Announcement
TE AM Agenda and Talks Reorganized

See Registration Desk

Review of LCLUC Observations and Data and Land Use

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LCLUC Program Objectives

- One of the long-standing objectives of the program is *to develop the capability to inventory and monitor land cover and land use change*

- As part of the thematic funding cycle we call for – *observation, detection and monitoring, data products* proposals *(30% of the funding 97-2011)*

- The program recognizes the importance of international cooperation on observations and participates actively in the GOFC/GOLD program

Observations for LCLUC

- **LANDSAT**
  - NASA Landsat Program Scientist (Garik Gutman)
  - 2003 SLC > Landsat Data Gap Study – investigated alternative sources (ASTER, CBERS, IRS, AWiFS)
  - LDCM will be critical – need for standard products (e.g. surface reflectance, continuous fields, land cover)
- ASTER /EO1 – used for some local studies
- MODIS
  - Regional > global studies
  - VIIRS for MODIS continuity (NASA science products?)
- Microwave Sensors – ERS, JERS, ALOS
- Fine resolution observations – USG Data Initiative
- Studies solicited on Data fusion/inter-use
- Assessment of Chinese Data and Availability

Commercial Imagery Today

United States
Commercial
Satellite Imagery
Footprints

WorldView-1—17.1 km
QuickBird—16.5 km
WorldView-2—16.4 km
GeoEye-1—15.7 km
Ikonos—11 km
OrbView3—8 km

309 km²
272 km²
270 km²
225 km²
54 km²

Portion of Landset 7 Scene: Washington D.C.

LANDSAT - Global Land Survey Data Sets
EPOCH Data Sets

Global cloud-free, orthorectified Landsat data sets centered on 1975, 1990, 2000, 2005, and 2010
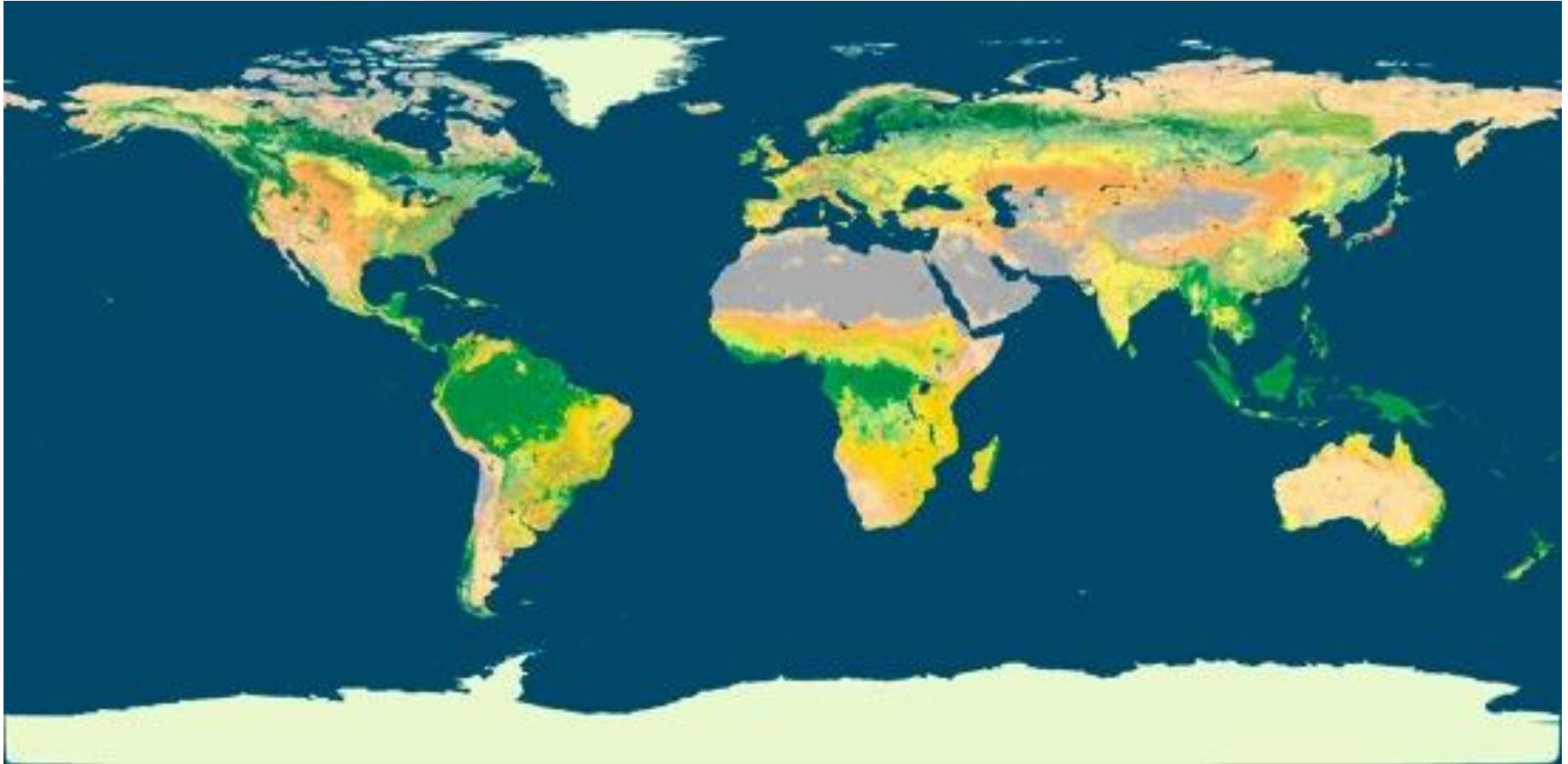
- Partnership between USGS and NASA LCLUC, in support of USGCRP

- Support global assessments of land-cover, land-cover change, and ecosystem dynamics (disturbance, vegetation health, etc)

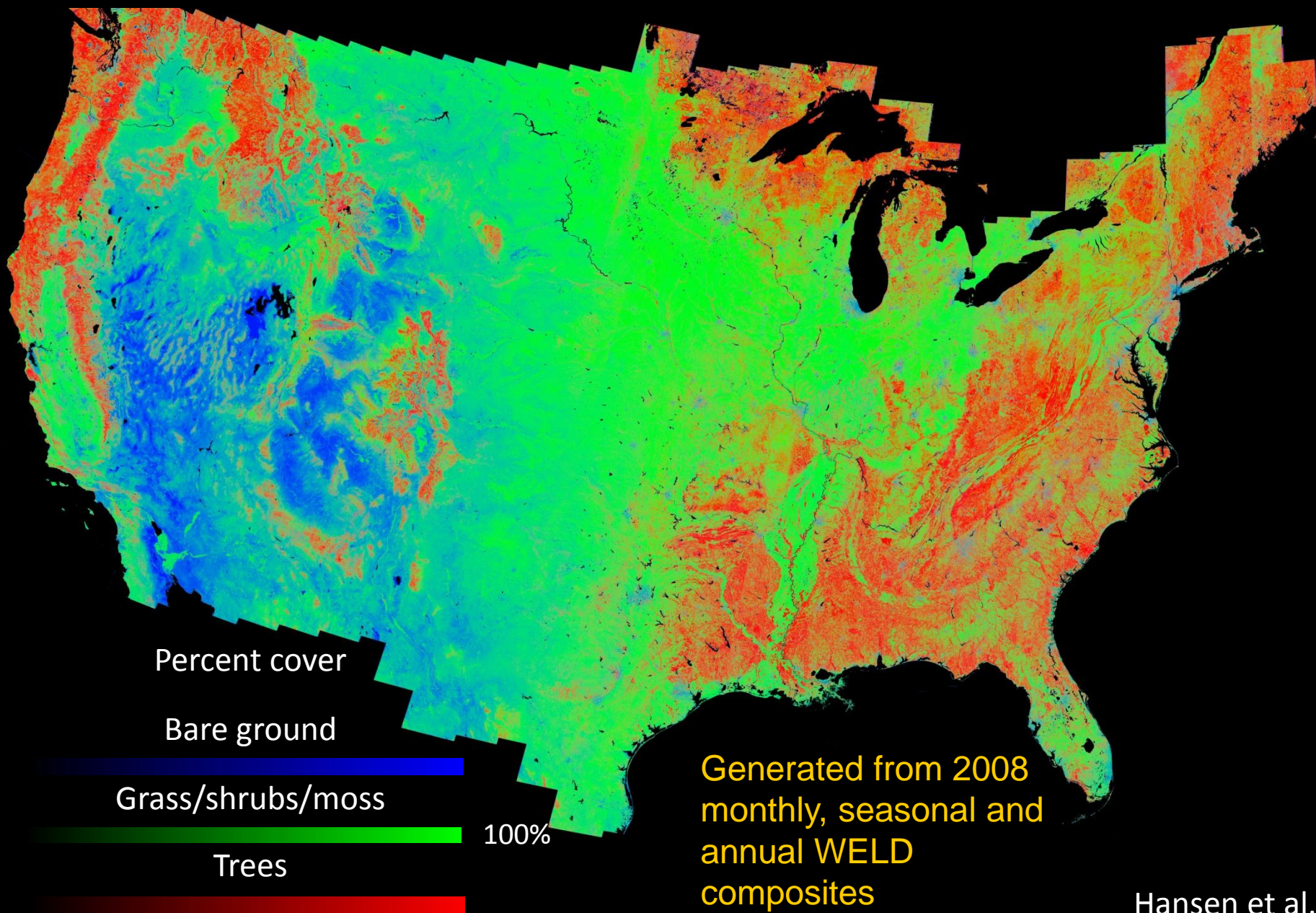- Pilot project for routine global monitoring in LDCM era
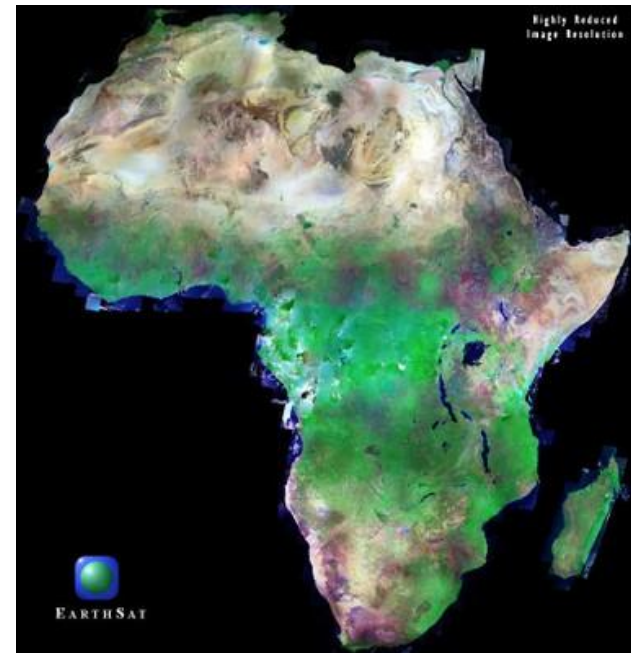
Land Cover

- **MODIS Global LC products (Science Team)**
  - Driven by 90's requirements DGVMs/GCMs – stratification
  - Land Cover
    - Global Land Cover products from Europe – inter-comparisons highlight differences
  - Validation and harmonization coordination (GOFC-GOLD)
  - Continuous fields
  - A surface type EDR to be generated from VIIRS (Friedl)
- **Landsat-based Regional LC Products**
  - Emphasis on Forest Cover (driven by Carbon Focus) – a mix of methods
  - LCLUC Program has not funded much genericregional land cover mapping
- **Landsat Global** in development (USGS / China?)

MODIS Global Land Cover

Friedl et al MODIS ST

CONUS 30m Vegetation Continuous Fields (%)

Percent cover

Bare ground

Grass/shrubs/moss

0%   100%

Trees

Generated from 2008 monthly, seasonal and annual WELD composites
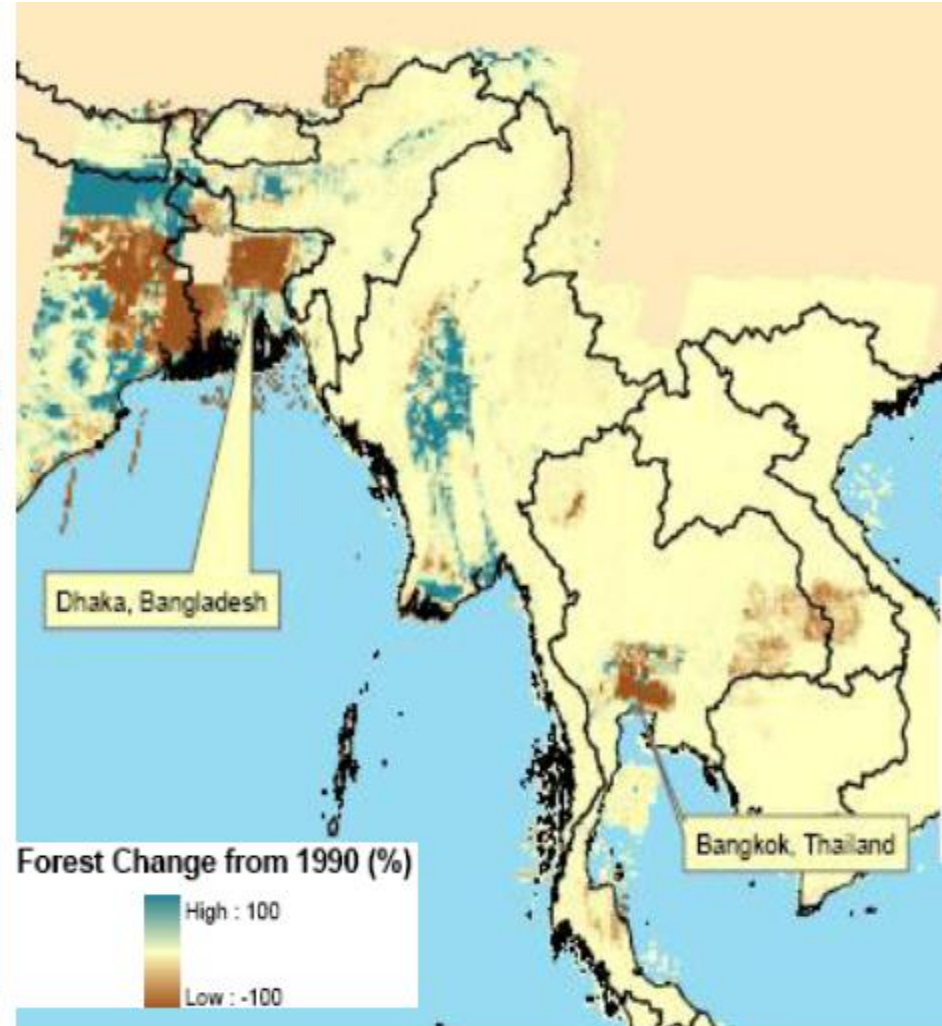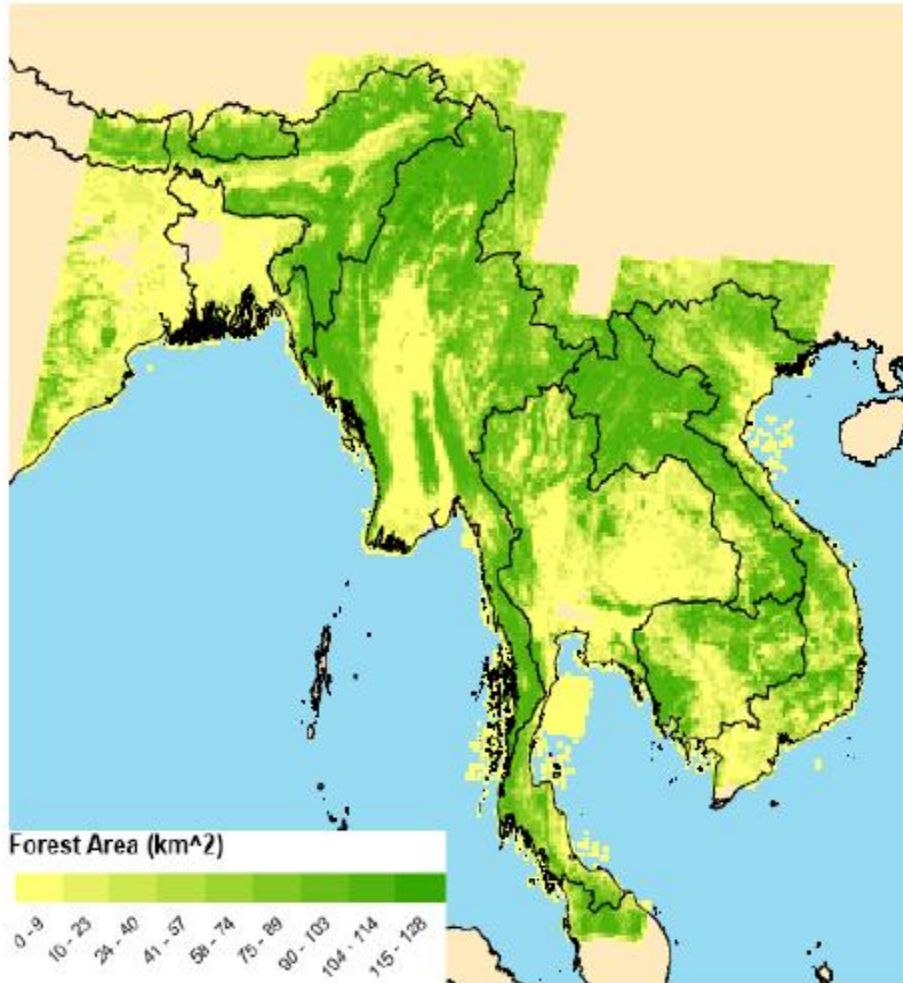
Hansen et al.

Automated Classification – Spectral Categories (SIAM) Applied to Landsat WELD Mosaic Product

Roy et al
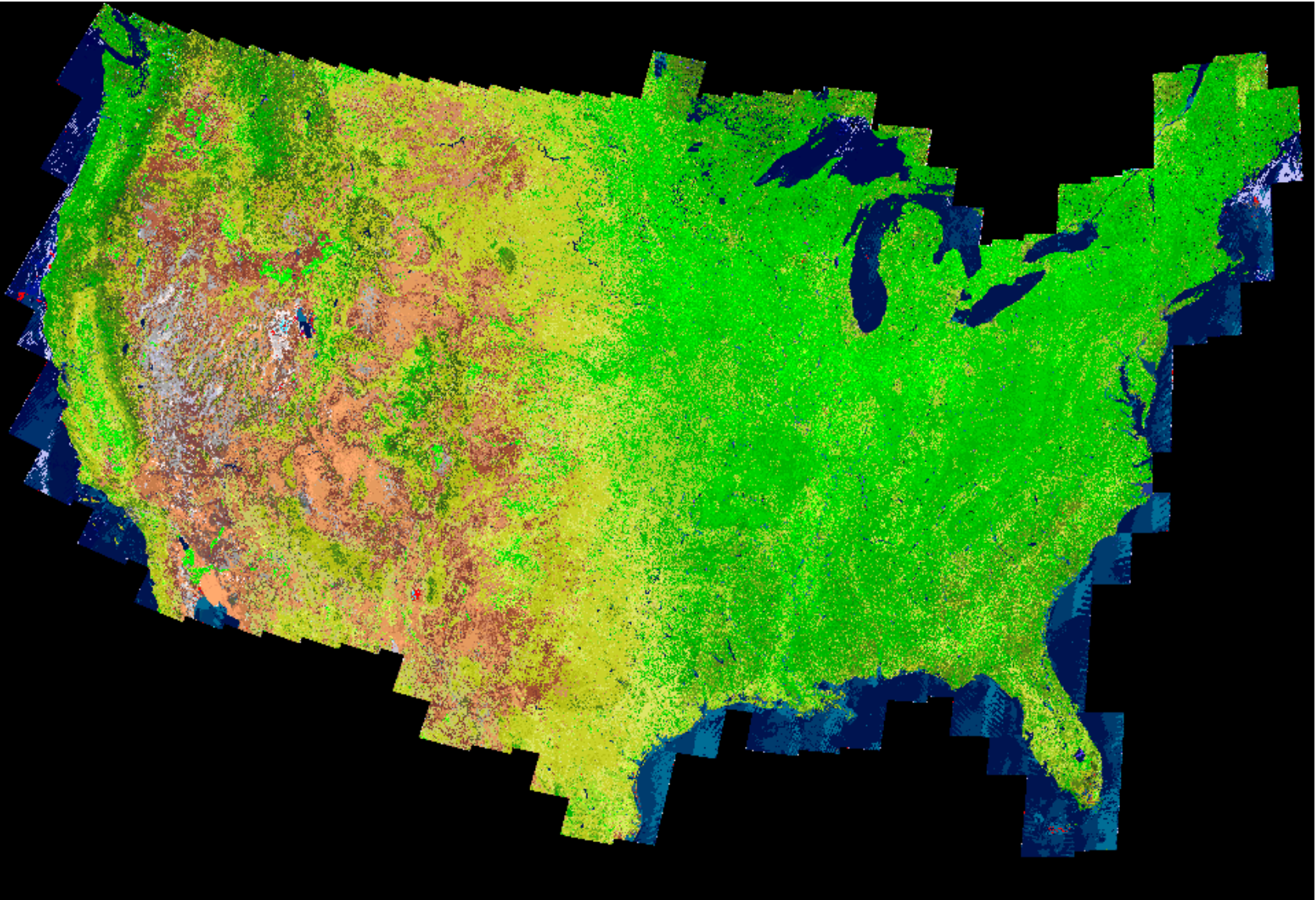
LAND Cover Change

- Emphasis has been on mapping Forest Cover Change (Carbon)
  - MODIS Vegetation Cover Change (experimental)
  - Landsat Change Detection
    - Two epoch change (Manual > automated pre-archive release)
    - Bulk analysis every available scene (mining the archive)
    - Analysis of Data Stacks (Scene > Region)
    - How to validate change – higher resolution data ?
   - Are standard practices emerging?

GLS Derived Forest Cover and Change

Forest Area (km^2)

0 - 9 | 10 - 23 | 24 - 40 | 41 - 57 | 58 - 74 | 75 - 89 | 90 - 103 | 104 - 114 | 115 - 128

Dhaka, Bangladesh

Bangkok, Thailand

Forest Change from 1990 (%)

High : 100

Low : -100

Skole et al MSU

Landsat Based Decadal Forest Change Mapping in the Congo Basin:1990s – 2000s
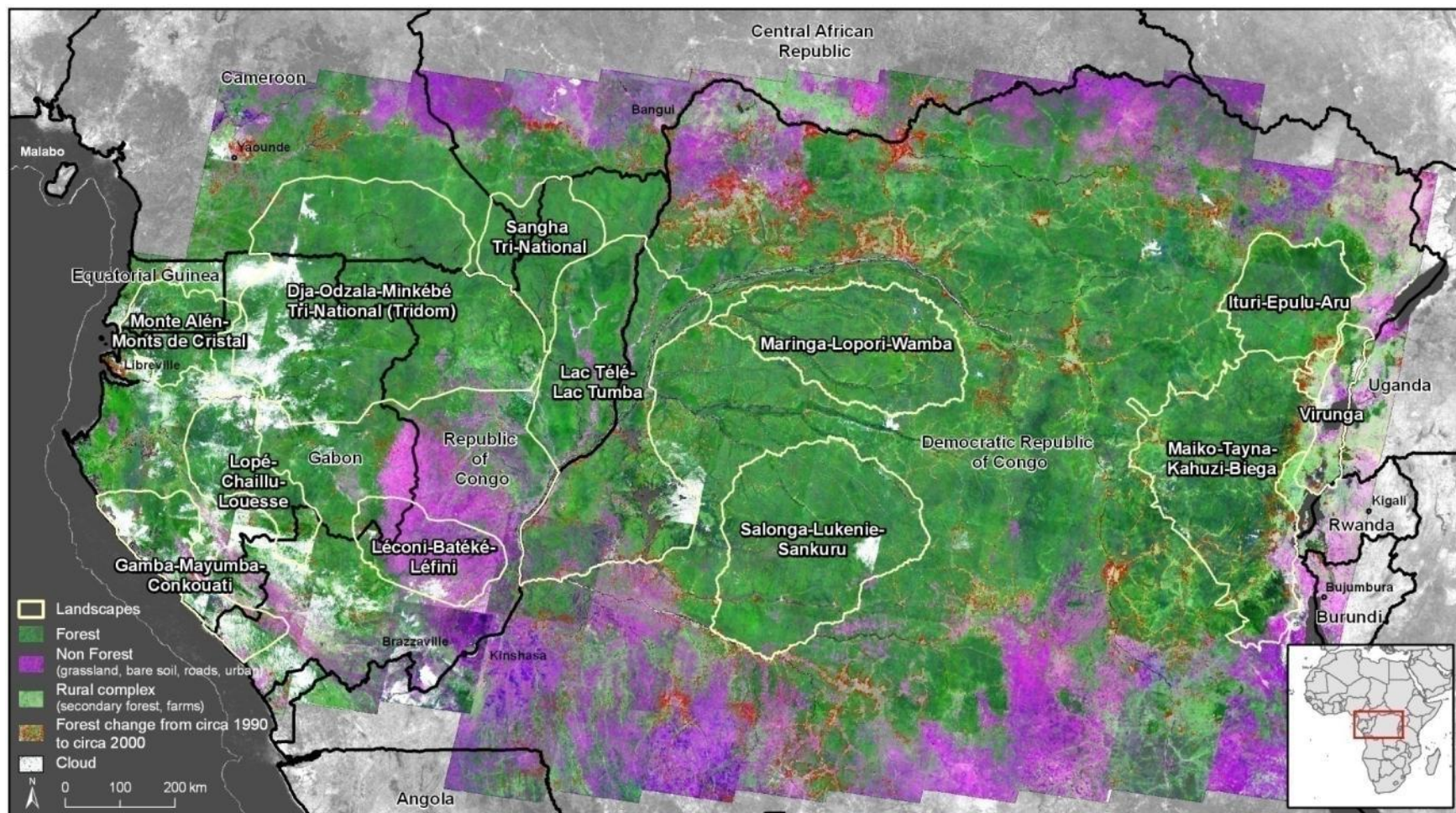
Forest change and forest cover lost (in red) from circa 1990 to circa 2000 was mapped consistently at 57m across the Congo Basin via an automated procedure incorporating MODIS and Landsat. Forest loss, enhanced for visualization, is depicted in red.
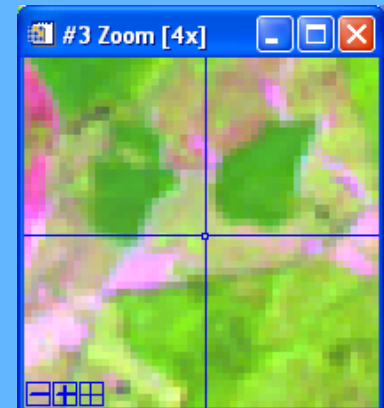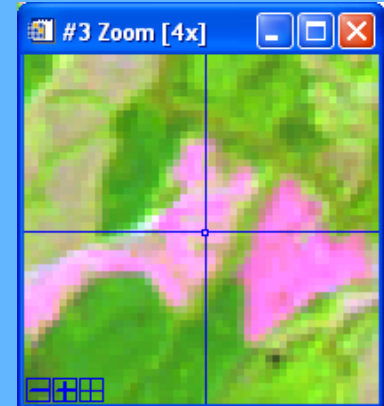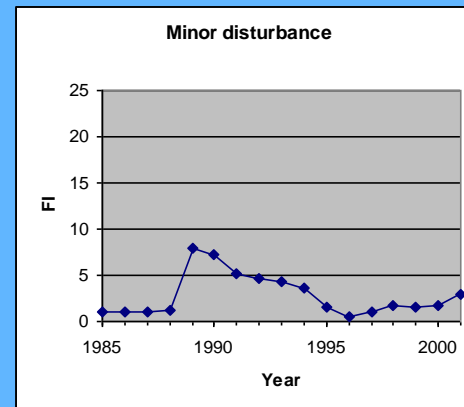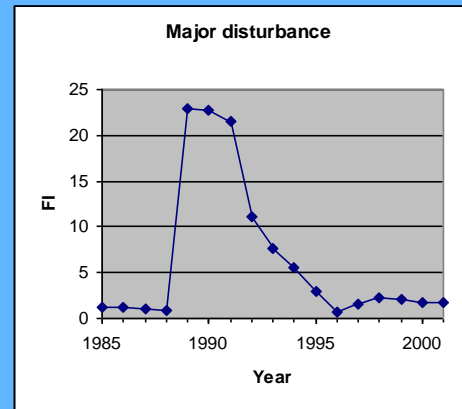
Hansen et al. UMD

Percent forest cover loss, 2000 to 2005
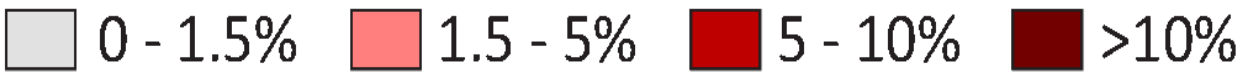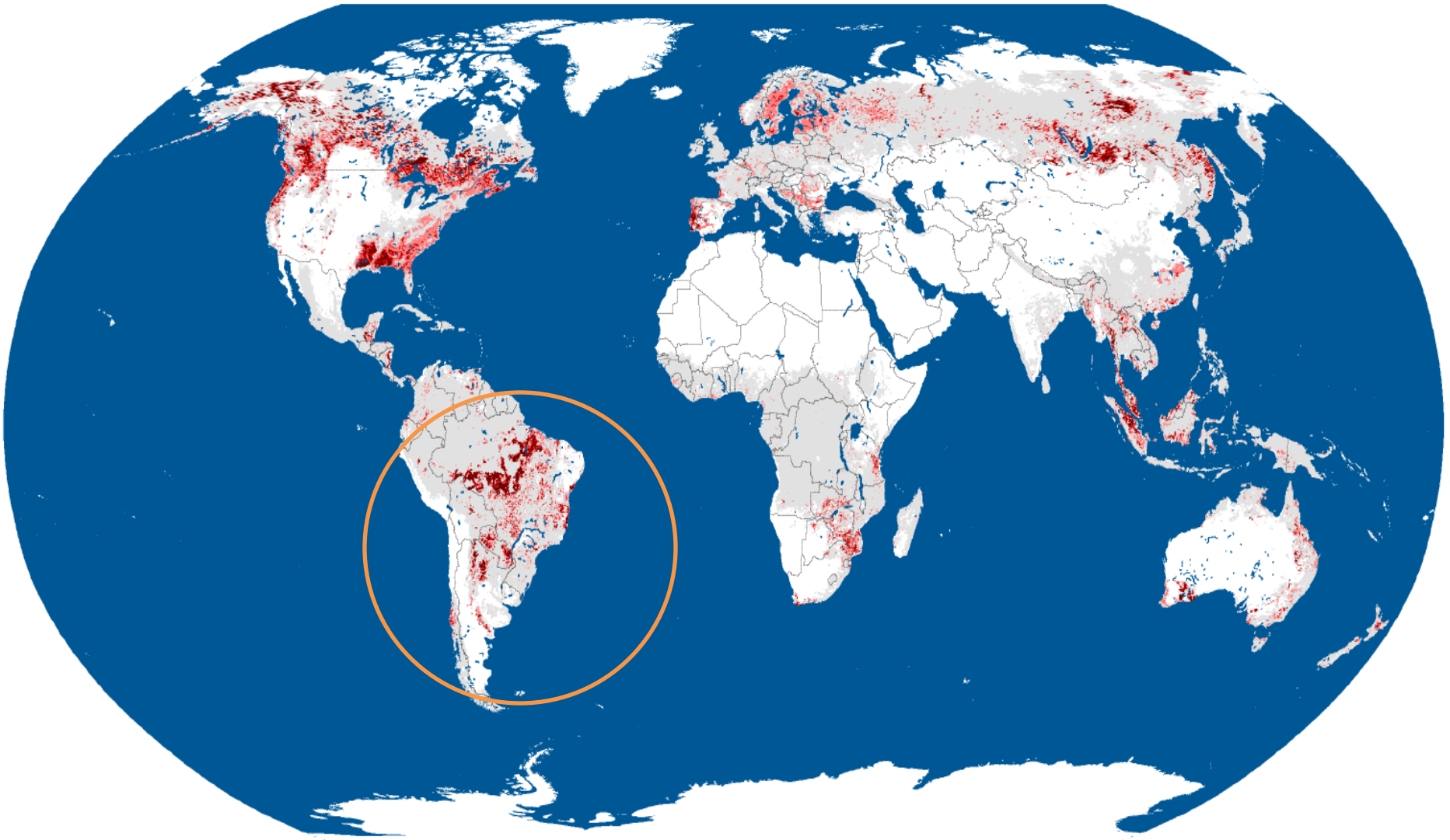
0 - 1.5%   1.5 - 5%   5 - 10%   >10%   Hansen et al

North American Forest Dynamics Vegetation Change Tracker
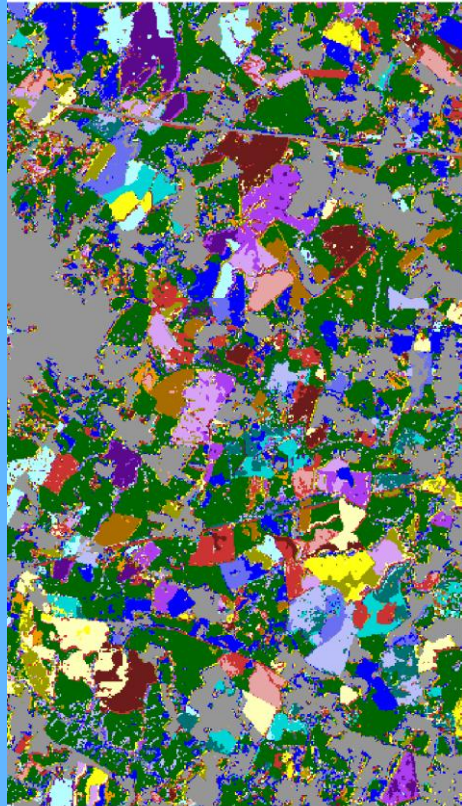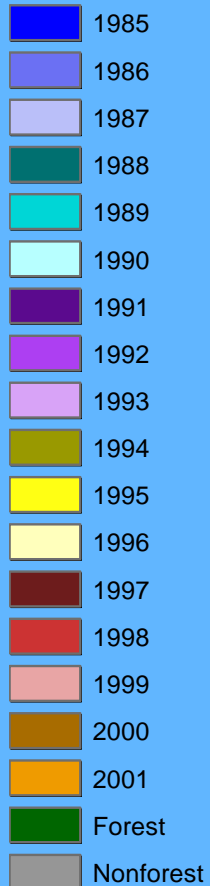
Lake Anna, VA, 60 km NW of Richmond

Goward, Huang et al *North American Forest Dynamics (NAFD) - A NACP Core Project*

Land Cover > Land Use

What we do with the land (rather than simply what is there) - for example:

- Agriculture (cropping system, type, yield)
  – Rainfed / Irrigated
  – Intensity (inputs)
  – Rotation
- Rangelands and Pasture
- Forestry
  – Plantation
  – Agroforestry
- Urban / Suburban
  – Residential (density) / Commercial

# Fine Resn Data - a more nuanced view of land cover


Skole et al

Land Use Change

- A not too distant future planet with 9 billion people and a changing climate will result in more land use change with local to global impacts and more pressure on society, natural resources, biodiversity

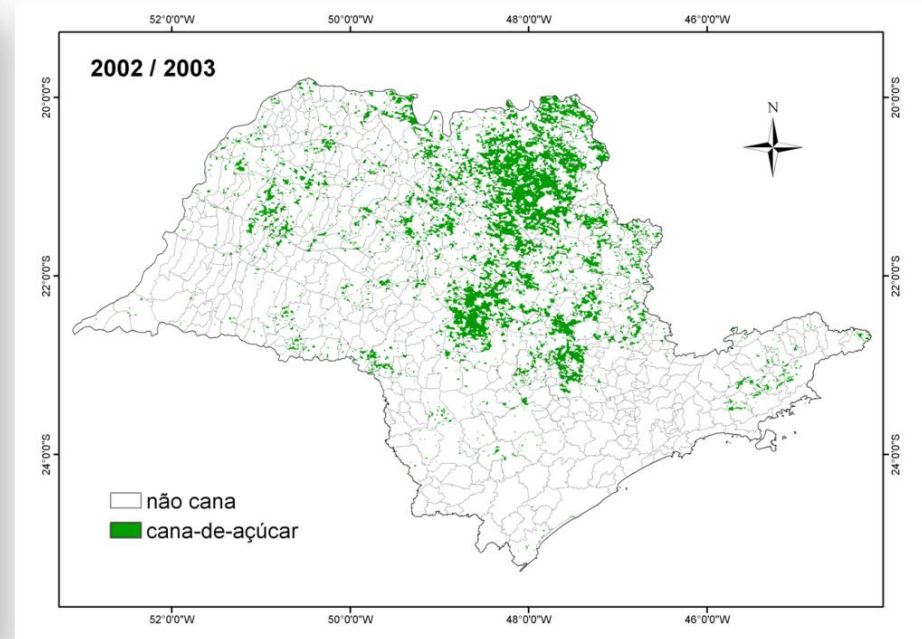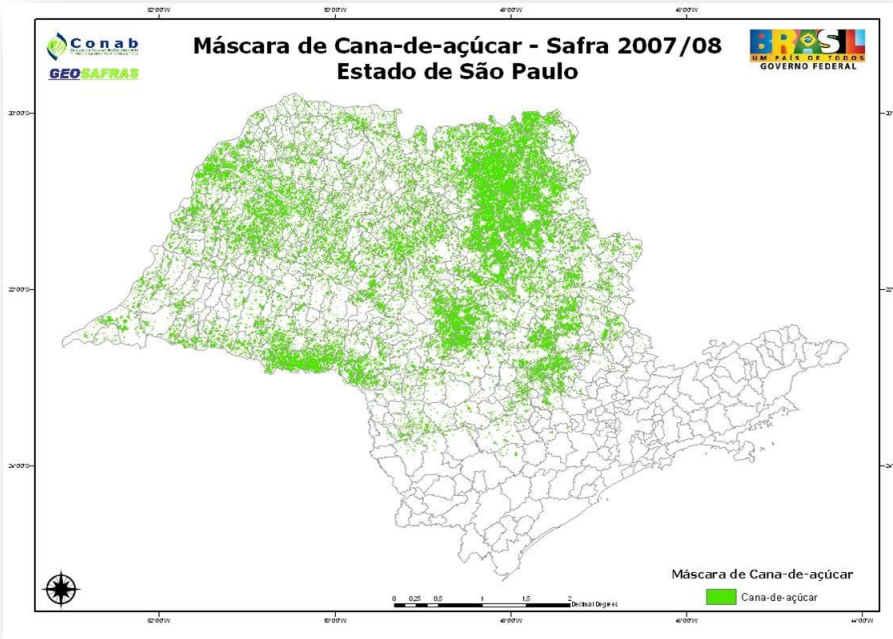- Linkage between land use – food, water and energy

Land Use

- Looking at the present and recent past and understanding the processes and impacts of LUC

- Looking to the future and the challenges we will need to face

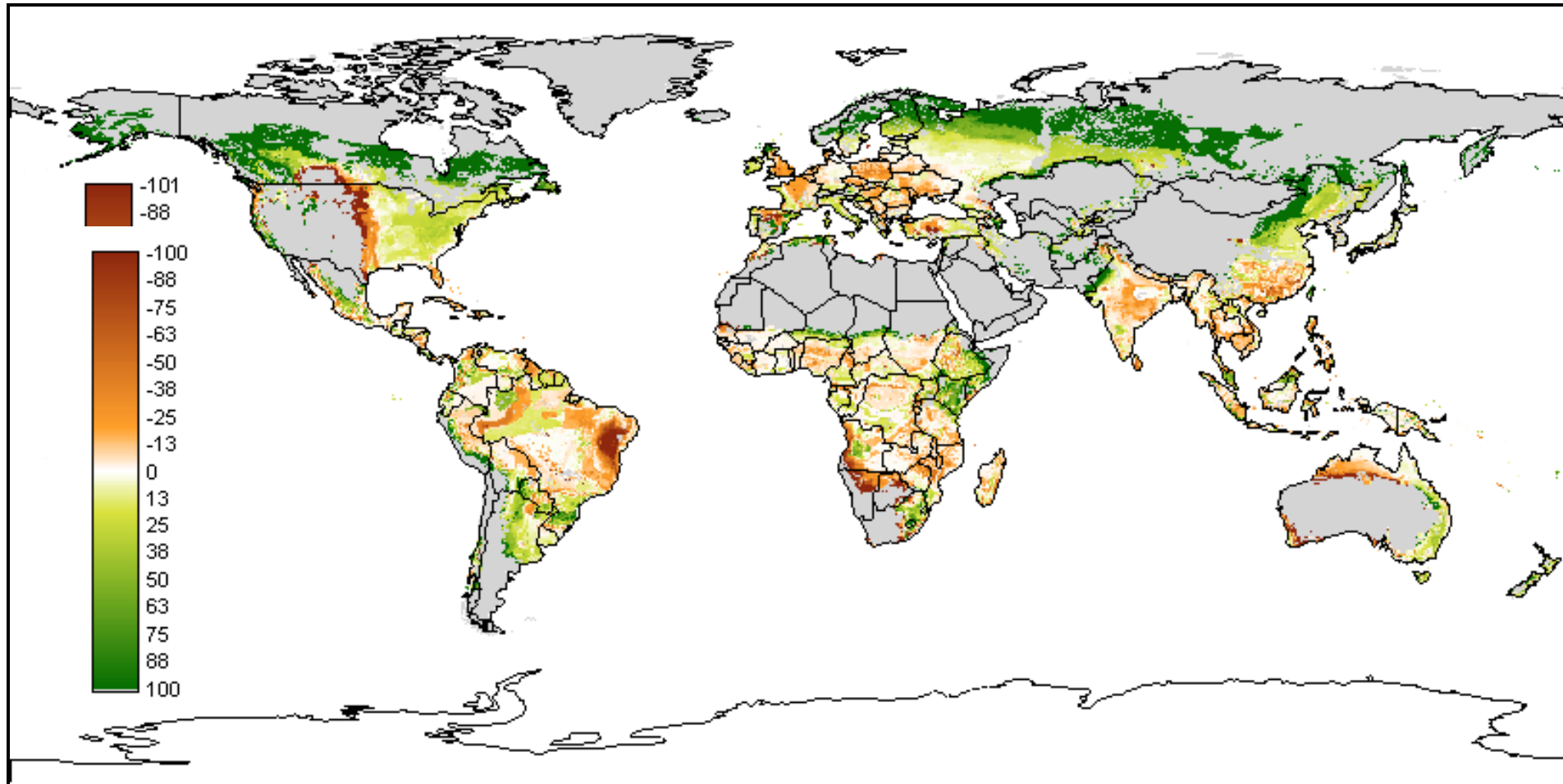# Soybean Expansion in Mato Grosso, Brazil

August 6 1992, TM

July 28, 2006, ASTER

Rio Peixoto de Azevedo

1992, TM

2006, ASTER
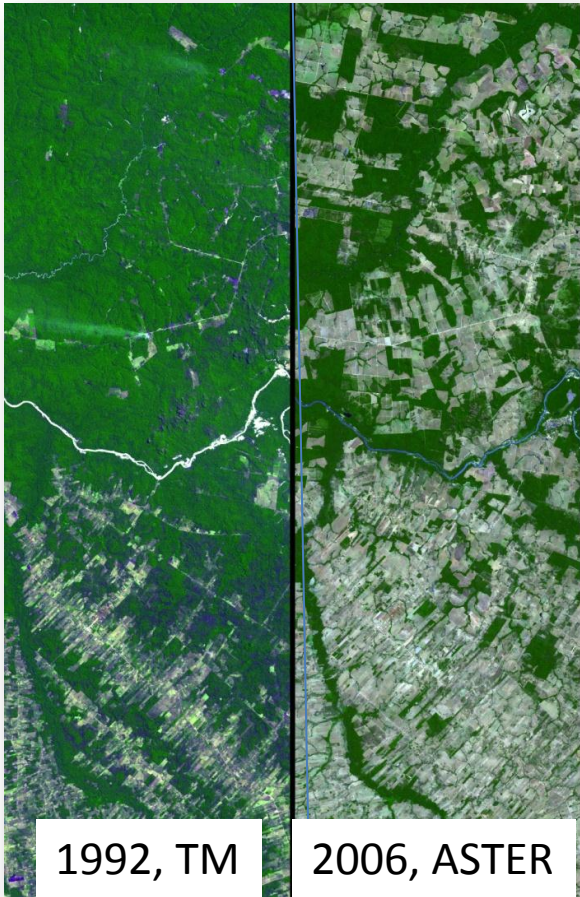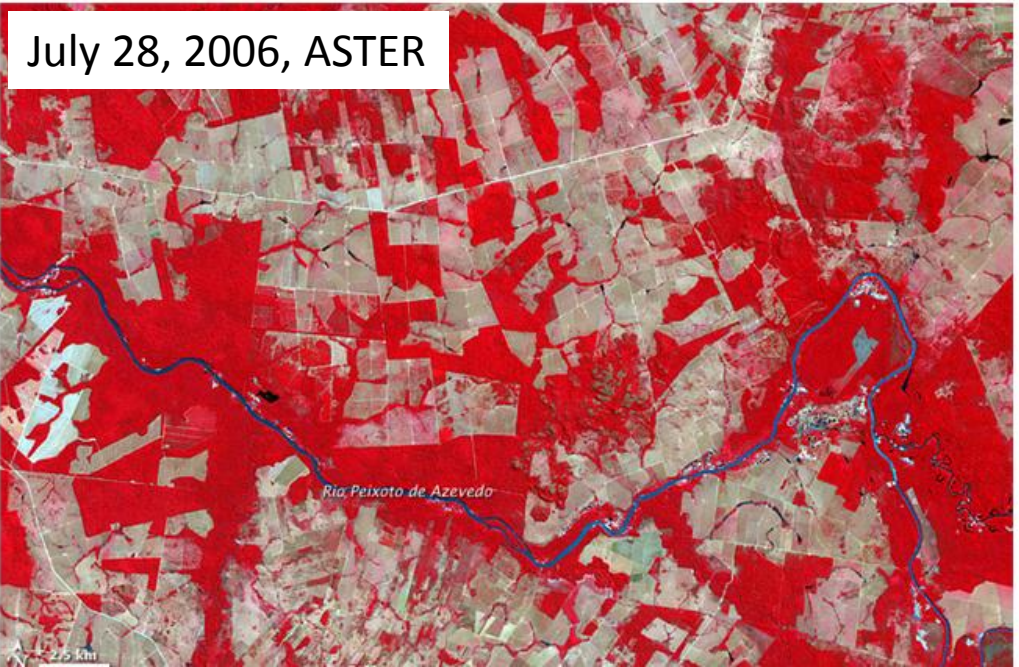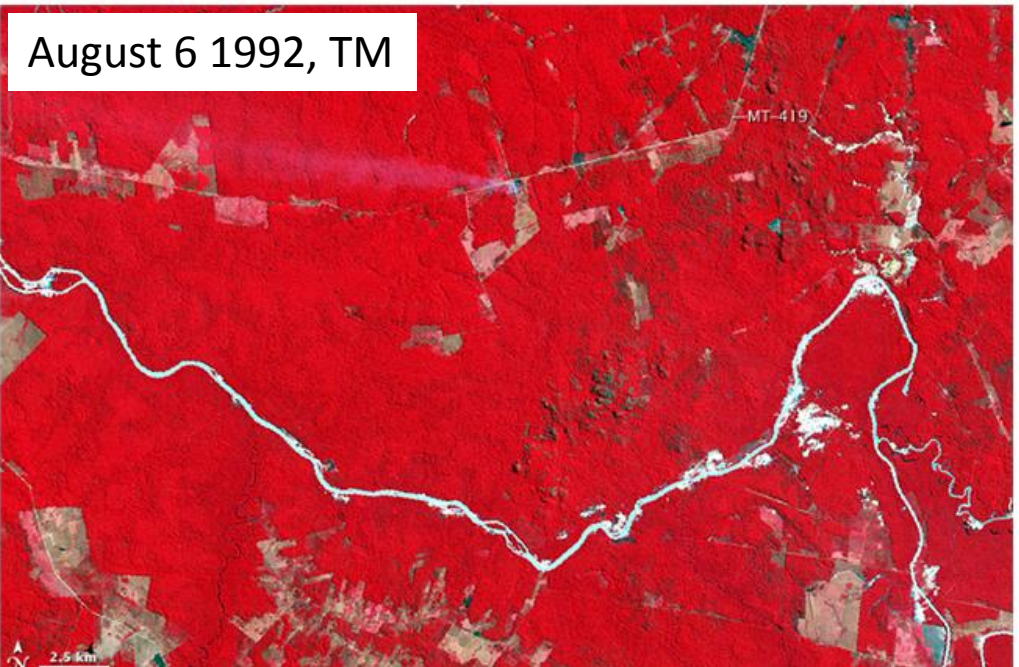
Sugarcane Expansion (Ethanol), Brazil

J. Rocha Conab

# Agricultural Impacts of Climate Change: cereal production capacity

Max-Planck Institute/ECHAM4 2080s

Impacts of Climate Change on Multiple Cropping Production Potential of Rain-fed Cereals

Climate change impacts are visualized using a normalized difference index. It is calculated by dividing the difference in cereal production capacity between future and current production potential by their sum.

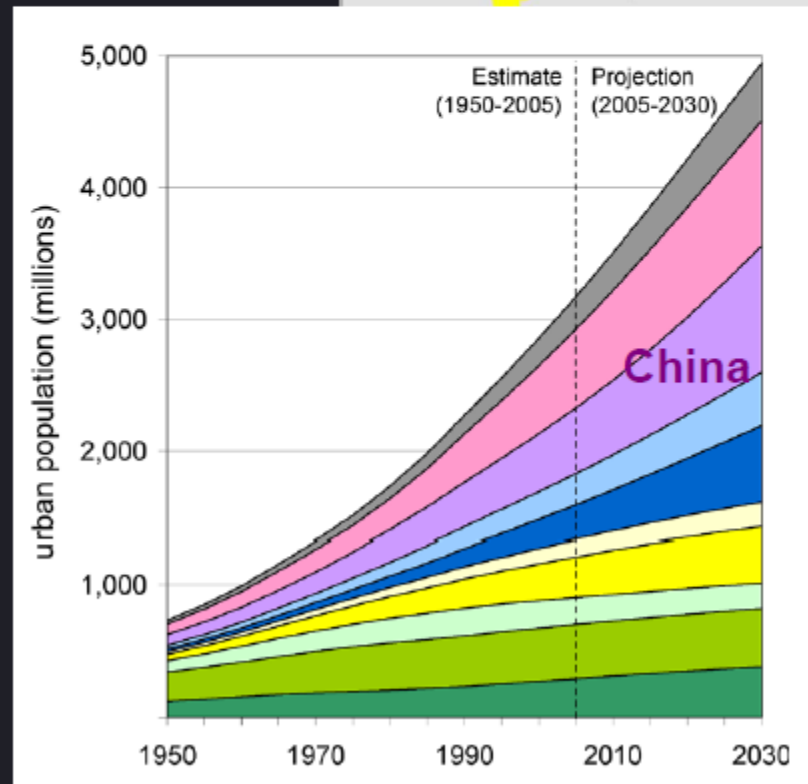# An Urbanizing Global Population
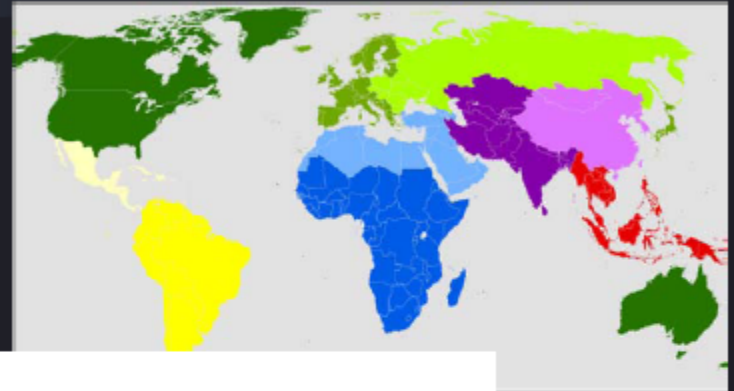
Urban population is increasing

50% of global urban population live in Asia

one-third will live in China or India by 2030

currently, 115 cities > 1 mil in China

Current and projected global urban population growth 1950-2030

Schneider et al

Coming to a town near you

Land Use Change

- Land Use Change is central to Adaptation Science
  - USGCRP is embracing Adaptation Science
  - Planet Under Pressure – vulnerability and resilience – next phase IGBP
  - Sustainability Science inc. Rio + 20
- New suite of land use models is needed and being developed with additional data needs
- NASA is supporting an NRC Study on Land Use Modeling   - hopefully will help clarify the community

Purpose of the Meeting

- Opportunity for input on future directions for the LCLUC program (an evolving program)
  - Topics for future ROSES calls
  - Input on the Proposal Process
- Should we/ and how could we strengthen the LU in LCLUC
- Would the community be ready to respond

- Presentations from those working at the interface between LC and LU
- Breakout sessions to solicit community input
  - Chairs will be press-ganged into service for their country