

Landsat Data Gap: Issues and Potential Solutions

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Introduction: Current Status

- The GEOCOVER-2000 30-m orthorectified Landsat dataset is publicly available
- A Global Mid-Decadal Land Survey is needed for studying changes since 2000
- Landsat-7 coverage is global, but each scene has data gaps
- Landsat-5 coverage is not global and the satellite is 20-yr old!

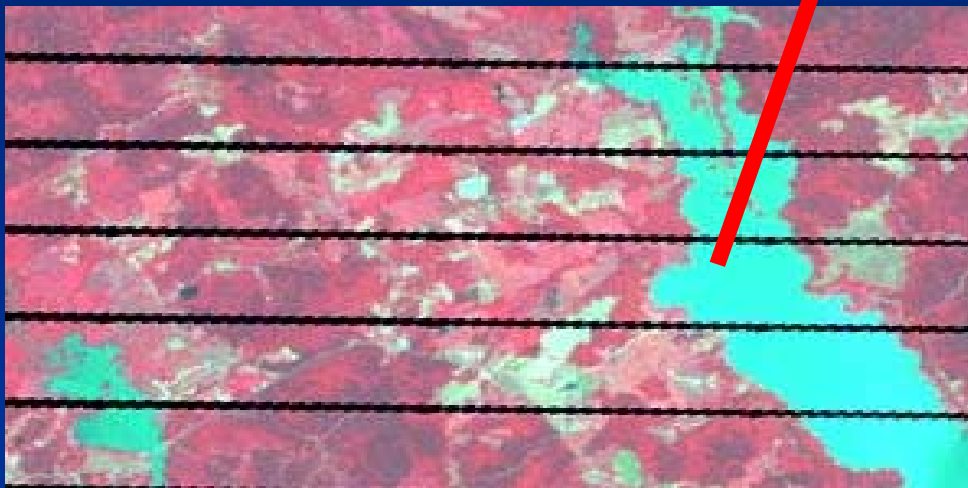
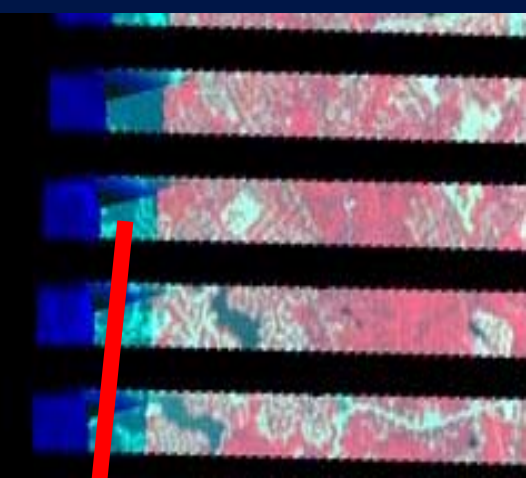
Introduction: Future Prospects

- In 3 years(2008-2009)
 - Landsat-5: out of fuel
 - Landsat-7: high risk of a gyro failure
- No firm plans for next Landsat
 - NPOESS/OLI unlikely
 - LDCM free flyer is probable (cautious optimism)
- Strategy for a 2010 global dataset is needed

Landsat-7: Current Status

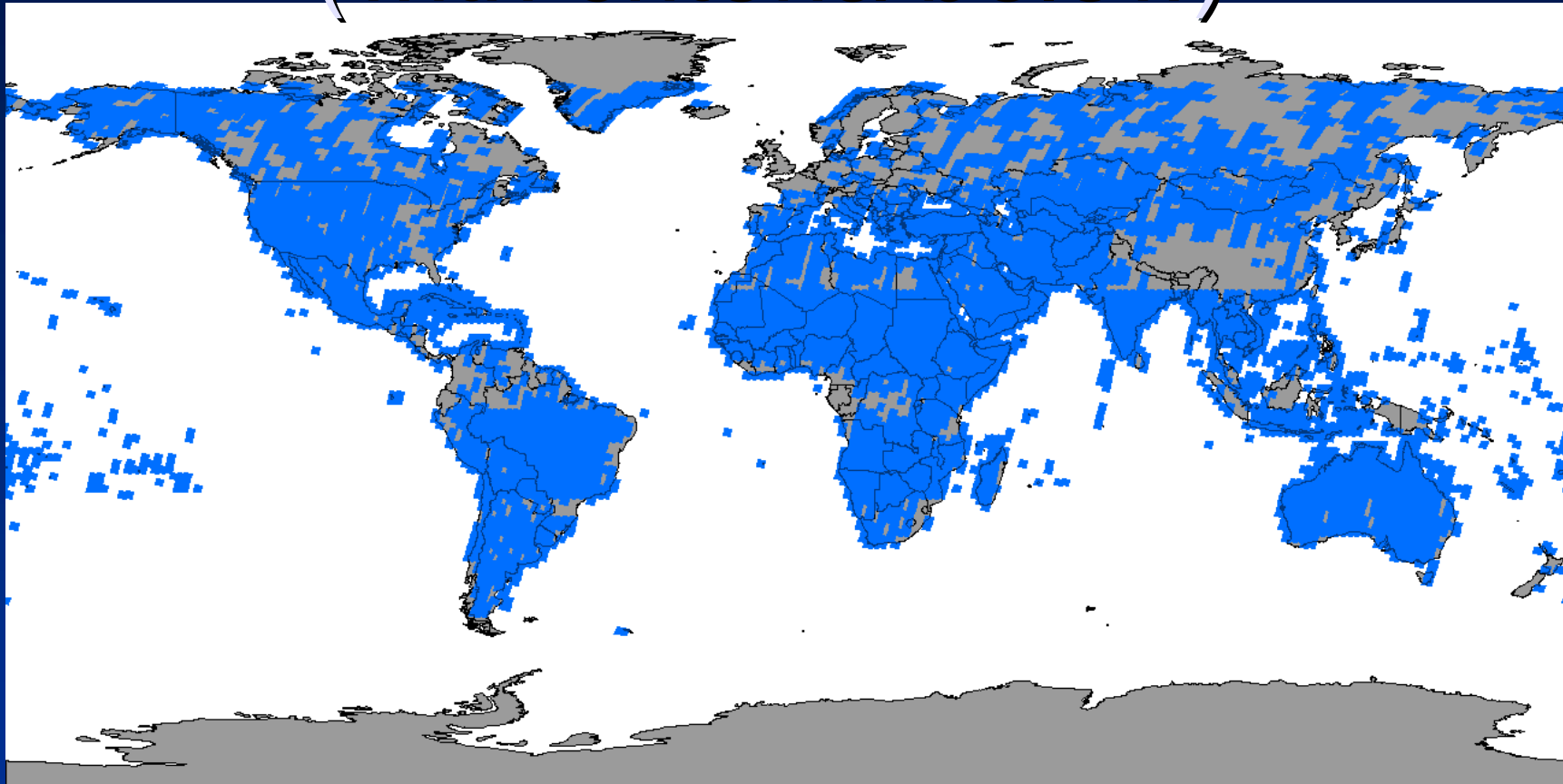
- Landsat-7 data alone are insufficient for producing high-quality, regional-to-global LCLUC products
 - Scan Line Corrector failed (end of May 2003)
 - L-7 composites from 2-3 consecutive images are still inadequate for LCLUC studies in areas with persistent clouds and/or significant seasonal changes

Landsat-7 Scan Line 'non-correction' problem



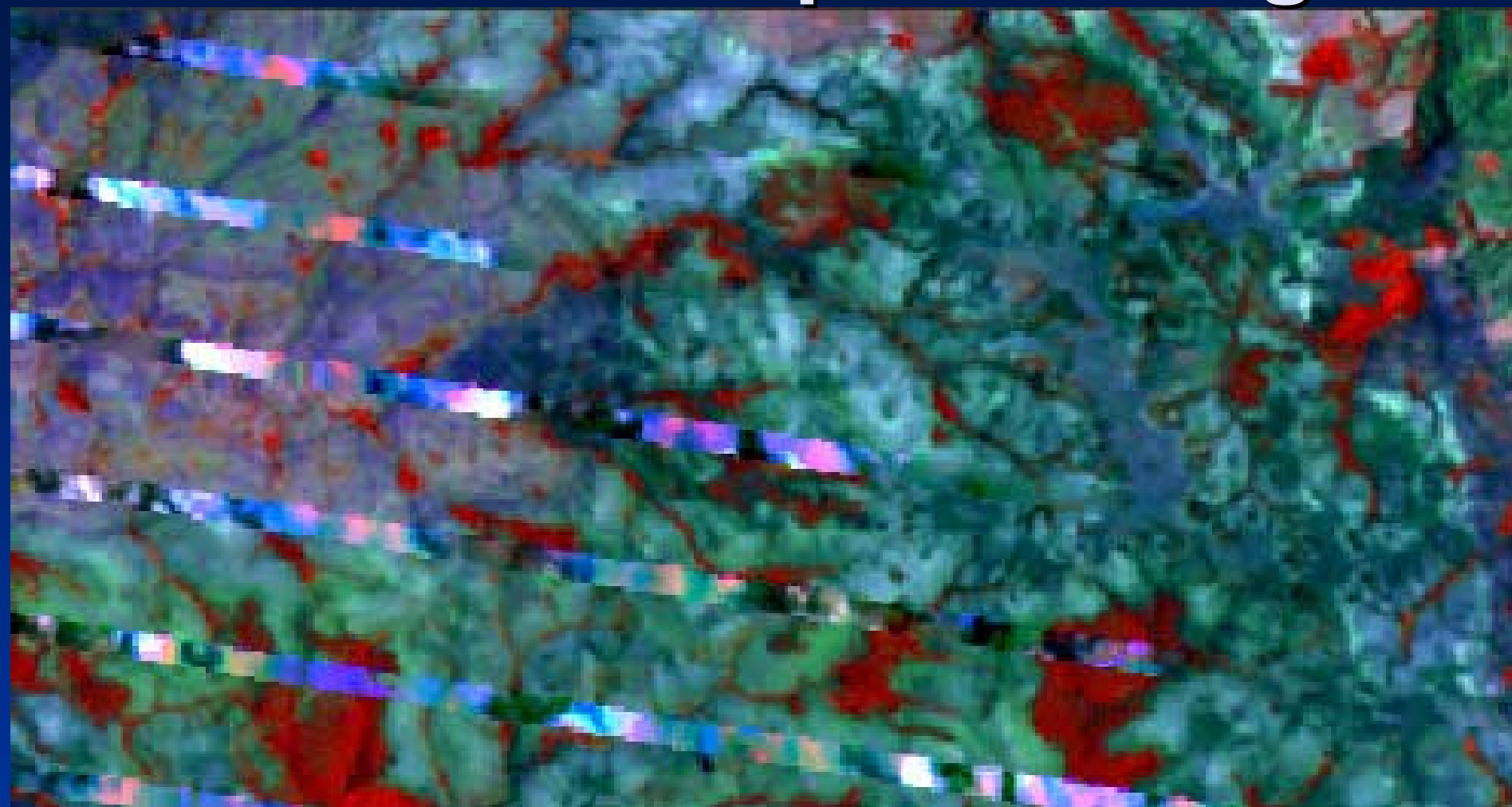
**Seriously degraded
data since 6/1/2003...**

L7 Global Coverage (with criteria below)



- Primary scene with $<10\%CC$, filler with $<20\%CC$, $>95\%$ coverage
 - Primary scene accounts for 78% of image area

Landsat-7 composite image



L-7 composite artifacts from gaps, clouds, and varying phenology
for Path 158 Row 70: Primary scene is 01.27.05, 2nd 02.12.05, 3rd
06.01.04, 4th 05.16.04, and 5th 11.24.04

L-5 is Alive and Kicking!

- Landsat-5 (20-yr old!) is a natural alternative with excellent-quality **but** data that are not centrally collected (as it is done for L-7)
- There is a set of international cooperators to deal with for getting data
- Landsat-5 coverage from the ground receiving stations is not global – there are gaps, and to fill them some steps should be taken

Path/row

158/70



158/71



158/72

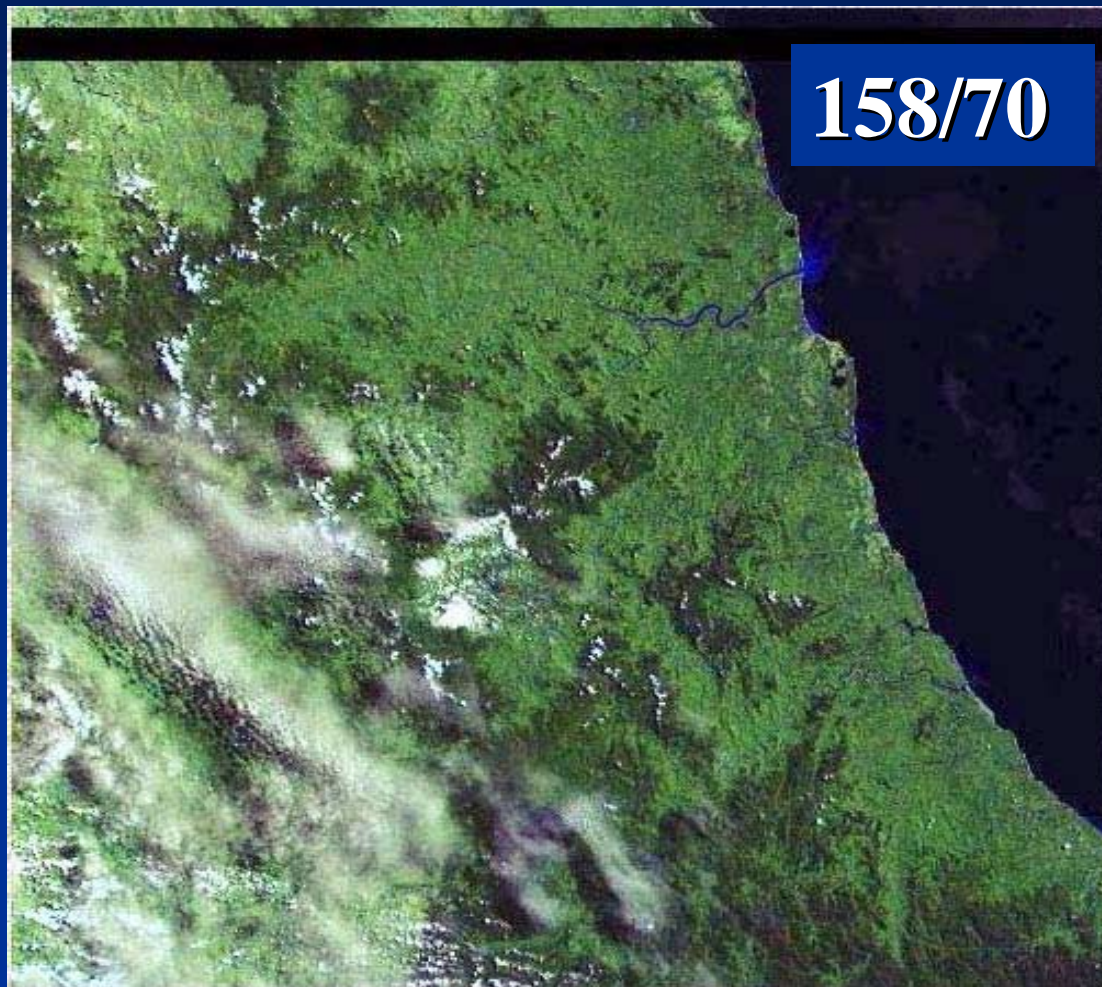


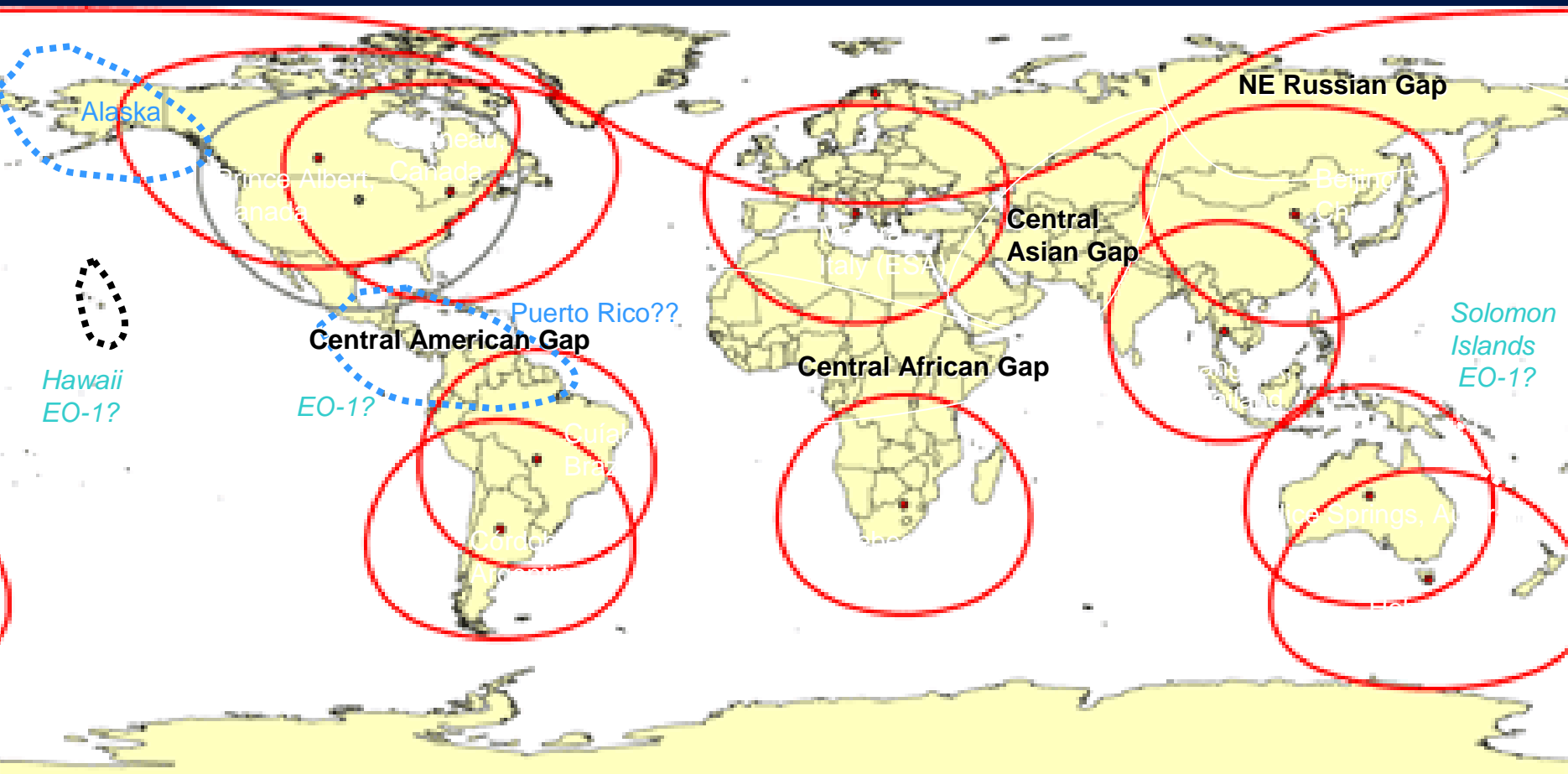
158/73



Quick looks (ZA)

**Landsat-5 from 2005
from Madagascar
'browsed' in June 2005**





Landsat-5 data are being collected by ground stations

Red - Landsat-5 coverage from International Cooperators

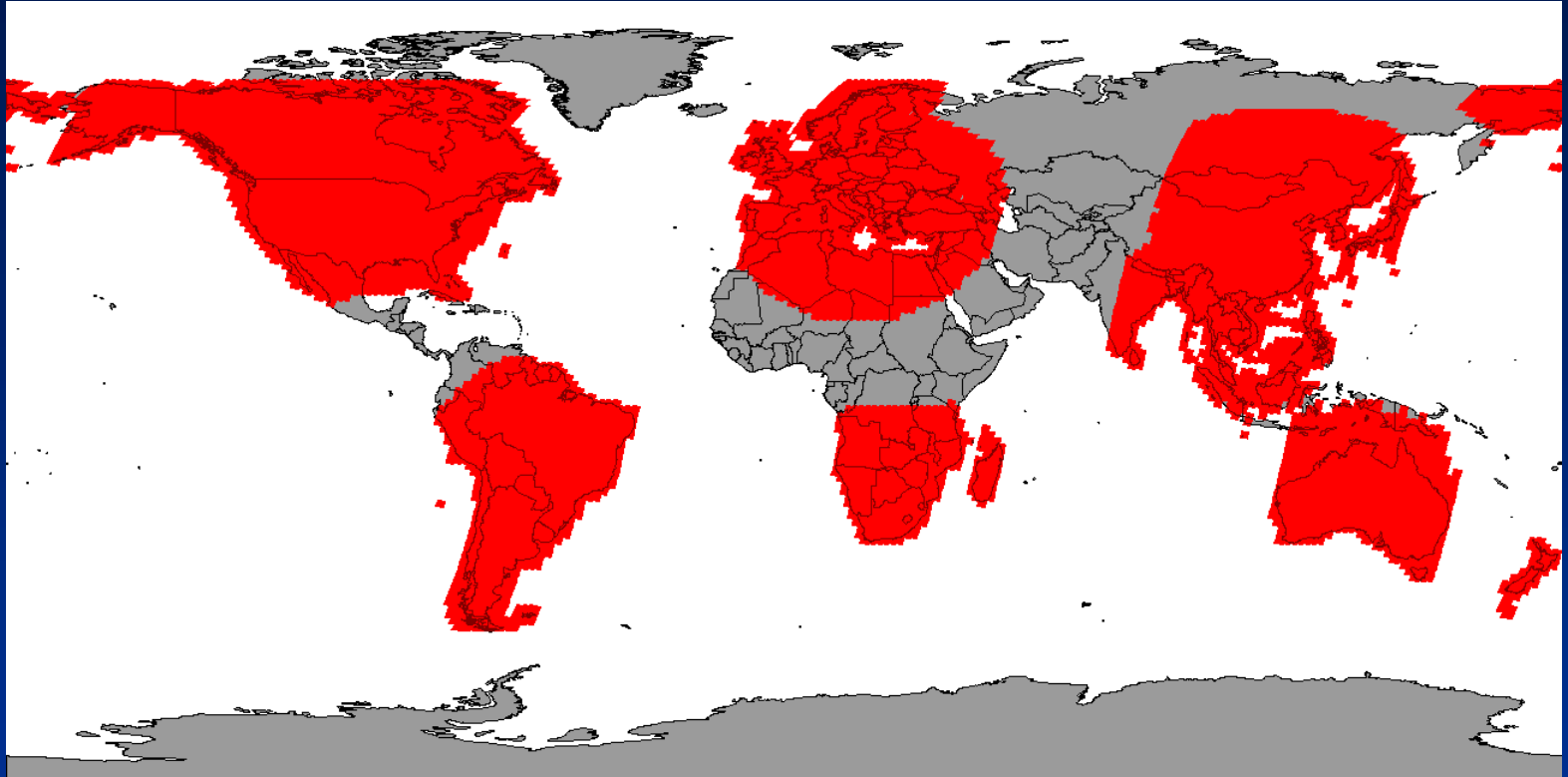
Gray - EROS L-5 coverage data

Black dotted lines: potential EO-1 contribution

Cian dotted lines: potential coverage from the existing stations

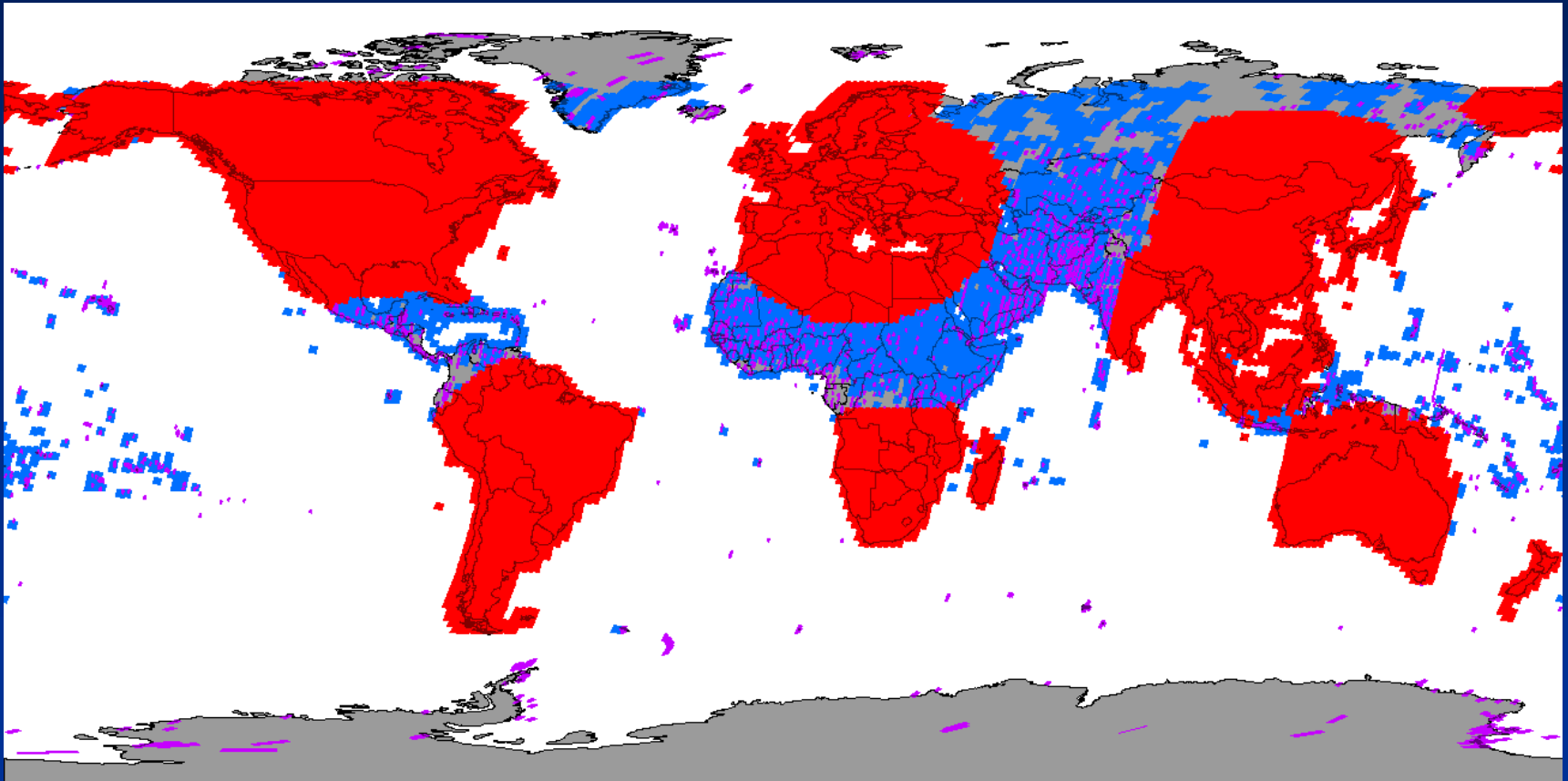
Black solid lines: existing L-5 coverage gaps

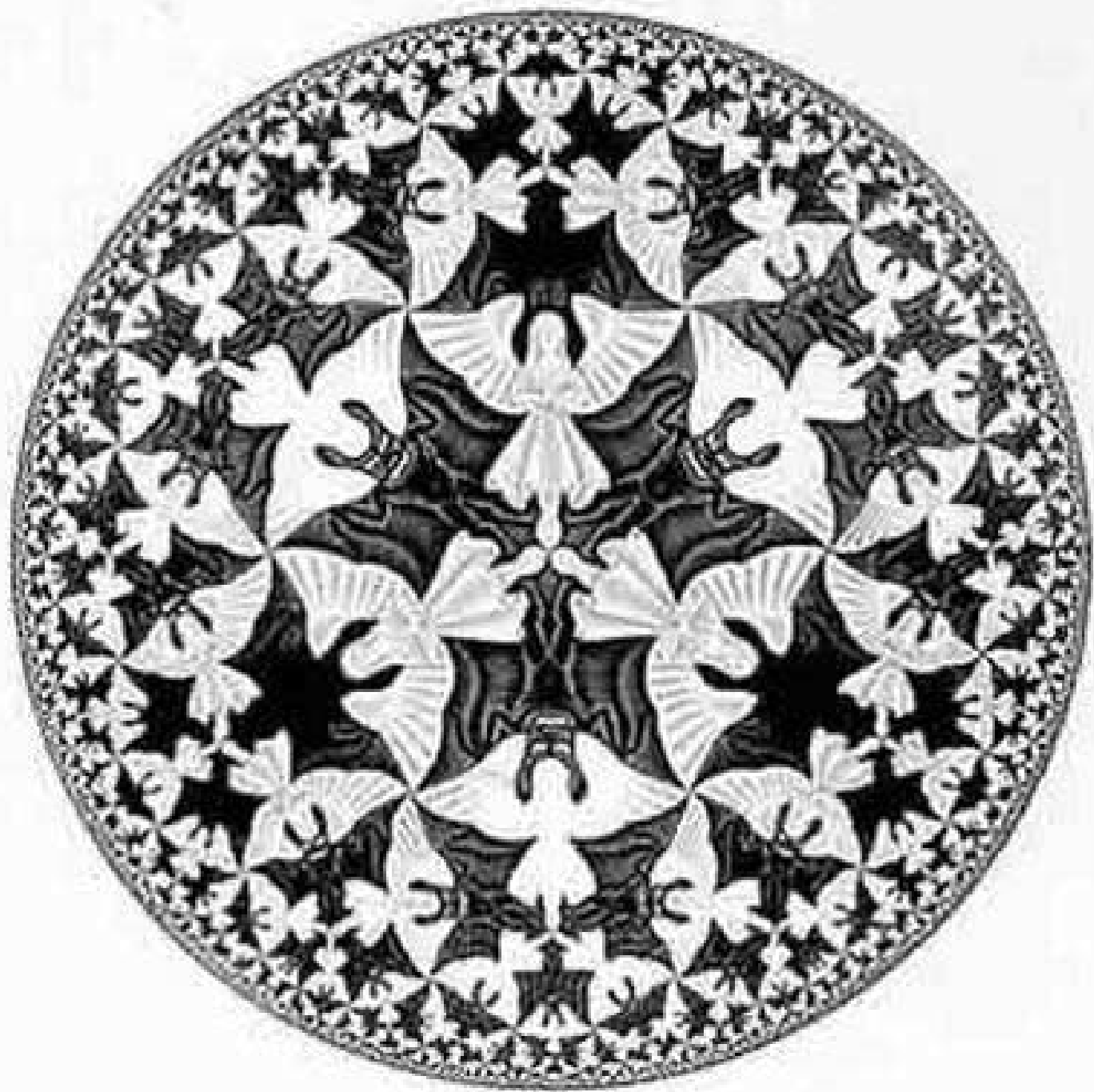
Actual Landsat 5 Coverage



L5/L7 Combined Coverage

- Almost 2/3rds through the imaging opportunity, 87% of the globe has been covered.

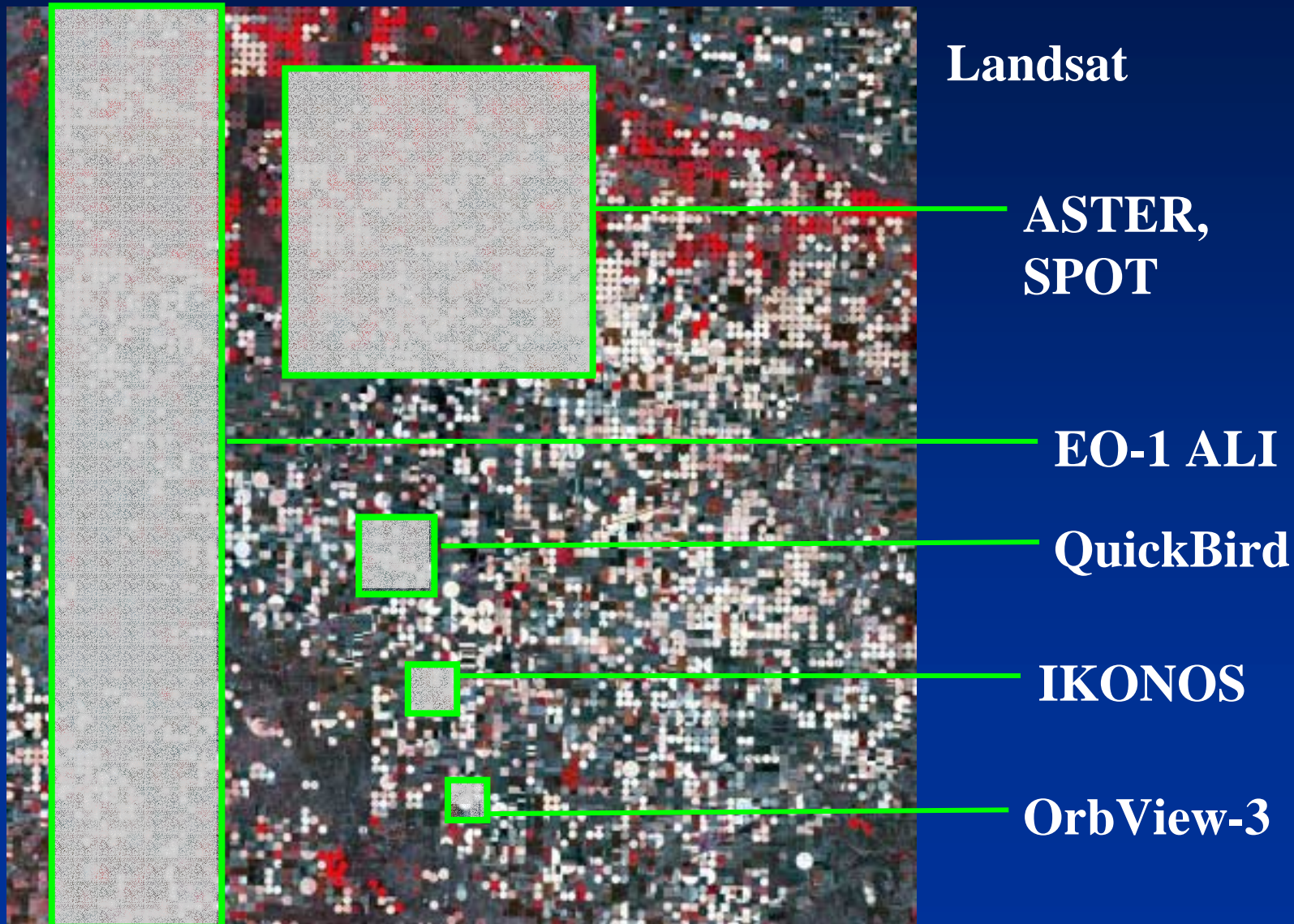




Potential Solution

- Cobble together adequate-quality Landsat-7 composites with all available Landsat-5 scenes during 2004-2006 period for seasons compatible with the GEOCOVER-2000 data
- Fill the gaps with other Landsat-like data (ASTER, ALI, SPOT, IRS, CBERS, etc.)
- Principle of redundancy: for each pixel as much information as possible from Landsat-like sources: L-7, L-5, ASTER, ALI, etc.

ALI, ASTER, SPOT May Complement Landsat Scenes



Summary of Goals

- Develop a Global Mid-Decadal Dataset (circa 2005) with Landsat-like spatial resolution
- Develop a strategy for the post-L5 period
- Gain experience in utilizing non-US sources so that a global high-resolution 2010 dataset can be developed when L-5 is dead and the next Landsat is yet unavailable

Mid-decadal Dataset: Plan of Action

- **Ensure acquisition of Landsat/Landsat-like data to achieve global coverage in 2006 with “good” scenes**
- **Negotiate with L-5 International Cooperators**
- **Negotiate with foreign sensor data owners**
- **A 3-phase project:**
 - **Phase 1 (FY06): data collection, acquisitions compatible with the 2000 data set**
 - **Phase 2 (FY 07-08): processing/orthorectification**
 - **Phase 3 (FY 08-09): land-cover and land-cover change products from both 2000 and 2005 datasets**

Global Coverage in the End of the Decade: Plan of Action

- **Develop a strategy for a Landsat-less years**
- **Ensure continuous acquisition of foreign Landsat-like data to achieve global coverage**
- **Negotiate with foreign sensor data owners**
- **Develop a strategy for a 2010 Global dataset**

Role of CEOS Cal/Val Group

- Phase I
 - Develop a strategy to intercalibrate non-Landsat sources of information for the mid-decadal project
 - Assist with access to foreign sensor data sources
 - Intercalibration of these data
- Phase III
 - Validation of land cover classification using in situ data
- End-of-decade activities
 - Verification of new sensors data quality
 - Inter-calibration



Thank you