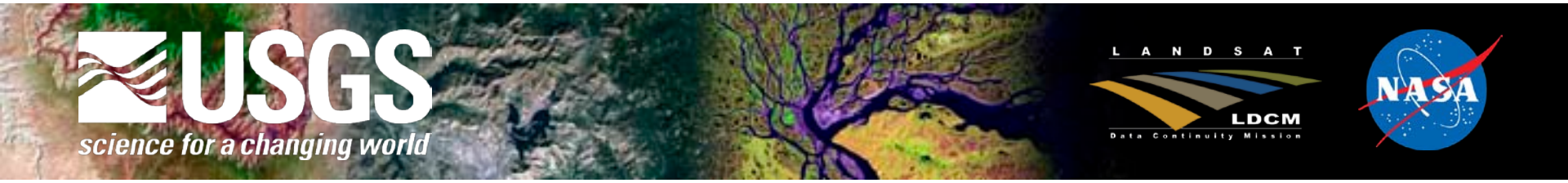

Global Land Survey Update

April 21, 2010
NASA GSFC

Jeffrey Masek, NASA GSFC

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

GLS Team

Implementation Team

Jeff Masek (NASA Lead)

Rachel Headley (USGS Lead)

Shannon Franks (SGT/GSFC)

Teresa Arvidson (LM/USGS)

John Gasch (Honeywell/USGS)

Sumit Chakravarty (SGT)

Science Steering Group

Sam Goward (UMD)

Curtis Woodcock (BU)

Matt Hansen (SDSU)

Chris Justice (UMD)

Darrel Williams (GST)

John Dwyer (USGS)

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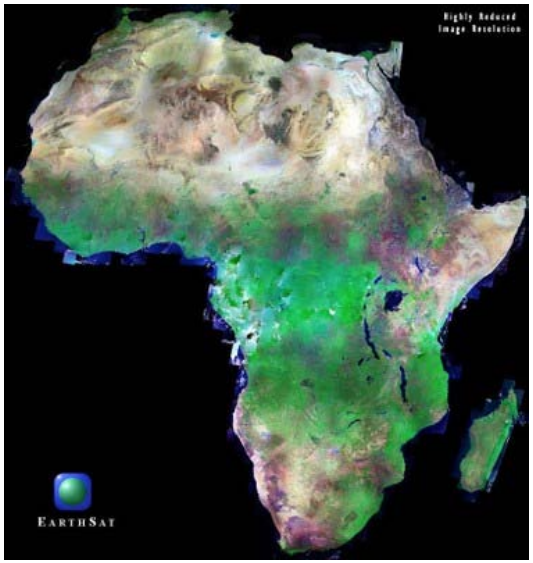
Global Land Survey Data Sets

Global cloud-free, orthorectified Landsat data sets centered on 1975, 1990, 2000, 2005, and 2010

- Partnership between USGS and NASA, in support of USGCRP
- Support global assessments of land-cover, land-cover change, and ecosystem dynamics (disturbance, vegetation health, etc)
- Pilot project for routine global monitoring in LDCM era



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Current availability of fine-scale satellite data sources and capacities for global land change observations

(courtesy GOFC/GOLD Sourcebook on REDD & Martin Herold, Wageningen U)

	Satellite observation system/program	Technical observation challenges solved	Access to information on quality of archived data worldwide	Continuous observation program for global coverage	Pre-processed global image datasets generated & accessible	Image data available in mapping agencies for land change analysis	Capacities to sustainably produce/use map products in developing countries
OPTICAL	LANDSAT TM/ETM						
	ASTER				On demand		
	SPOT HRV (1-5)				Commercially		
	CBERS 1-3				Regionally		
	IRS / Indian program				Regionally		
	DMC program			Probably	Commercially		
SAR	ALOS/PALSAR + JERS						
	ENVISAT ASAR, ERS 1/2				Regionally		
	TERRARSAR-X				Commercially		
HR	IKONOS, GEOEye			Probably	Potentially		
	ICESAT/GLAS (LIDAR)						

Increase usefulness through demonstration

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(Note: dark gray=common or fully applicable, light gray=partially applicable/several eamples, white=rare or no applications or examples)

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GLS 1975-2005 Status

- Reprocessed GLS 1975, 1990, 2000 (complete)
- GLS 2005 Originally “due” by December 31, 2008
  - ~90% complete by that date
- Data Set “essentially” complete May 2009
  - 140 scenes from Brazil (CUB), Indonesia (BKT) were still missing
  - Notification to LCLUC program, USGS press release
- Final scenes delivered and processed September 2009
  - Free, per-scene download from GLOVIS, EE
  - Bulk distribution from UMD GLCF for fee
  - Bulk distribution from USGS if disk provided

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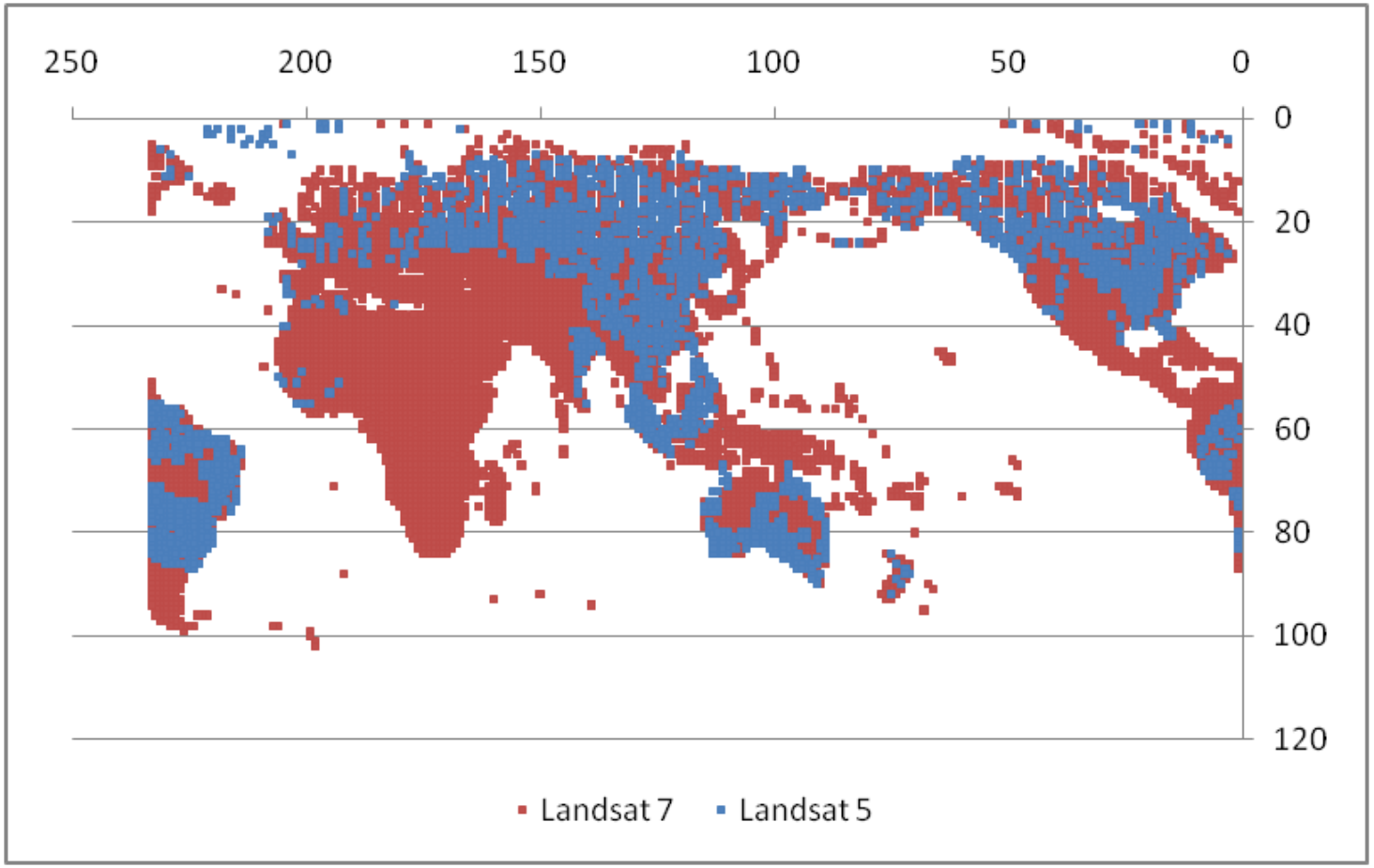
General Distribution



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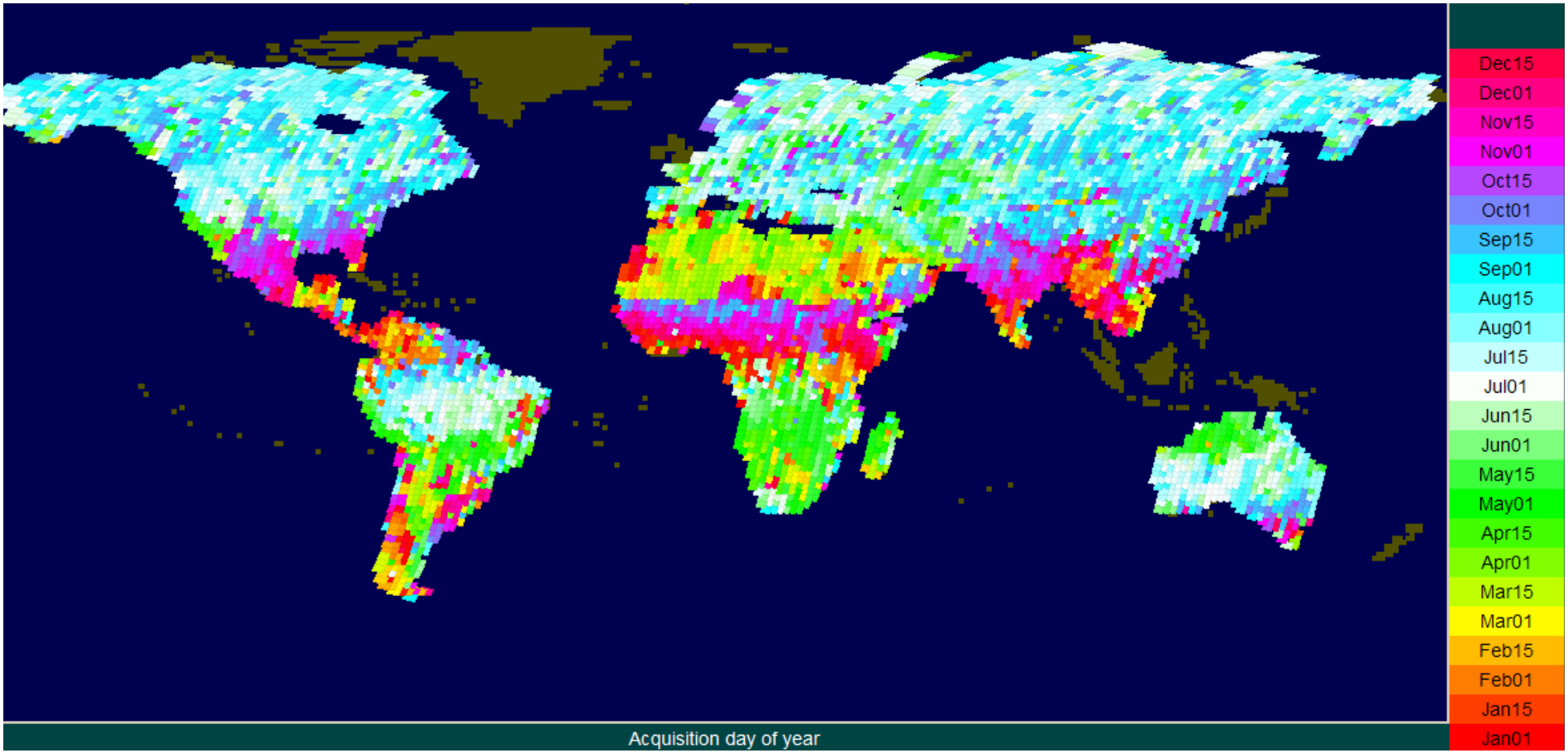
Acquisition Day of Year



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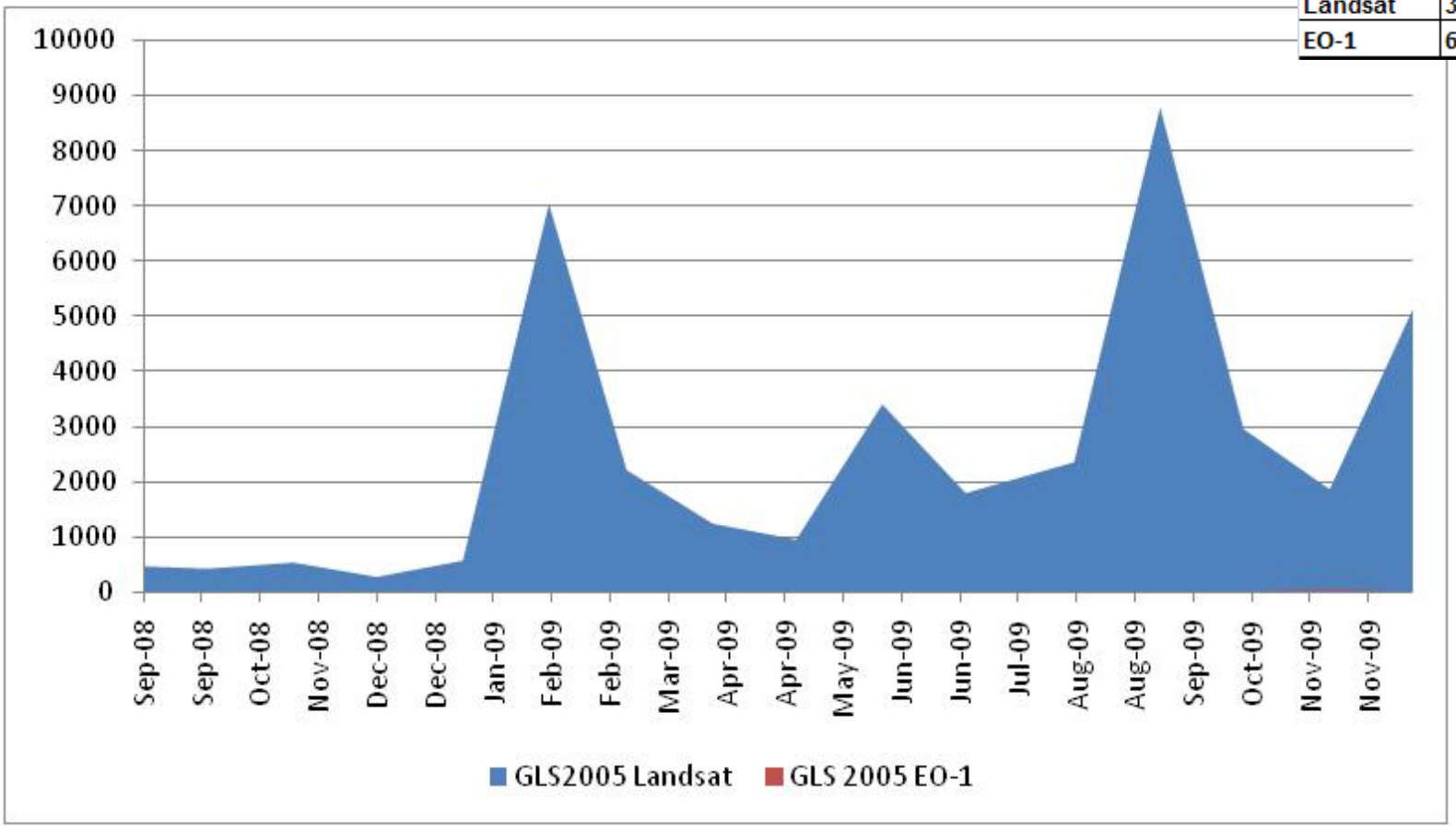
GLS2005 downloads

Date Range	9/2008 - 12/2009
Landsat	39991
EO-1	65



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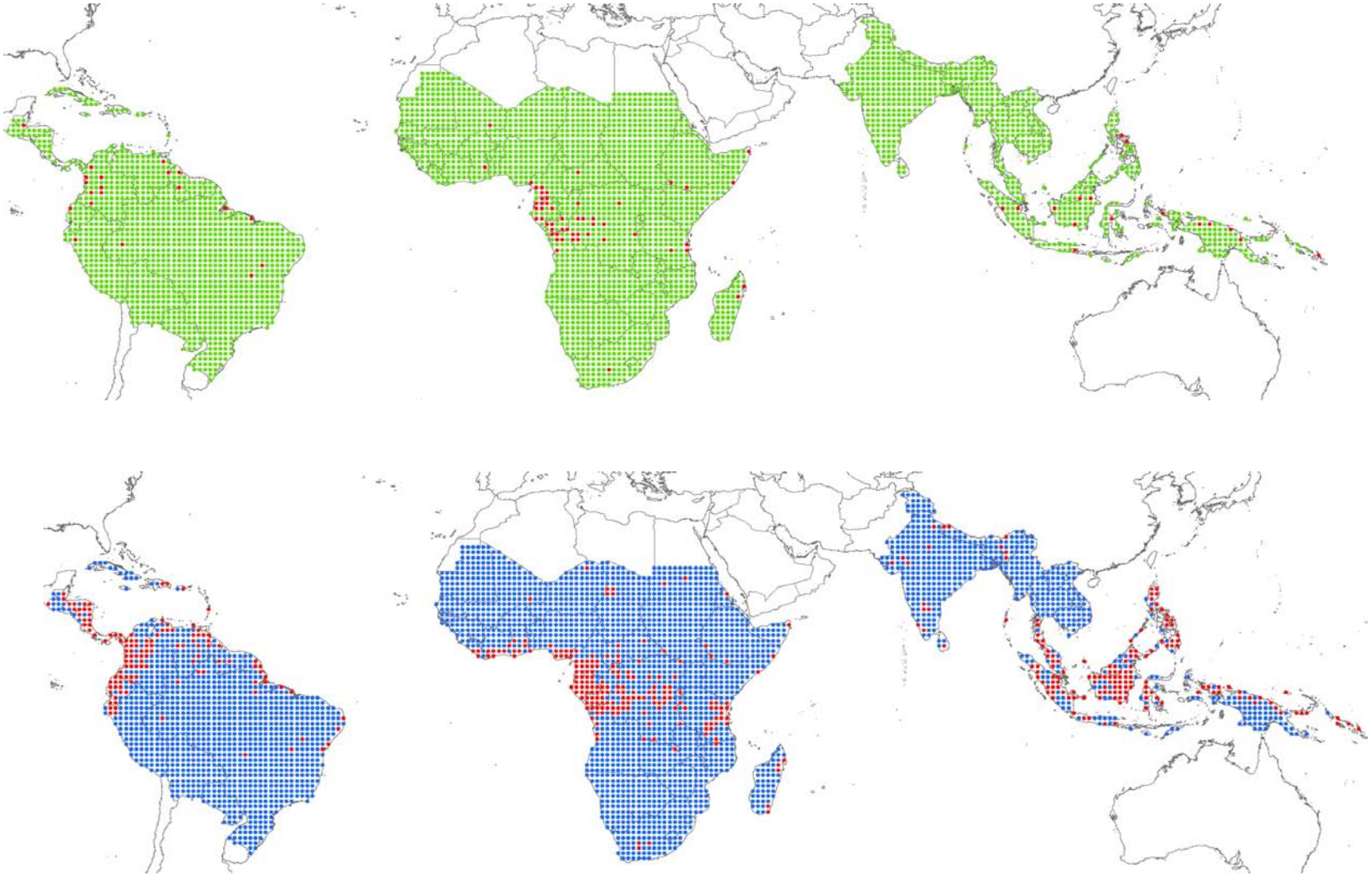
TREES-3: Good image pairs 1990–2000 (green), good data 2005 (blue)

(based on cloud cover; date suitability within 10x10km box)



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GLS 2010 Value Proposition

Why assemble GLS2010 when the archive is now open?

-Incorporate international L5 data otherwise not available (or not freely available)

- *US archive data*
- *Campaign Station acquisitions (only for GLS)*
- *International Cooperators (donate data to GLS)*

- Gap-filled L7 products otherwise unavailable

- relieves users from having to search metadata and assemble “best” data set for land cover research

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GLS 2010 Overview

Intended as "near duplicate" of GLS2005

- combination of Landsat-5, Landsat-7, ALI
- 2009-2010 acquisition window
- one clear image per WRS
  (2-3 images for humid tropics, cloudy areas)
  *** cloud-clearing option?*
- leaf-on (peak NDVI)
- gap-filled (for cloud-cover < 8%) at GSFC

Delivery in mid-2011

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Campaign Station Updates

- 2009/2010 Coverage for Eurasia via ScanEx stations in Moscow, Irkutsk, and Magadan
- 2009/2010 Coverage for South Africa, Maspalomas
- 2009 Coverage from Malindi, Kenya
  - 2010 Acqusitions temporarily on-hold – working to set up new agreement w/ University of Rome
  - 2009 data to be delivered to EROS in coming weeks
- Chetumal acquisitions spotty due to technical issues

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GLS2010 Campaign Acquisitions (as of March 2010)

Organization	Country	Location	GSID	Desired Start Date	Desired Finish Date	Actual Start Date (WBDR)	Actual Finish Date (WBDR)	Actual Start Date (Ingest)	Actual Finish Date (Ingest)	Scenes (WBDR)	Scenes (Ingest)
CONABIO	Mexico	Chetumal	CHM	N/A	N/A	8/6/09	8/6/09	3/6/09	8/20/09	16	156
				10/15/09	2/15/10	11/23/09	(ongoing)	11/24/09	11/27/09	(ongoing)	318
					12/31/10						
CSIR-SAC	South Africa	Hartebeesthoek	JSA	2/1/09	5/31/09	3/18/09	5/31/09	3/19/09	7/13/09	1745	1365
				2/1/10	5/31/10	2/1/10	(ongoing)	(not received)	(not received)	527	0
ESA	Kenya	Malindi	MLK	6/1/09	7/19/09	6/1/09	7/18/09	(not received)	(not received)	1568	0
				11/1/09	1/20/10	11/2/09	2/12/10	(not received)	(not received)	3258	0
				6/1/10	7/19/10						
				11/1/10	1/20/11						
	Spain	Maspalomas	MPS	6/1/09	12/31/10	6/3/09	(ongoing)	6/3/09	12/13/09	(ongoing)	4595
	Sweden	Kiruna	KIS	6/1/09	12/31/10	6/8/09	12/1/09	(not received)	(not received)	8047	0
ScanEx	Russia	Irkutsk	IKR	6/1/09	10/1/09	6/17/09	9/30/09	6/5/09	9/30/09	6866	7245
				6/1/10	10/1/10						
		Magadan	MGR	6/1/09	10/1/09	6/10/09	9/30/09	6/5/09	9/30/09	4808	5105
				6/1/10	10/1/10						
		Moscow	MOR	6/1/09	10/1/09	6/5/09	9/30/09	6/5/09	9/30/09	5864	6495
				6/1/09	10/1/10						
4	**6**	**8**	**8**							**32699**	**25279**

Currently active

Currently in-active

Part 2: Global Landsat monitoring

GLS Program has included parallel development of land cover science & monitoring activities

Annapolis Workshop, February 2007…

Global estimates of land cover change highest priorities
- forest cover change (conversion, disturbance, recovery)
- agricultural extensification (including irrigated ag)
- global standing water extent & variability
- arctic hydrology, permafrost, bog dynamics
- urbanization

Implement via distributed teams; but harmonization and inter-comparison critical

Validation approaches need to be integrated from the start (validation standards for LC Change still evolving)

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GLS Science Prototypes - Background

ROSES 2007 called for prototype projects to use the GLS datasets for large-area analysis of land cover, and land cover change

MEASURES 2007 solicited proposals for Earth Science Data Records

Evolving International Activities

- **GCOS/GTOS ECVs (land cover, fire)**
- **FRA 2010 & TREES-3 projects**
- **GEO tasks on land cover, carbon tracking**
- **CEOS LSI Constellation**
- **REDD+ formulation**

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GLS/Landsat Science Products

NASA LCLUC, TE, Earth Science Information Systems programs are funding analyses of Landsat record:

- Chander, G. (USGS EROS) - Sensor cross-calibration
- Davis, B. (NASA SSC) - Sensor intercomparison for land cover
- Giri, C. (USGS EROS) – Monitoring Tropical Mangrove Forests
- Hansen, M. (SDSU) – Forest Cover in Humid Tropics
- Masek, J. (GSFC)/S. Goward (UMD) – North American Forest Disturbance
- Roy, D. (SDSU) – Web-Enabled Landsat Data
- Skole, D. (MSU) – Tropical Forest Cover Change
- Townshend, J. (UMD) –South America Forest Cover Change; Global Forest Cover Change Earth Science Data Record
- Xiao, X. (UNH) – Land Cover Products for Monsoon Asia

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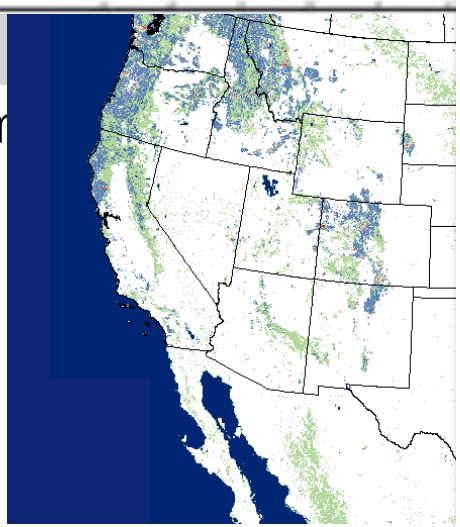
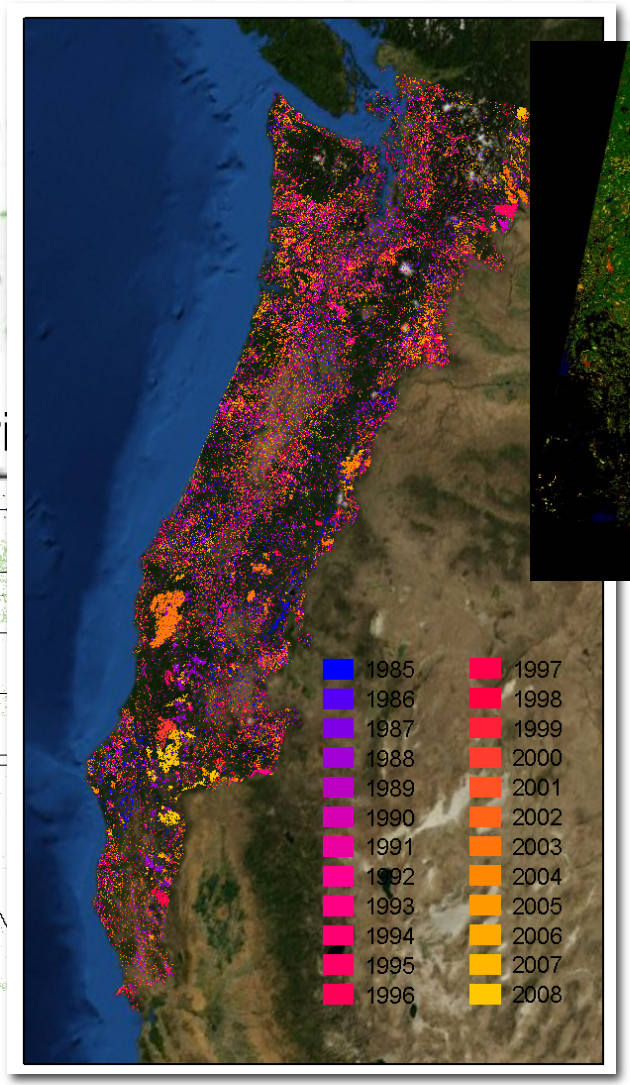
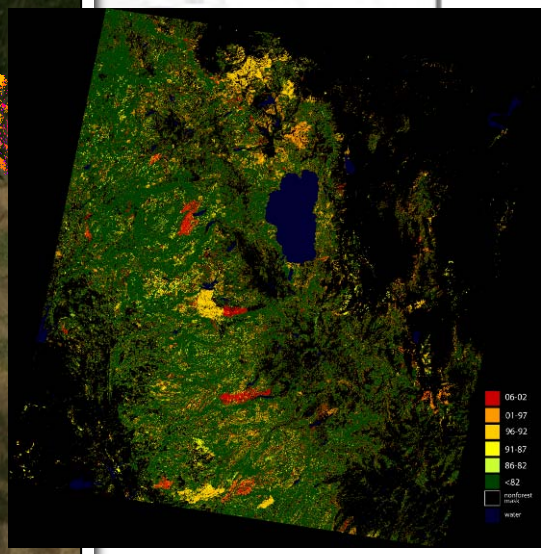
New Products from Landsat

Global mangrove distri



WELD 30m





Disturbance Time Series (Goward, Kennedy, Huang)

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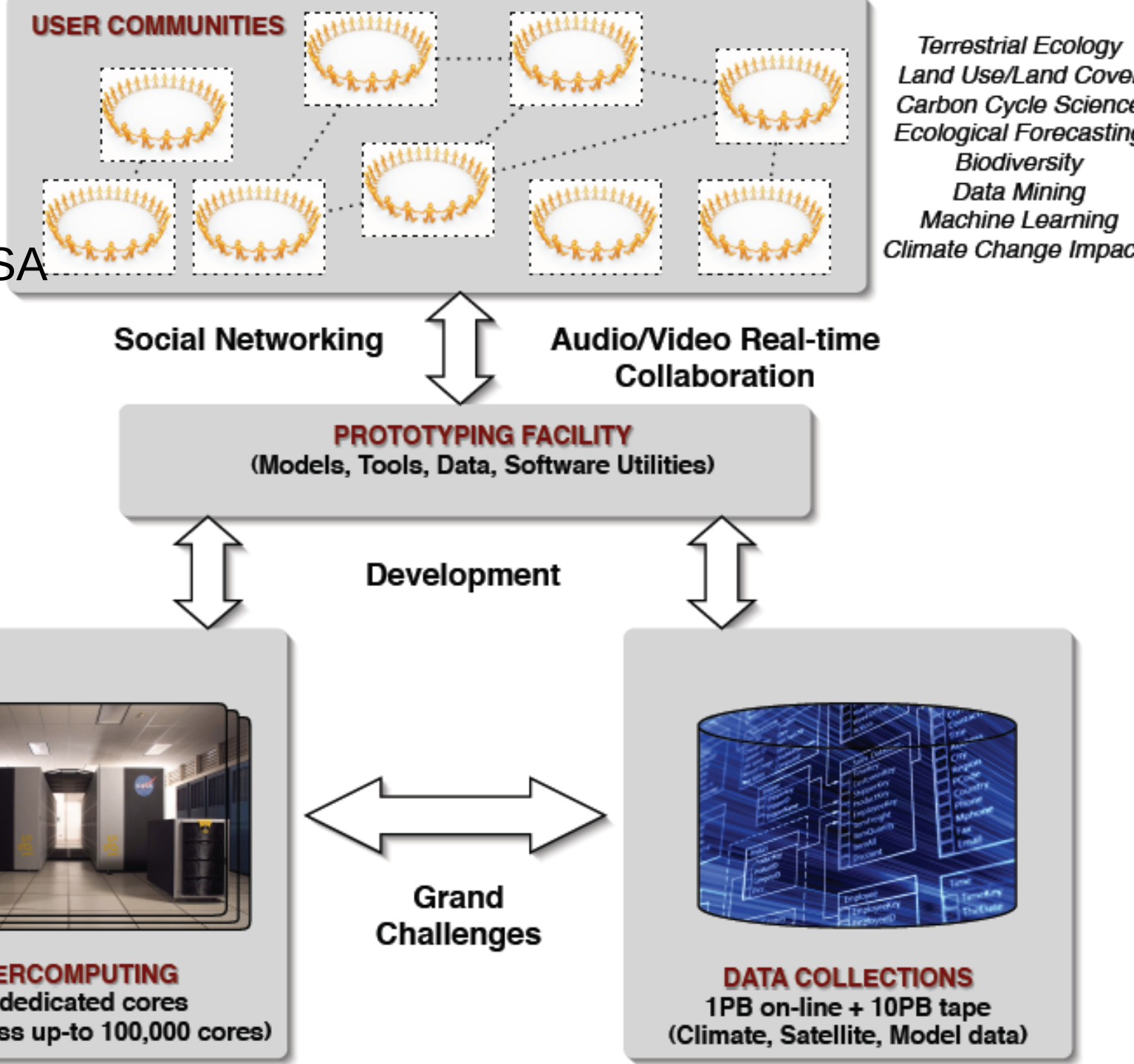
NASA Earth Exchange (Rama Nemani, NASA ARC)



Conclusions

- **GLS2010 effort underway; data set release in 2011**
- **Open archive has revolutionized Landsat applications; new opportunities for GLS & beyond**
- **GLS prototype analyses complete (MEASURES in process)…**
  - Heavy emphasis on forest cover dynamics
  - pursue synthesis of forest cover work to support REDD, FRA, GEO Carbon Tracking?
  - Improved understanding of international assets (CBERS, AWIFS) for LSI and GEO tasks
- **Current solicitation focuses on characterizing urban and agricultural systems**
- **What next…**
  - global land cover / change assesment? (needs refinement - tension between general classes and specific themes)
  - thematic change information for WG2?
  - working group to propose new products?

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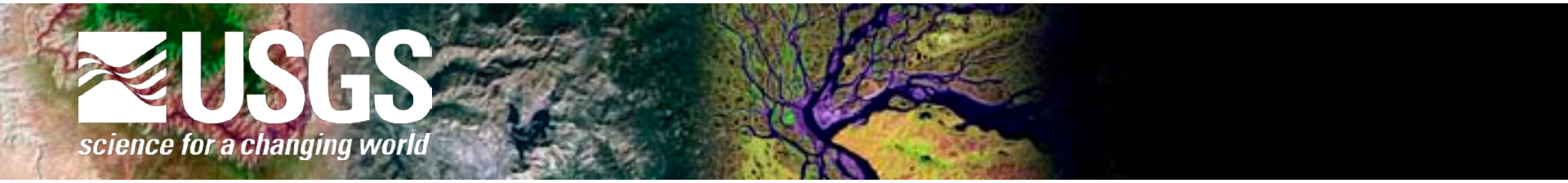
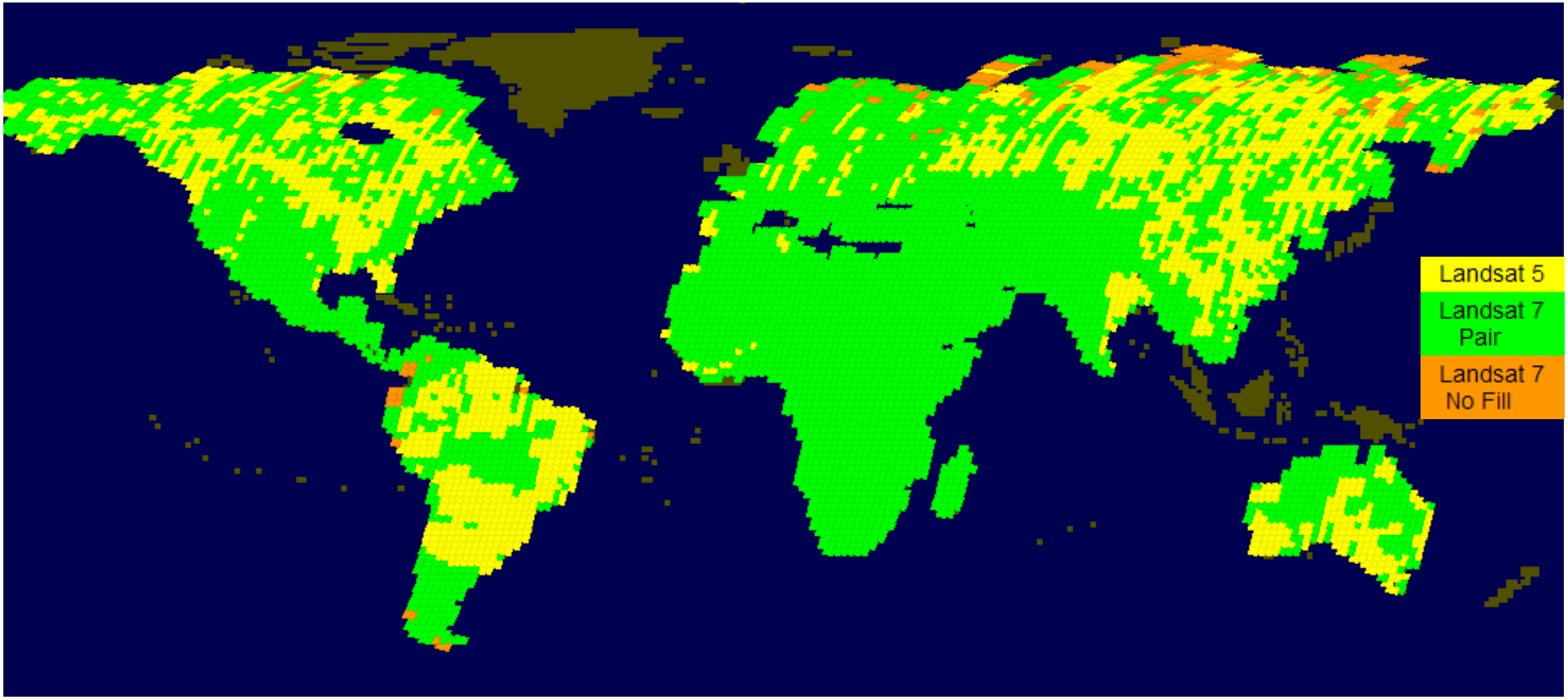


Back Up

GLS2005 Metadata: Sensor Choice



Landsat 5: 2109 **Landsat 7: 4658**

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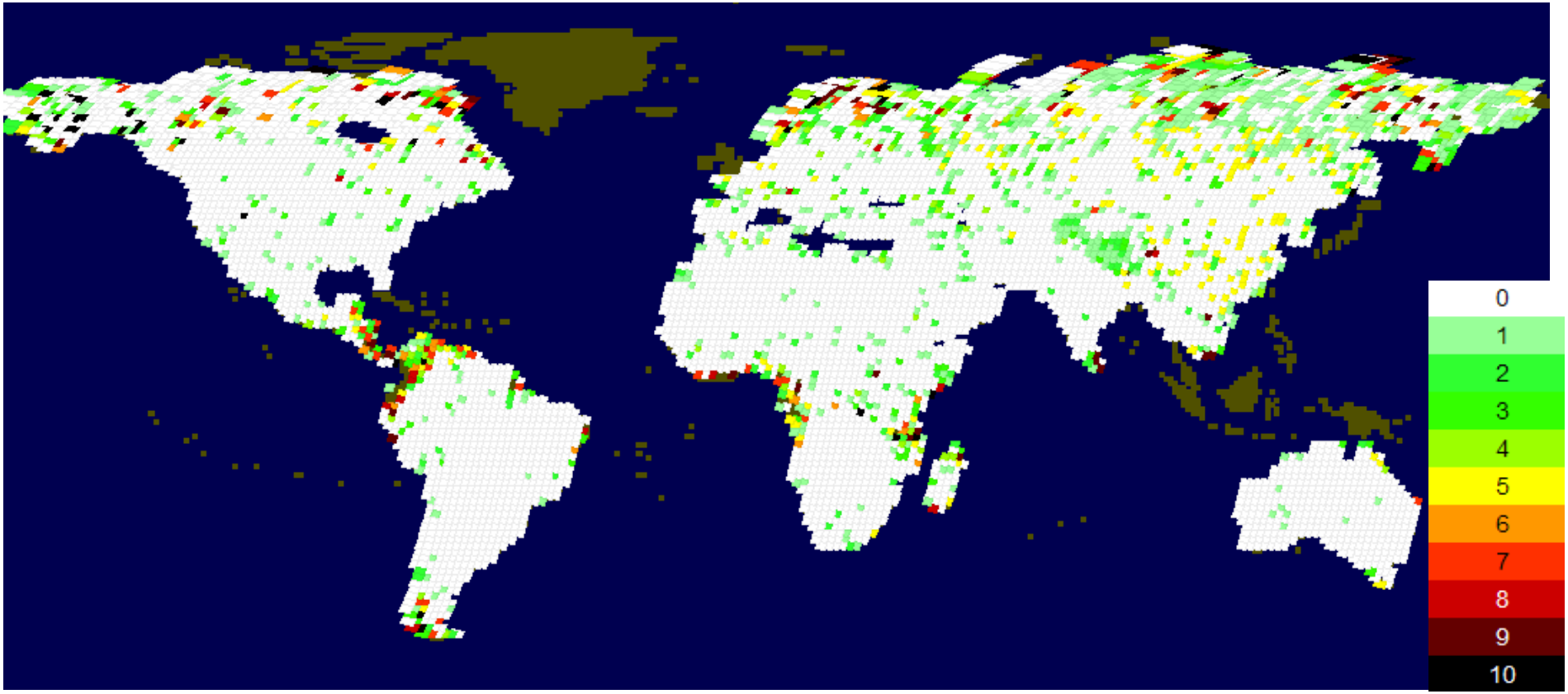
Cloud Cover- Base Image



ACCA average: 1.33%

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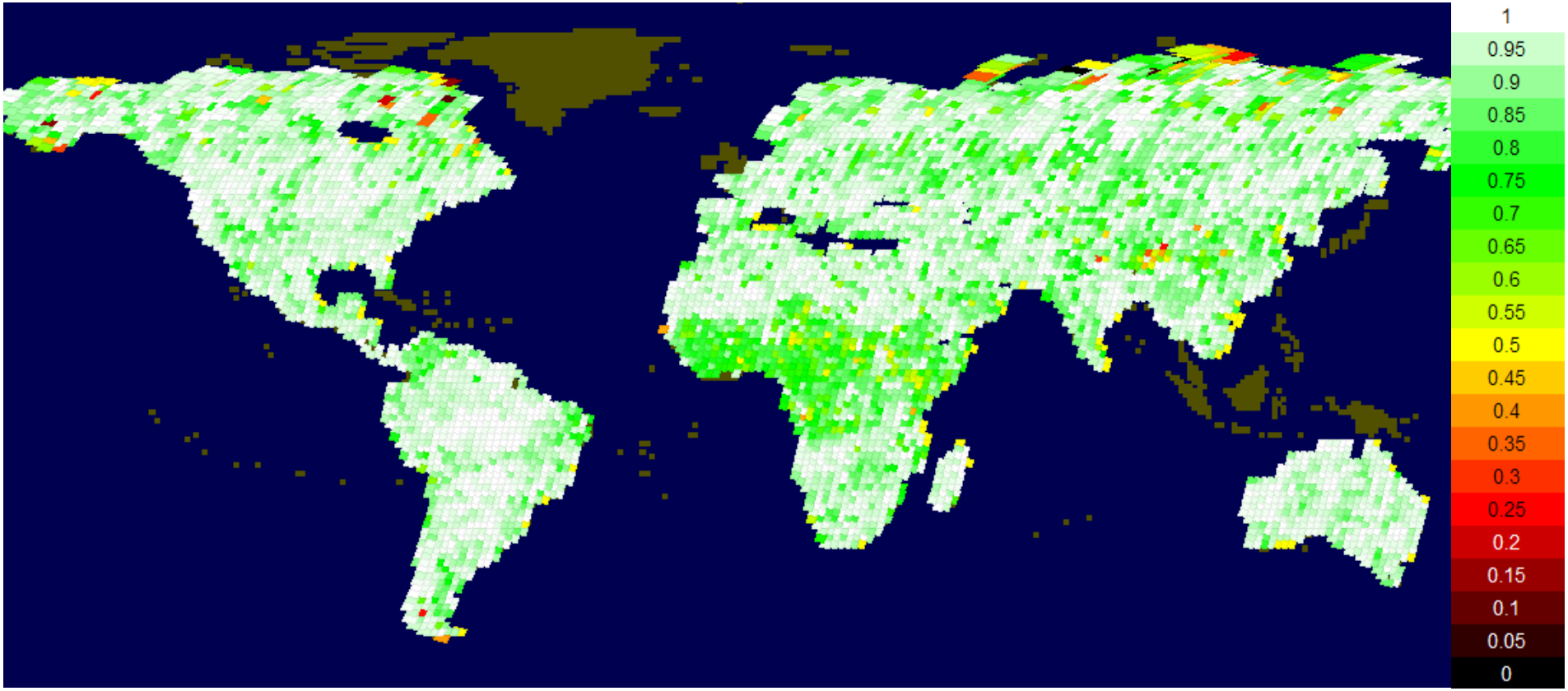
NDVI-Base Image



NDVI average: 0.914 (normalized)
NDVI average: 0.501 (raw)

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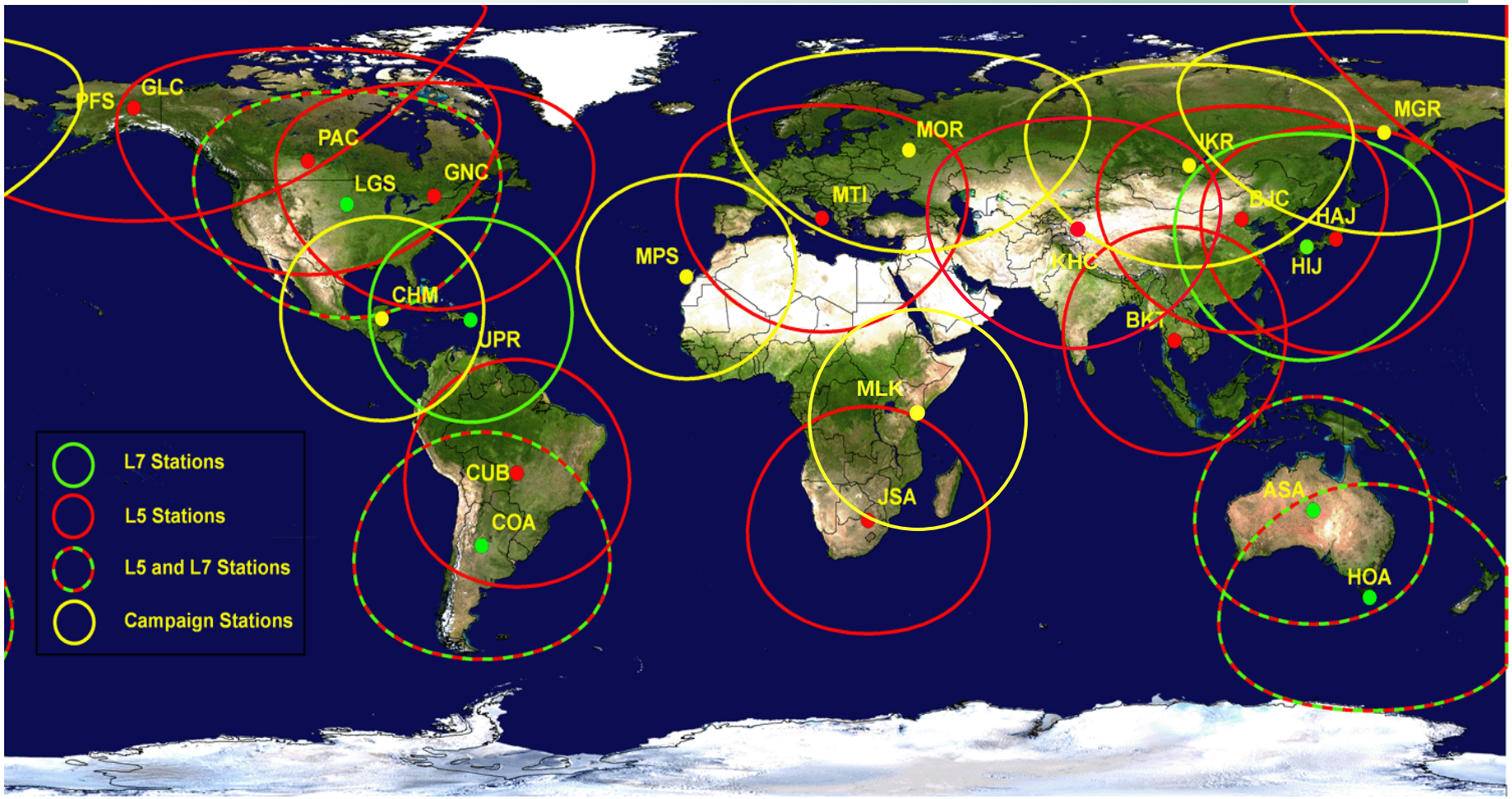
KHC

Combined Ground Station Network



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