

NASA's Land-Cover/Land Use Change Program

Welcome to the LCLUC Cherry Blossom ST Meeting

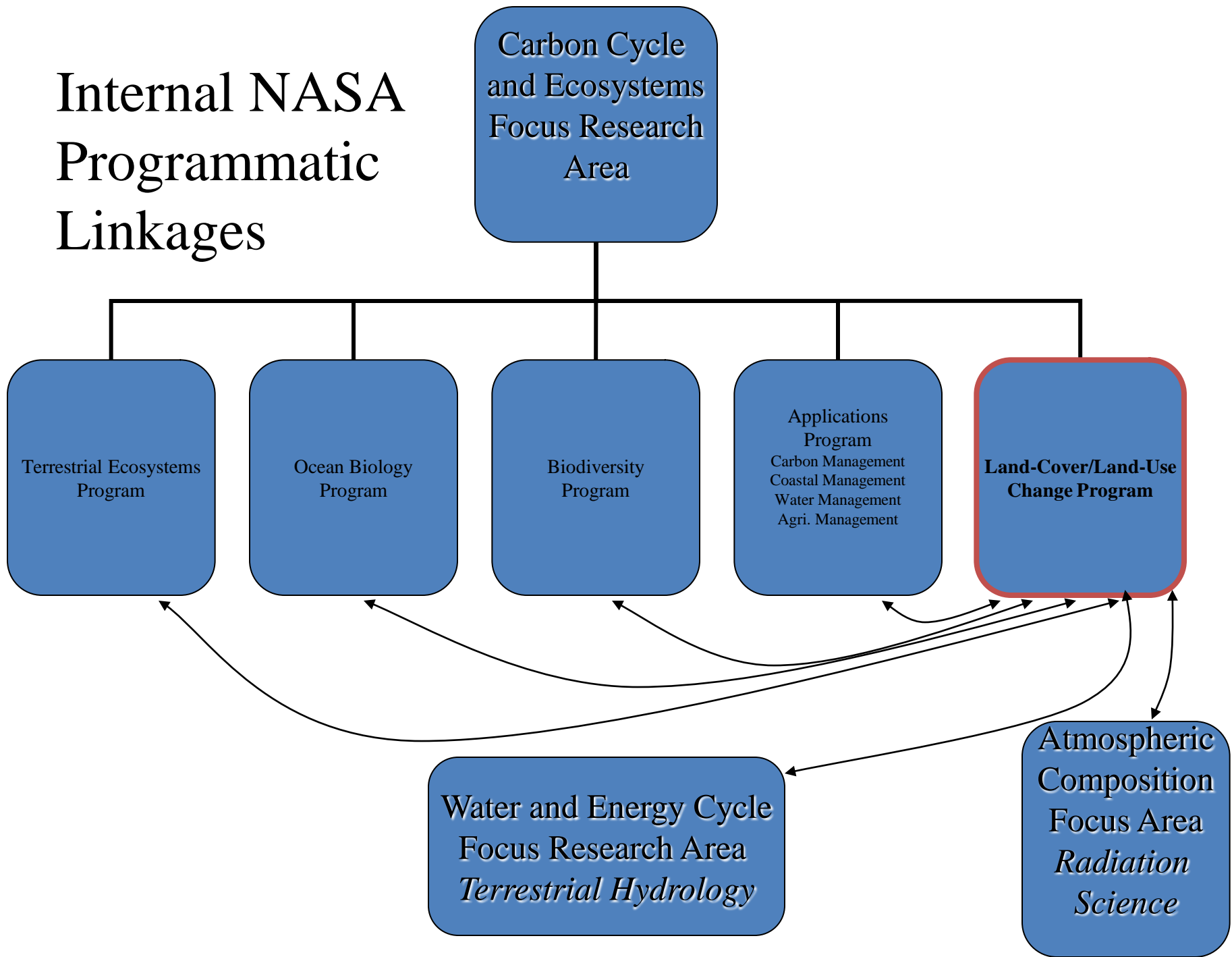
Garik Gutman,
NASA Headquarters
Manager, LCLUC Program



Status of the LCLUC program

- **Internal and external linkages**
- **Regional Initiatives**
- **Land Surface Imaging constellation**
- **Activities and reporting**
- **Data issues**
- **LCLUC-related projects**
- **NRA's**
- **Future plans**

Internal NASA Programmatic Linkages



External Linkages: National

- U.S. Global Climate Research Program (LULCC element)
 - Active participation in the LULC Interagency Working Group (LUIWG)
 - Support LUIWG Steering Group activities
 - NASA LCLUC projects results contribute to USGCRP's annual issue of Our Changing Planet
 - NRC review of land use models - NASA LCLUC is major contributor
- USGS
 - Landsat program (ST meetings, telecons, LDCM, Education/Outreach)
 - Global Land Surveys (leading the project execution, funding of campaign stations, labor at USGS)
 - Contribution to SPOT data buy

External Linkages: International

- International

- GTOS/Global Observations of Forest Cover and Land-cover Dynamics (GOFC-GOLD) –Inter. Project Office (IPO) in Canada

- Fire Implementation Team office at UMD
- Newly formed Central Asia Regional Information Network (CARIN) at Almaty ST meeting
- The East European to be formed at the next ST meeting in Tartu, Estonia

- IGBP/IHDP

- Global Land Project (GLP) –IPO in Denmark
- Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS) –IPO in Finland
- Northern Eurasia Earth Science Partnership Initiative (NEESPI) –IPO in Finland
- Monsoon Asia Integrated Regional Study (MAIRS) –IPO in China

- CEOS

- Calibration and validation (Land Product Validation WG –co-chair @ GSFC)
- Land Surface Imaging (LSI) constellation

Support of IGBP-WCRP Regional Programs

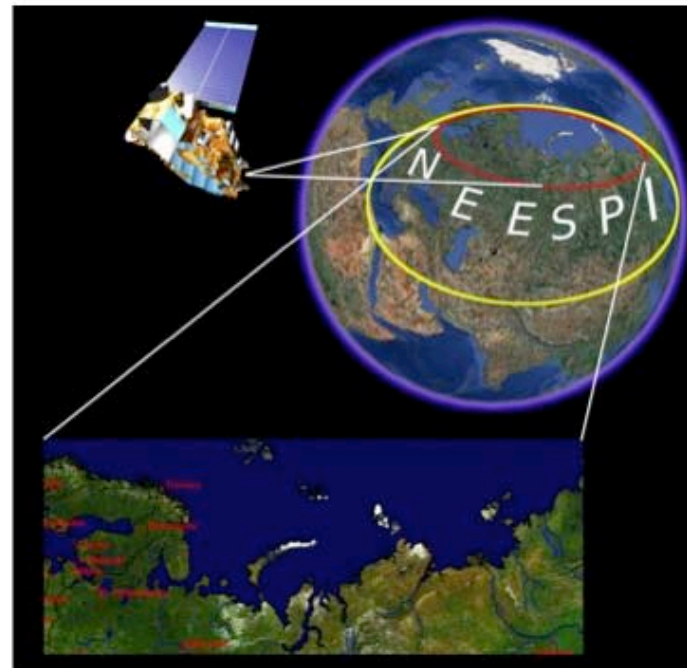
- NEESPI
 - The founder of the program Don Deering passed away
 - The NEESPI session at EGU will be dedicated to him
 - The “Arctic LCLUC” book submitted!
 - 15 new LCLUC projects
 - A book on Siberia under preparation
- MAIRS
 - Asian Monsoon Years (2007–2012)
 - 6 new LCLUC projects
 - Drylands special issue is under preparation



Don Deering
MARCH 28, 1948-FEB. 15, 2010

Eurasian Arctic Land Cover and Land Use In a Changing Climate

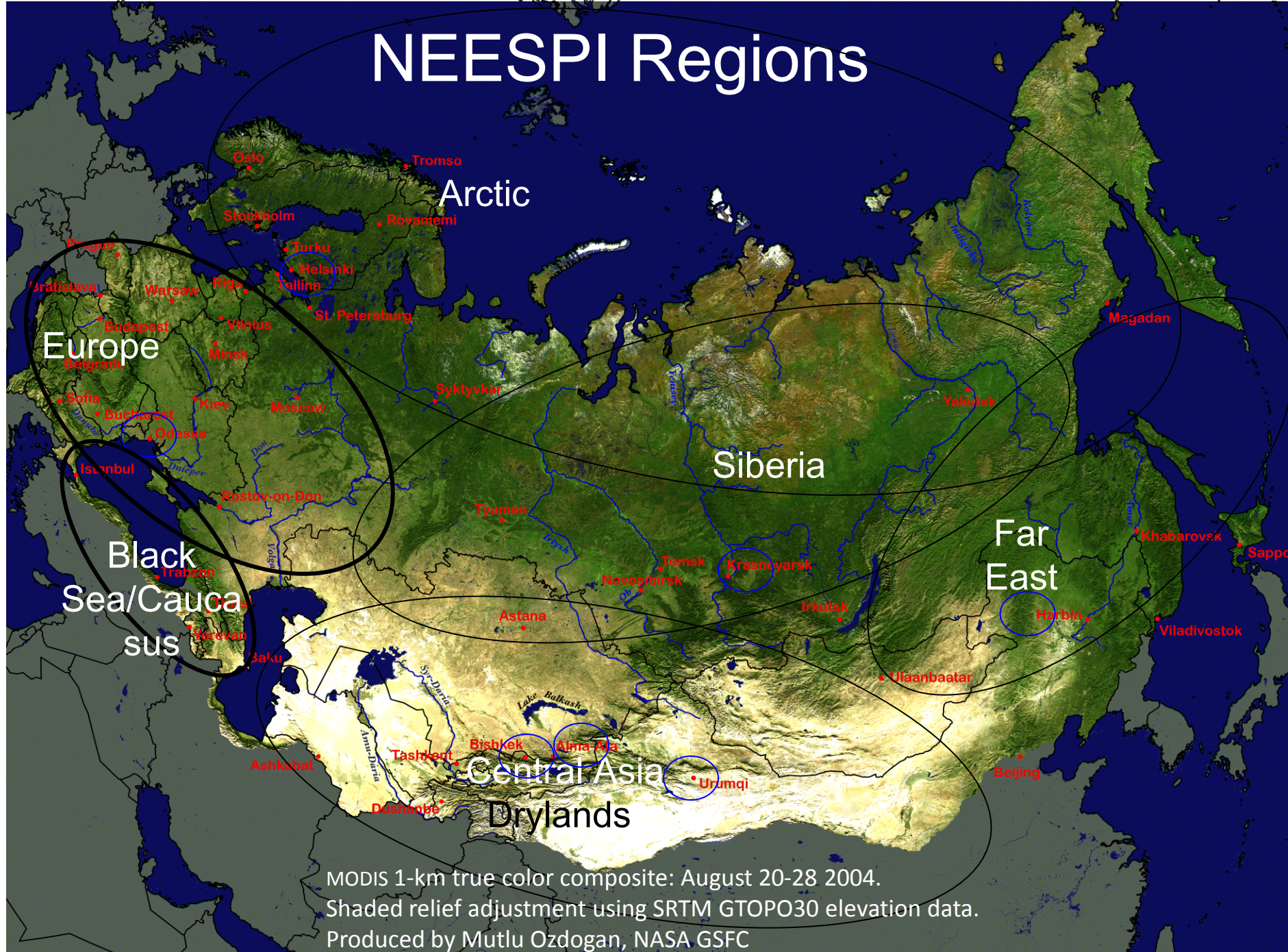
- NASA LCLUC Program contribution to IPY - a compilation of the studies focused on the Arctic region of Northern Eurasia
- The region of interest is land ecosystems north of 60° latitude, specifically transitional forest-tundra and tundra zones
- Twelve chapters written by international teams including US, Russian, and European scientists
- Submitted to Springer
- Expected this year



2-Programs Synergy



NEESPI Regions



LCLUC Global Expansion

- NEESPI Europe, Siberia, Central Asia, Arctic and MAIRS SE Asia – research well developed, expected to produce synthesis studies and tangible products (special issues, books)
- For NEESPI: Black Sea and Caspian regions, Caucasus, Far East are not sufficiently studied
- For MAIRS: South Asia needs more research
- South Asia, Mediterranean, Africa and South America – many proposals submitted

CEOS Land Surface Imaging (LSI) Constellation

- **LSI Constellation Portal**
- **LSI Portal:** Potential enhancements in cooperation with CEOS Working Group on Information Systems and Services (WGISS) <http://wgiss.ceos.org/lcip>

CEOS Agency Members

- USGS: **Co-Chair**, Tom Holm
- ISRO: **Co-Chair**, V. Hegde
- INPE: **Co-Chair**, Julio Delga
- INPE: João Viane Soares
- EC: Herve JeanJean
- ESA: Michael Berger
- CSA: Daniel DeLisle
- CONAE: Ana Medico
- JAXA: Takeo Tadono
- NOAA: Kevin Gallo
- NASA: Garik Gutman
- NRSCC: Yonghong Zhang
- CRESDA: Xiaohua Yi
- GISTDA: Phuriwaj Ruengnaowaroj
- CNES: Aurelie Sand
- CDTI: Mónica Lopez





CEOS Land Surface Imaging Constellation Portal

for

Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access

Overview

- CEOS Agency Mid-Resolution Optical Satellite Systems

Satellites

- Satellites & Sensors
- Status & Launches
- Orbit Information

Sensors

- Band Information
- Visible & NIR Bands
 - SWIR Bands
 - Thermal Bands
- Panchromatic Bands
- Hyperspectral Bands

Radiometric & Geometric Characteristics

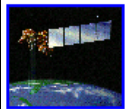
- Geographic Characteristics

Data

- Data Access
- Documentation

CEOS Agency Current and

Satellite	Ser
ADEOS-1	AVI
ALOS	AVI
CBERS-1	HRCC
CBERS-2	HRCC
CBERS-2B	HRCC
EO-1	ALI, HRSS
IMS-1	MSS
IRS-1A	LISS-1
IRS-1B	LISS-1
IRS-1C	LISS-1
IRS-1D	LISS-1
IRS-P2	LISS-1
IRS-P6	LISS-II
JERS-1	COSMO
Landsat 1	MSS
Landsat 2	MSS
Landsat 3	MSS
Landsat 4	MSS
Landsat 5	MSS
Landsat 7	ETM+
SAC-C	HRSS
SPOT-1	HRSS
SPOT-2	HRSS
SPOT-3	HRSS
SPOT-4	HRSS
SPOT-5	HRSS
Terra	ASTER
THEOS	MS



Platform: LANDSAT-7

[Click to view more](#)

Platform-based Instruments:

[Click to view more](#)

Orbit

Orbit Altitude: 705km
 Orbit Inclination: 98.2 degree
 Equator Crossing: nominally 10 AM
 Period: 99 minutes
 Repeat Cycle: 16 days
 Orbit Type: LEO > Low Earth Orbit > Polar Sun-Synchronous

Related Data Sets

[View all records related to this platform](#)

Description

Landsat 7 systematically provides well-calibrated, multispectral, moderate resolution, substantially cloud-free, sun-lit digital images of the Earth's continental and coastal areas with global coverage on a seasonal basis. It covers the United States every 16 days. Operations were transferred to USGS on Fall 2000.

The Landsat Project is a joint initiative of the U.S. Geological Survey (USGS) and the NASA to gather Earth resource data using a series of satellites. NASA

[Click to view more](#)


Online Resource:

- <http://nasascience.nasa.gov/missions/landsat-7>
- <http://landsathandbook.gsfc.nasa.gov/handbook/handbook.htmls/chapter2/chapter2.html>
- <http://landsat.gsfc.nasa.gov/>

Platform Logistics:

Design Life: 5 Years
 Launch Date: 1999-03-15
 Primary Sponsors:
 USA/USGS
 USA/NASA

Science Team

- LCLUC Program
 - EOS Program
 - IDS Program
 - Carbon Cycle Program
 - ACCESS/MEASURES
 - Students Fellowship Program
 - New Investigator Program
- 

Program Components

Total ~40 projects

- LCLUC Monitoring/Modeling
- LCLUC impact on Carbon Cycle
- LCLUC impact on Water Cycle
- LCLUC impact on Climate, Environment, Biodiversity
- Climate impact on LCLUC and adaptation

LCLUC Science Team Meetings

Washington: Spring

2007: Climate/Carbon

2008: Joint CC&E Focus Area meeting

2009: LCLUC impacts on climate

2010: GLS LCLUC products



International: Fall-Winter

2007: Drylands (NEESPI/MAIRS)

Urumqi, China

2008: Tropics (MAIRS)

Kohn Kaen, Thailand

2009: Drylands (MAIRS/NEESPI)

Almaty, Kazakhstan

2010: *Boreal/Temperate (NEESPI)*

Tartu, Estonia



ST Meetings' Objectives

- program status
- feedback from the PI's
- identifying programmatic gaps, discussing new directions
- Format: less oral talks (mostly joint topical reviews), more discussions
- International: enhancing linkages with international programs and regional networks

Reporting and Communication

- The Web site: <http://lcluc.hq.nasa.gov>Project Abstracts
 - Progress reports
 - Presentations
 - **Project update: 1 slide (bullets + visual)**
 - **Posters as ppt presentations!**
 - Lists of publications and references
 - Project metadata and data set links
- Sensitive info -to me by separate e-mail
- Submit these materials to LeeAnn on an ongoing basis to ensure accurate reflection of all the great work you are doing
- PI's are encouraged to host their own websites to showcase their results in more detail and to make their data sets available-provide links.
- Announcements, events, job ops, news
- Forthcoming meetings
- Outreach (discoveries, journal covers, LCLUCers in the news, books)

Education and Outreach

- Each PI should provide
 - information on MS and Ph.D. students graduating during and after the project
 - Thesis title, dates
- Statistics on LCLUC educational “products” are being collected
- Students achievements (awards, discoveries)
- Link to the Landsat Project Office Education and Outreach Component

Data Issues

- *NASA promotes the free and open sharing of data*
- *USGS - Landsat data for free distribution*
- **LCLUC expects its PI's to make their data and products available to the broader community**
- Data sharing is encouraged
- Metadata page on the LCLUC web site
- LCLUCers use established Land Cover data distribution centers (EROS, GLCF,TRFC)
- Landsat-based GLS (1975,1990, 2000, 2005) available
- GLS 2010 is being collected
- SPOT coverage for CONUS at USGS
- International cooperation on Landsat-like data

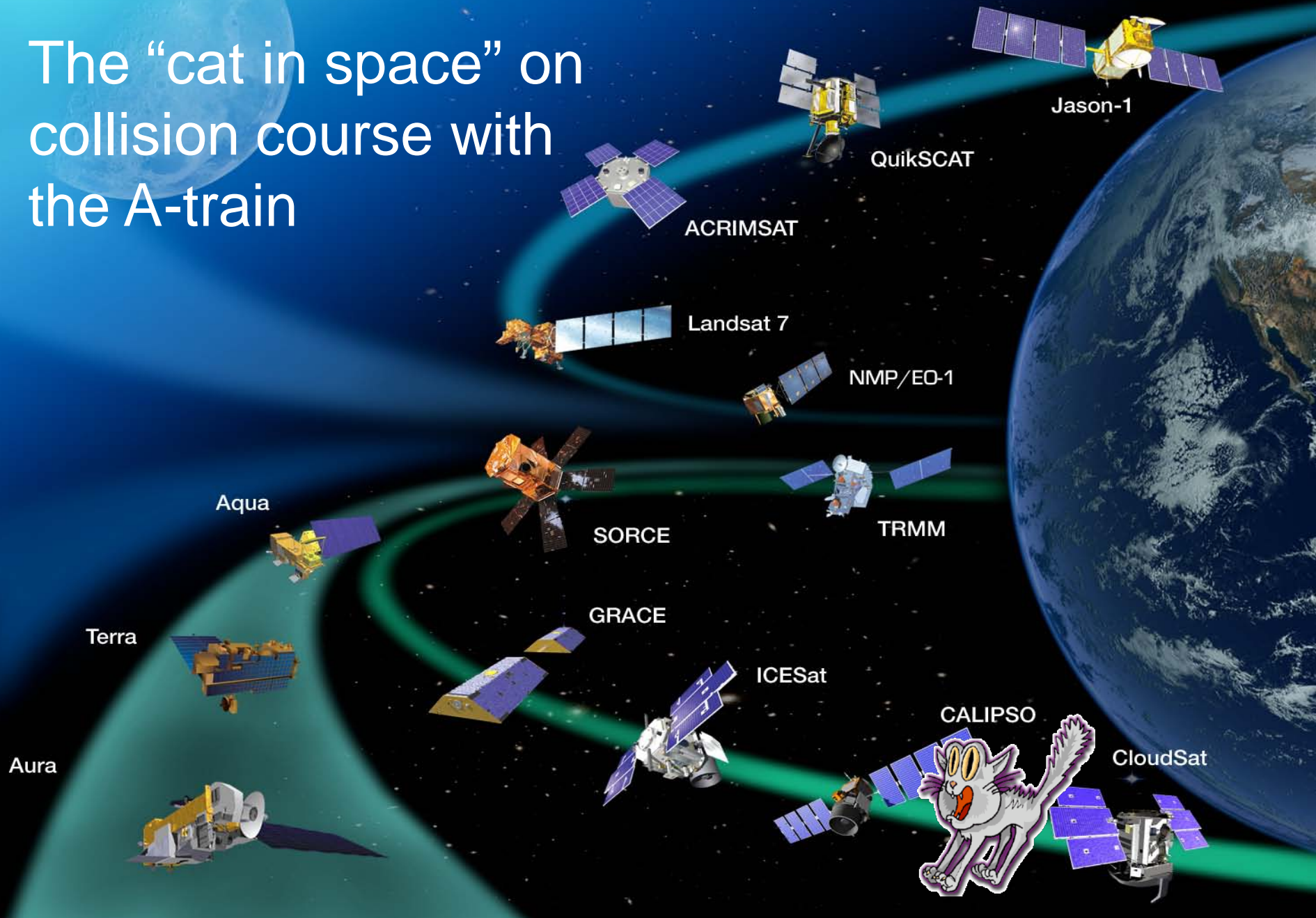
Landsat-5: The Cat in Space

- A 25+ yr old Landsat-5 is still alive and kicking!
- Still produces great imaged and contributes to GLS collections
- Campaign stations receive L-5 data
- The rumors of his last breath before slow death have been slightly exaggerated
- But there are some other issues (A-train)



“The TWTA current is starting to stabilize with a reduced duty cycle, and recent forecasts suggest data can be acquired for another 12+ months (maybe up to 2-3 years)”

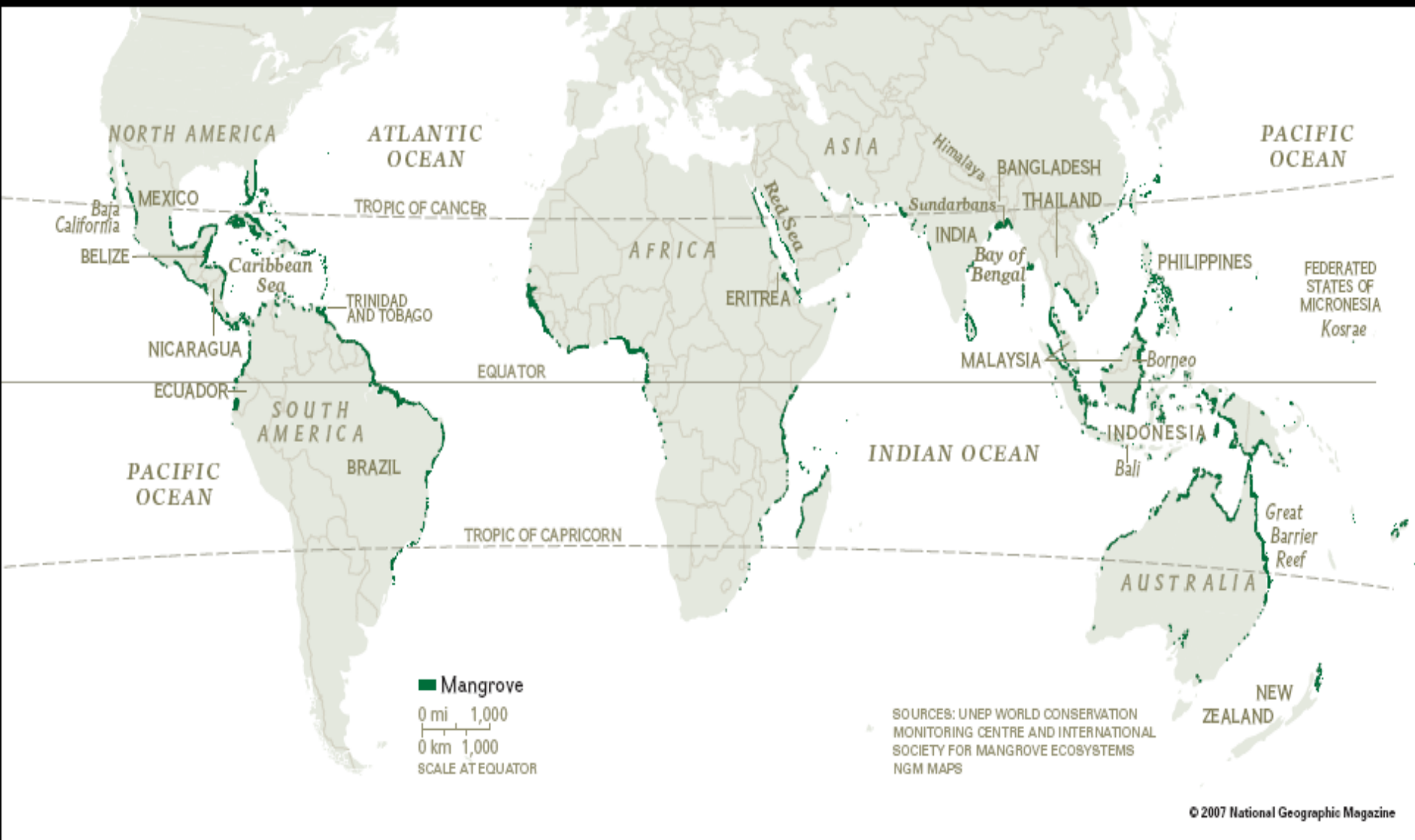
The “cat in space” on collision course with the A-train



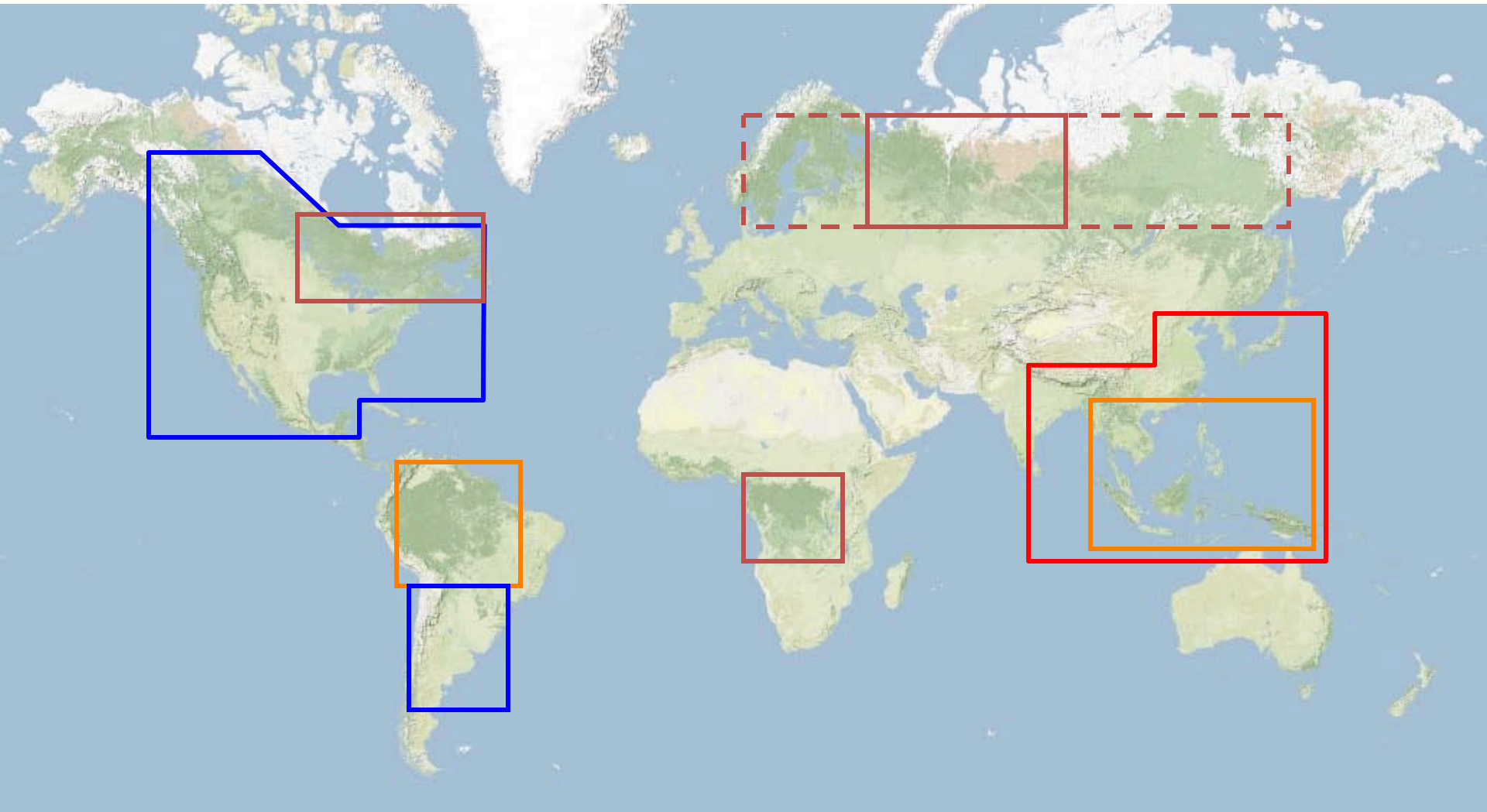
GLS Science: Data products and long-term land-cover analysis


- **USGS EROS**
 - **Sensor cross-calibration (Chander)**
 - **Monitoring Tropical Mangrove Forests (Giri)**
- **South Dakota State U.**
 - **Forest Cover in Humid Tropics (Hansen)**
- **Stennis Space Center & UMD**
 - **Sensor intercomparisons (Pagnutti and Ryan)**
 - **Impact on land cover studies (Goward)**
- **Michigan State U.**
 - **Tropical Forest Cover Change (Skole)**
- **University of MD**
 - **Global Forest Cover Change Data Record (Townshend)**
- **U. Oklahoma**
 - **Land Cover Products for Monsoon Asia (Xiao)**
- **Boston U.**
 - **Validation and cross-product intercomparisons (Woodcock)**
- **More to come from the current LCLUC round**


Mangrove forest cover change 1990-2005





Geographic Coverage of LCLUC GLS Projects




 Hansen 1990-2005
(forest conversion)

 Skole 1990-2005
(forest conversion + logging)

 Townshend 1975-2005
(forest conversion)

 Xiao 2005 (non forest land cover)

 Goward/Masek 1990-2005
(forest disturbance)

GLS Quality Issues

- Where are data gaps in the GLS datasets?
- How stable is the GLS time series?
- How are we going to handle the 1990 calibration issue
- Are transitions between adjacent path/rows derived from L-5 and L7 data seamless?
- What is the proportion of data with poor gap-filled results? How is it controlled (QC)?
- What is proportion of path/rows with no L-5 available and no good L-7 for interpolation?
- How consistent (in terms of season) has been scene selection?
- What are we missing by having such infrequent time sampling with GLS in terms of disturbance history?
- Do we still have issues with geodetic correction? How is it in high latitudes? Ideas for future improvements?
- How we can benefit from collaborations with our international partners on processing Landsat-like data?

ESA-NASA Collaboration: Ground Segments and Data

- Full suite of collaborative opportunities for the agencies ground segments and data assets to enhance mission return and enable efficient development and generation of multi-mission/multi-agency data products.
- Collaborations
 - Harmonize ground system architecture, project status, approach and plans
 - Data systems interoperability strategy, planning, and implementation
 - Organized Data Exchange for each Agency¹'s research use and feedback on data properties
 - Understanding of each agency approach to products and product availability, leading to projects and strategy for product harmonization and joint products (e.g., approach to ECVs and Earth system long-term data records)
 - Common strategy for long-term data stewardship
 - Creation of common data holdings for specific projects (e.g., supersites)

Solicitations and Projects

- EOS and MEASURES (final)
 - I am Program Scientist for UMD MEASURES Landsat project
- Carbon Cycle/LCLUC projects (final)
- GLS LCLUC Products projects (final)
 - I am co-lead on the USGS-NASA GLS initiative
- LCLUC projections projects (final)
- Climate impact on land use, adaptation (mid-term)
- Small contributions to non-NASA ongoing international projects programs (mid-term)
- ROSES-2009 to be selected in September
 - Will be submitted not more than 67 proposals; about 10 to be selected
- Selected IDS to be announced
 - Many LCLUC-relevant elements

Results Statistics

- Regular
 - Recommended for funding 9 out of 27 submitted:
 - 8 Universities (in 2 projects NASA is co-I) and one USFS
 - Funding ~ 2.4M/yr
 - Rejected 18
 - Among them 4 from NASA Centers
- “Small”
 - Recommended for funding 9 out of 15 submitted:
 - 8 Universities
 - 1 NASA GSFC
 - Funding ~ 0.8M/yr
 - Rejected 6
 - 1 from NASA Center

“Regular” Proposals Selected

<p>Chen continuation</p>	<p>University of Toledo</p>	<p>Interactive Changes of Ecosystems and Societies on the <u>Mongolian Plateau</u>: From Coupled Regulations of Land Use and Changing Climate to Adaptation</p>
<p>Southworth New to LCLUC but co-I has been with LCLUC</p>	<p>University of Florida</p>	<p>Understanding and predicting the impact of climate variability and climate change on land use and land cover change via socio-economic institutions in <u>Southern Africa</u></p>
<p>Walker continuation</p>	<p>University of Alaska (NASA GSFC co-I)</p>	<p>Adaptation to Rapid Land-Use and Climate Changes on the <u>Yamal, Russia</u></p>
<p>Goetz continuation</p>	<p>Woods Hole Research Center (NASA Ames co-I)</p>	<p>Modeling Strategies for Adaptation to Linked Climate and Land Use Change in the <u>United States</u></p>
<p>Zhuang New to LCLUC but co-Is have been with LCLUC</p>	<p>Purdue University</p>	<p>Changes of Land Cover and Land Use and Greenhouse Gas Emissions in <u>Northern Eurasia</u></p>
<p>Brown Has been with LCLUC but new to studies in Mongolia</p>	<p>University of Michigan</p>	<p>Grassland Ecosystems and Societal Adaptations Under Changing Grazing Intensity and Climate on the <u>Mongolian Plateau</u></p>
<p>Conard continuation</p>	<p>USFS</p>	<p>The Influence of Changing Forestry Practices on the Effects of Wildfire; Interactions between Fire and Changing Climate in <u>central Siberia</u></p>
<p>de Beurs Has been co-I in LCLUC</p>	<p>Virginia Polytechnic Institute</p>	<p>Land Abandonment in <u>Russia</u>: Assessing Future Vulnerability and Adaptation to Changing Climate and Population Dynamics</p>
<p>Fan New to LCLUC</p>	<p>Michigan State University</p>	<p><u>China's</u> urbanization and its sustainability under future climate change</p>

“Small” Proposals Selected

Lettenmaier continuation	U. Washington (Russia, Japan) NEESPI	Assimilation of tower and satellite-based methane observations for improved estimation of methane fluxes over <u>northern Eurasia</u>
Knyazikhin New to LCLUC	Boston University (Finland, Estonia) NEESPI	REMOTE SENSING OF FOREST STRUCTURE ACROSS MULTIPLE SCALES FROM LEAVES TO CANOPIES AND STANDS (<u>Fennoscandia</u>)
Radeloff continuation	U. Wisconsin (Russia) NEESPI	Land use change, protected areas, and biodiversity in the Caucasus and Ural Mountains (<u>Russia</u>)
Ozdogan Has been with LCLUC but new in drylands studies	U. Wisconsin (China, Kazakhstan) NEESPI and MAIRS	Investigating the Relationship Between Land Use/Land Cover Change, Hydrologic Cycle, and Climate in <u>Semi-Arid Central Asia</u>
Krankina continuation	Oregon State U. (Russia) NEESPI	Contribution to studies of LCLUC in <u>Northern Eurasia</u>
Hughes New to LCLUC	U. Arizona (Russia) NEESPI	Response of forest growth to climate variability and change: remotely-sensed and in situ data for <u>European Russia</u>
Leptoukh New to LCLUC	NASA (China) MAIRS	NASA Data and Services Supporting Monsoon Asia Integrated Regional Study in <u>Eastern Asia</u>
O'Neal New to LCLUC and NASA	U. Delaware (Russia) NEESPI	Field and Remotely Sensed Data for Improved Characterization of Permafrost Landscapes in the <u>Russian Arctic</u>
Saatchi Has been with LCLUC	U. California, LA	Impacts of Land Cover and Land Use Change on Water and Energy Cycle in Caspian Sea Drainage Basin

Future Steps

- Enhance social science component in LCLUC projects
- Balance the program thematically and geographically
- Develop synthesis of global forest from GLS projects
- More emphasis on non-forest land-cover types
- Develop LCLUC calls on a regular, annual basis
 - Step-1 Dec 1, Step-2 June 1
- Revise the solicitation procedure
 - Two-step or one-step process?
 - Narrowing the calls?
- New, improved LCLUC website
- Continue the twice-a-year ST meetings structure
- Next year – the 15th Anniversary meeting for all alumni!

ROSES-2010 LCLUC

- Synthesis of Previous Studies for LCLUC “hot spots” over the globe
- Vulnerability, Impacts, and Adaption of Land Use to Climate Change
- \$2M to be distributed; proposals vary from 100K/yr to 500K/yr
- Needs narrowing down the scope: new ideas are welcome
- Amendment will follow – this is the time and place to influence me
- With 130+ proposals we need 2 steps and still the success rate is 1/7
- I prefer receiving 30-40 proposals to select 10
- In this case we don't need 2 steps
- If we to continue with two steps 70-80 proposals could be expected but not 135!
- Food for thoughts and the subject of one breakout session

Global Land Project (GLP) Open Science Meeting 2010

- **Land Systems, Global Change and Sustainability**
 - Including joint day with UGEC Science Conference on: *Sustainable land systems in the era of urbanization and climate change*
- 17-19th October 2010, Arizona State University, Tempe
- **Registration and abstract submission is open on**
www.glp2010.org
 - **Extended Deadline for Abstract submission: 15th May 2010!**
 - **Reduced “Combi-Ticket” to attend both the UGEC and GLP Conferences (<http://www.glp2010.org/Registration.shtml>)**
 - **Support for early career and developing country**

Thank you,
Enjoy
the Spring time



Apr 2009

