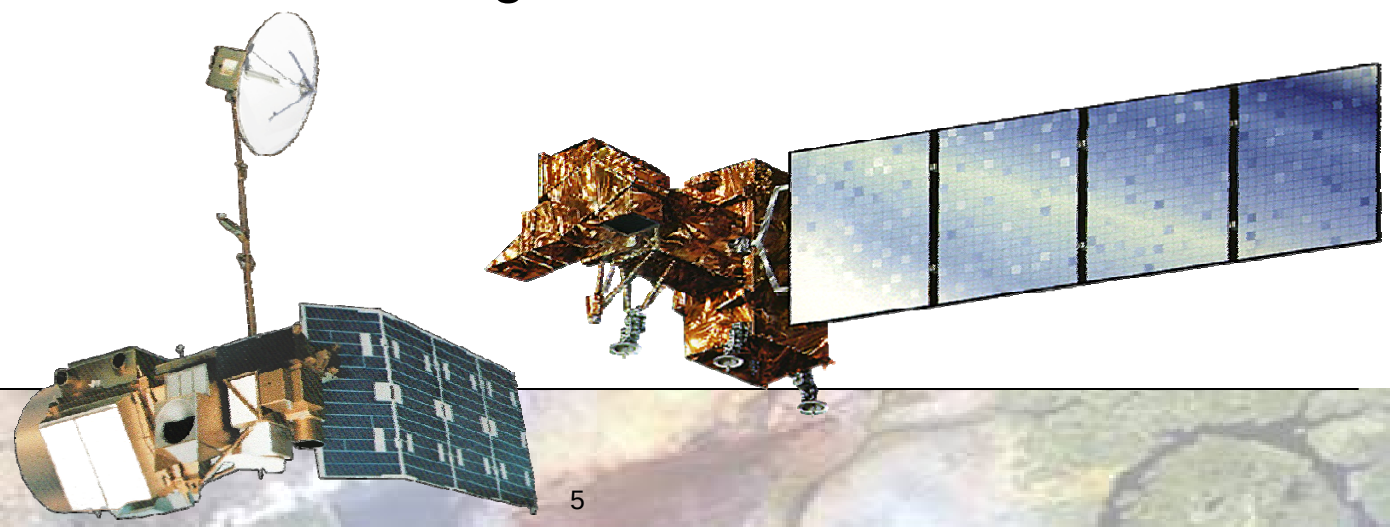
Ron Hayes

EROS / LPSO / Vicarious Calibrations Group



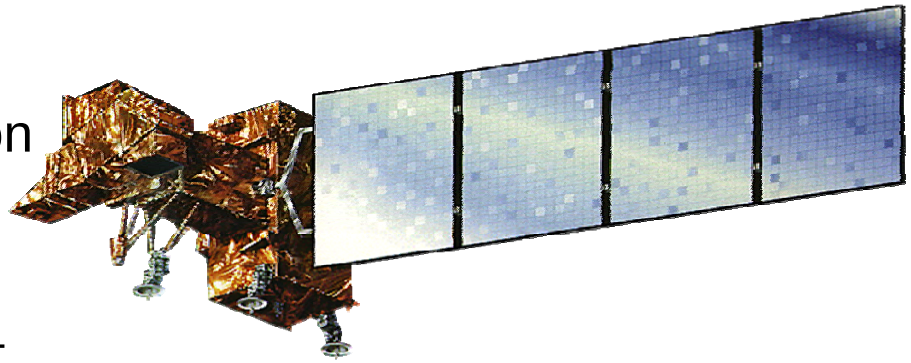
Landsat Calibration Overview

- **Characterize sensor performance**
  - Conduct Daily Calibrations on L5 and L7 using IAS
  - Populate a Trending Database
  - Create Calibration Parameter Files (CPF's)
  - Validate Calibrations with Vicarious data collections
  - Publish results
- **Develop characterization, correction and calibration algorithms**
- **Monitor Health and Welfare of the Systems (Anomaly Resolution)**
- **Data Validation and Exchange for International Ground Stations (IGS's)**



Calibrations for L7 with IAS

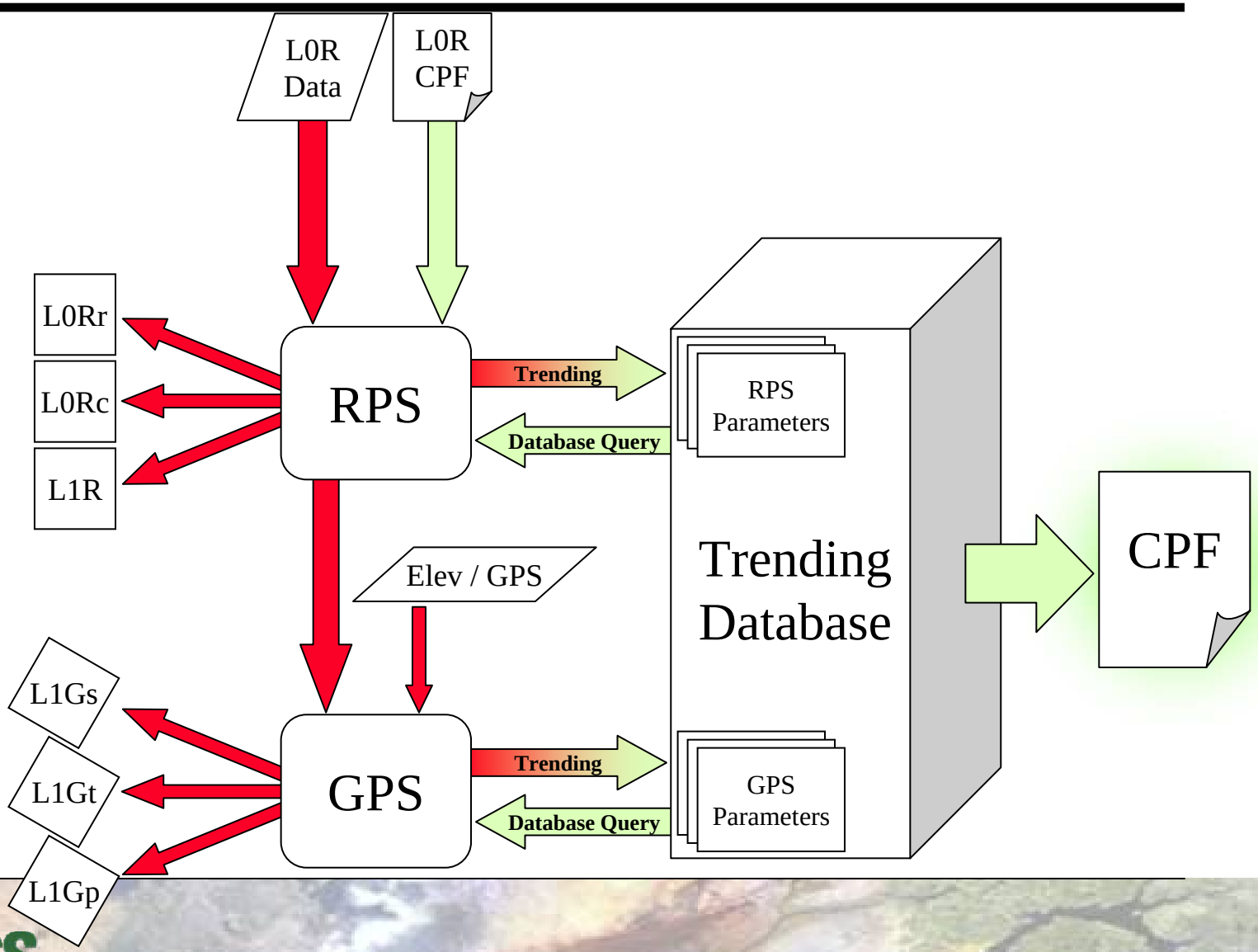
- **Radiometric**
  - L1r Day Characterization
  - L1r Night Characterization
  - Full Aperture Solar Calibration
  - Partial Aperture Solar Calibration
  - Coherent Noise Analysis
- **Geometric**
  - Geodetic Accuracy Assessment
  - Band to Band Alignment
  - Sensor Alignment
  - Scan Mirror Calibration / Bumper Mode
- **Spatial**
  - MTF Characterization



Calibrations for L5 with IAS

- **Radiometric**
  - L7 Cross Calibration
  - Outgassing Correction
  - Look-up Table (LUT)
  - Coherent Noise Analysis
  - L1r Day Characterization
  - L1r Night Characterization
- **Geometric**
  - Bumper Mode Mirror Calibration
  - Geodetic Accuracy Assessment
  - Band to Band Alignment
  - Sensor Alignment
- **Spatial**
  - MTF Characterization

Internal IAS Processing



Upcoming IAS Releases

- **IAS 7.1.3 Bumper Mode Release**
  - In production 1/08/07
  - BM Physical Model Gap Phased Stats Generation
- **IAS 8.0 multi-mission architecture**
  - Scheduled for production 5/3/07
  - CPF update: Add bumper mode daily parameters
  - LPGS to follow this summer
- **IAS / next: L4 TM Calibration (SDSU starting now)**
- **IAS / next: MSS all Calibration (Feasibility Fall 2007)**

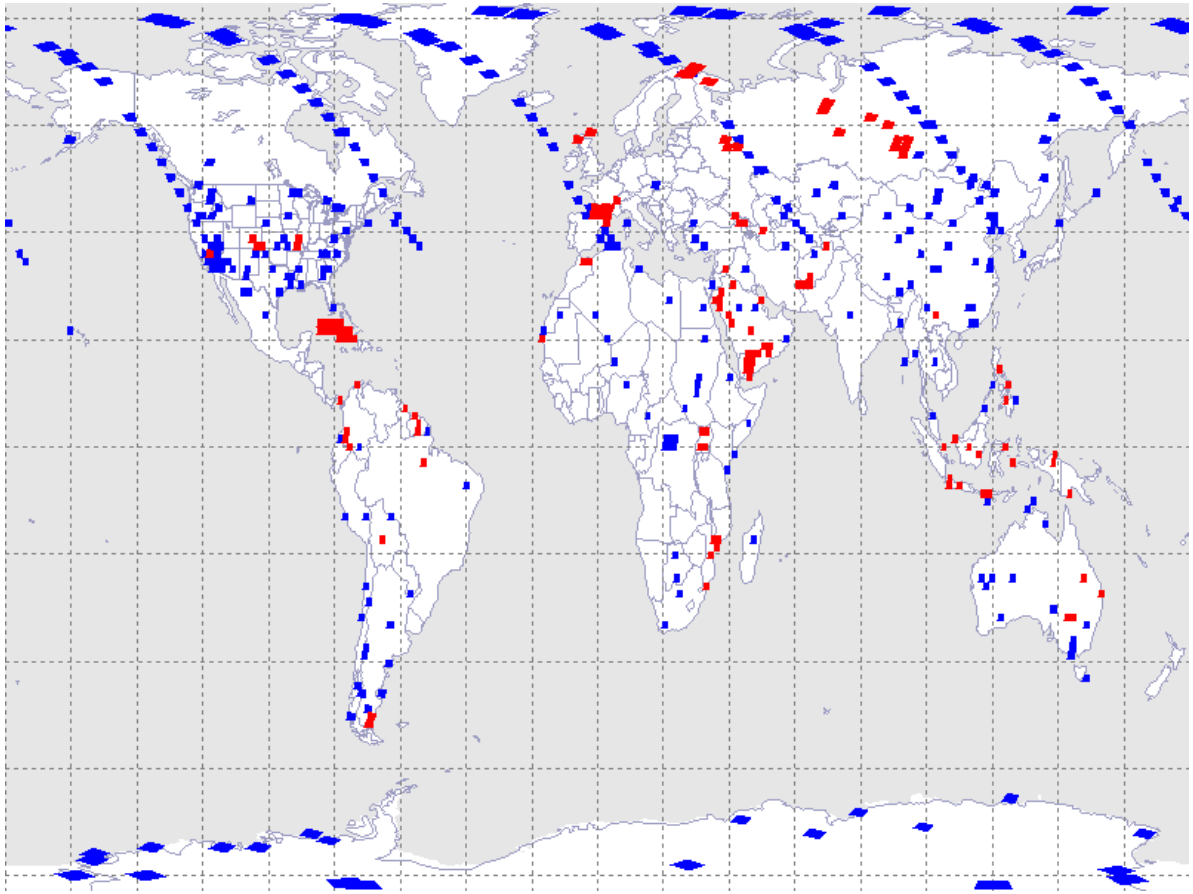
Landsat 7 Calibration

- **Geodetic Accuracy**
- **Band 2 Band**
- **MTF Characterization**
- **Radiometric Assessment**
- **Thermal Band Assessment**
- **PASC / FASC Analysis**
- **IGS RCC / L0r Data Validation & Exchange**
- **IGS L1 Data Validation & Exchange**
- **IGS Mission Wide Metadata exchange**
- **CPF generation / publication**
- **Product Validation / Technical assistance**

Scene Trending -- October, 2006

309 LPGS ingests

351 IAS ingests



LPGS ingests **IAS ingests**

Landsat 5 Calibration

- **TM Calibration Development with SDSU and EROS**
- **Bumper Mode Calibrations**
- **L5 Recalibration Activity**
- **Working with ESA to provide Invariant Site Calibrations over Libya**
- **L5 LUT update**
- **L4 and L5 TM OG icing correction improvements**
- **L5 TM thermal band absolute calibration corrections**
- **CPF parameters and definition document**
- **Fixed Solar Array operations**

Future Calibration Efforts

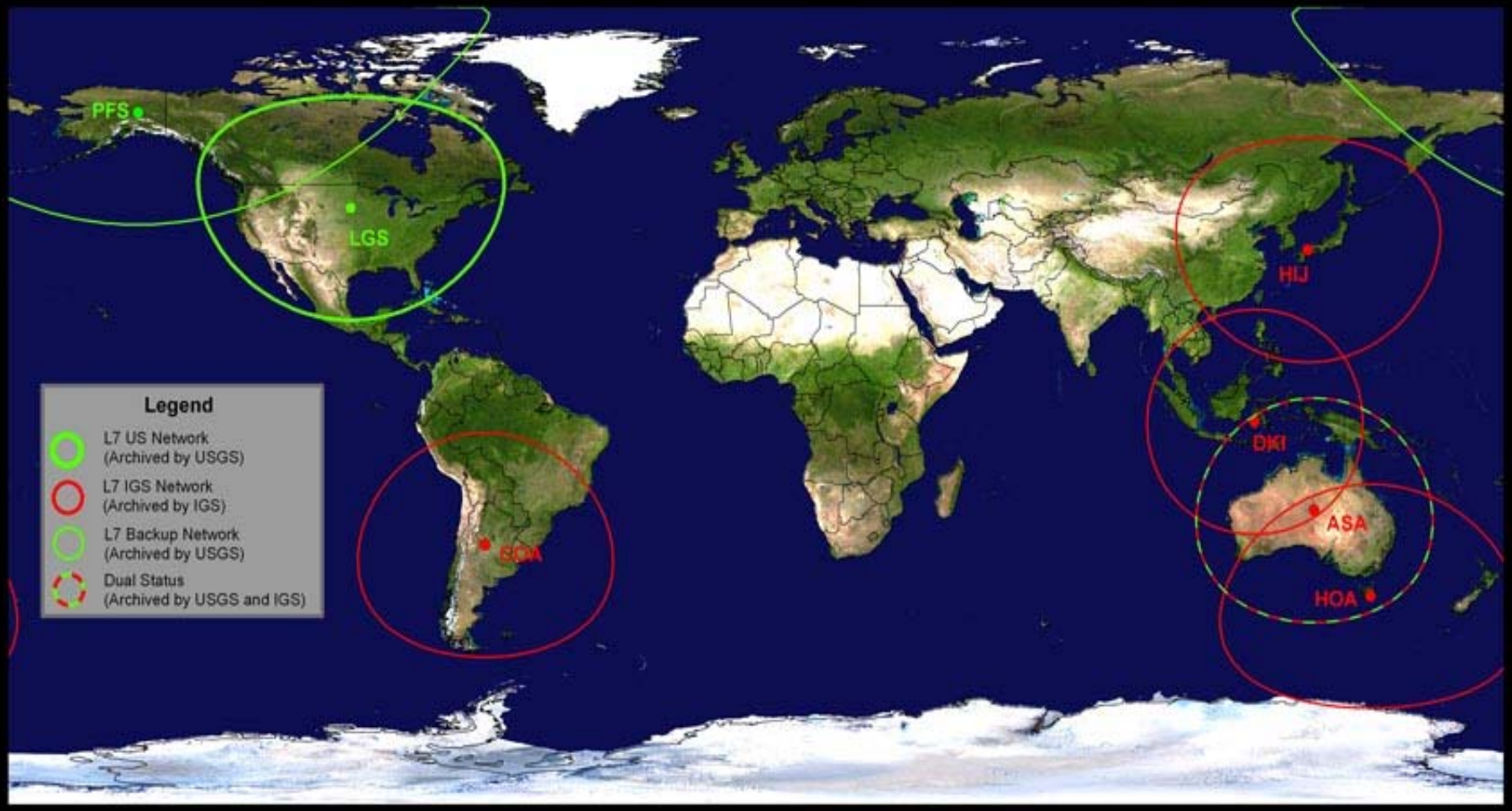
- **SDSU to complete development for L5 TM**
- **EROS to work on L5 TM geometry development**
- **EROS to work on L7 Bumper Mode characterization**
- **SDSU to begin work on L4 TM development**
- **SDSU to begin MSS calibration feasibility study**
- **Landsat Mission Gap potential work**
- **Work with Landsat Science Team on Calibration Concerns / specific issues with data continuity**

IGS Data Validation & Exchange

- **L7 DV&E**
  - Currently supporting 4 International and 3 USGS network stations
- **L5 DV&E**
  - Currently supporting 10 International and 3 USGS network stations, 3 mid-decadal campaign, 2 mid-decadal proposed
  - New L5 stations: Mexico (Chetumal), ESA/Malindi (Kenya), Maspalomas, Russia (Irkutsk and Moscow),
- **Metadata Exchange**

Landsat 7 Network

Landsat 7 Ground Station Network



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

Status of Landsat 7 stations current as of 7 October, 2006.

Landsat 5 Reception Network

USGS
science for a changing world

Landsat 5 Ground Station Network

Currently supporting 10 International and 3 USGS network stations, 3 mid-decadal campaign, 2 mid-decadal proposed

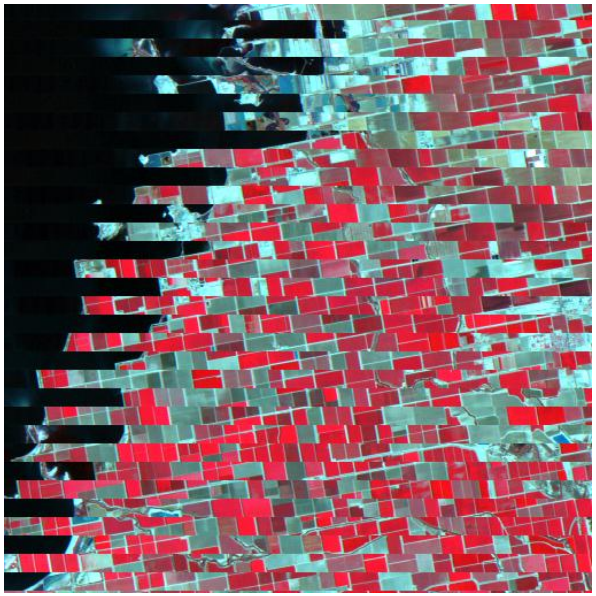
New L5 stations: Mexico (Chetumal), ESA/Malindi (Kenya), Maspalomas, Russia (Irkutsk and Moscow),

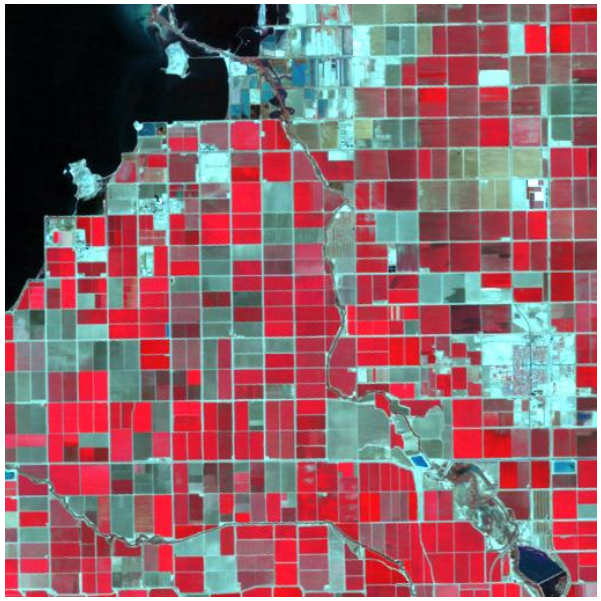
U.S. Department of the Interior
U.S. Geological Survey

Status of Landsat 5 stations current as of 7 October, 2008.

Spacecraft / Sensor Anomaly Investigations

- **The Calibration group is relied on for Sensor and data expertise for Anomaly resolution**
  - Attitude data is effected by some anomalies
  - Image data analysis
- **Bumper Mode on L7**
  - Ensure we can process
  - Align Scans
  - Update CPF's





Questions?