

Remote Sensing Applications for Dynamics and Productivity of Grasslands and Croplands

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<http://www.eomf.ou.edu>

2014 Oklahoma Workshop on Remote Sensing Technology and Application

National Weather Center, OU, Norman, Oklahoma, November 12, 2014



Earth Observation and Modeling Facility

A. The Computational Laboratory

12 computer servers

800 Terabyte online data storage, and a member of OU PetaStore facility

B. The Data Visualization Laboratory

C. The Remote Sensing Laboratory

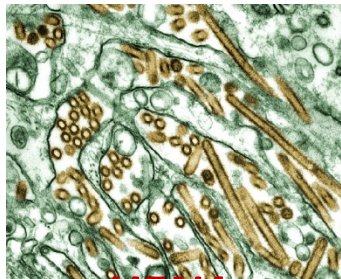
Hyperspectral, multi-spectral and thermal remote sensing

GIS, GPS,

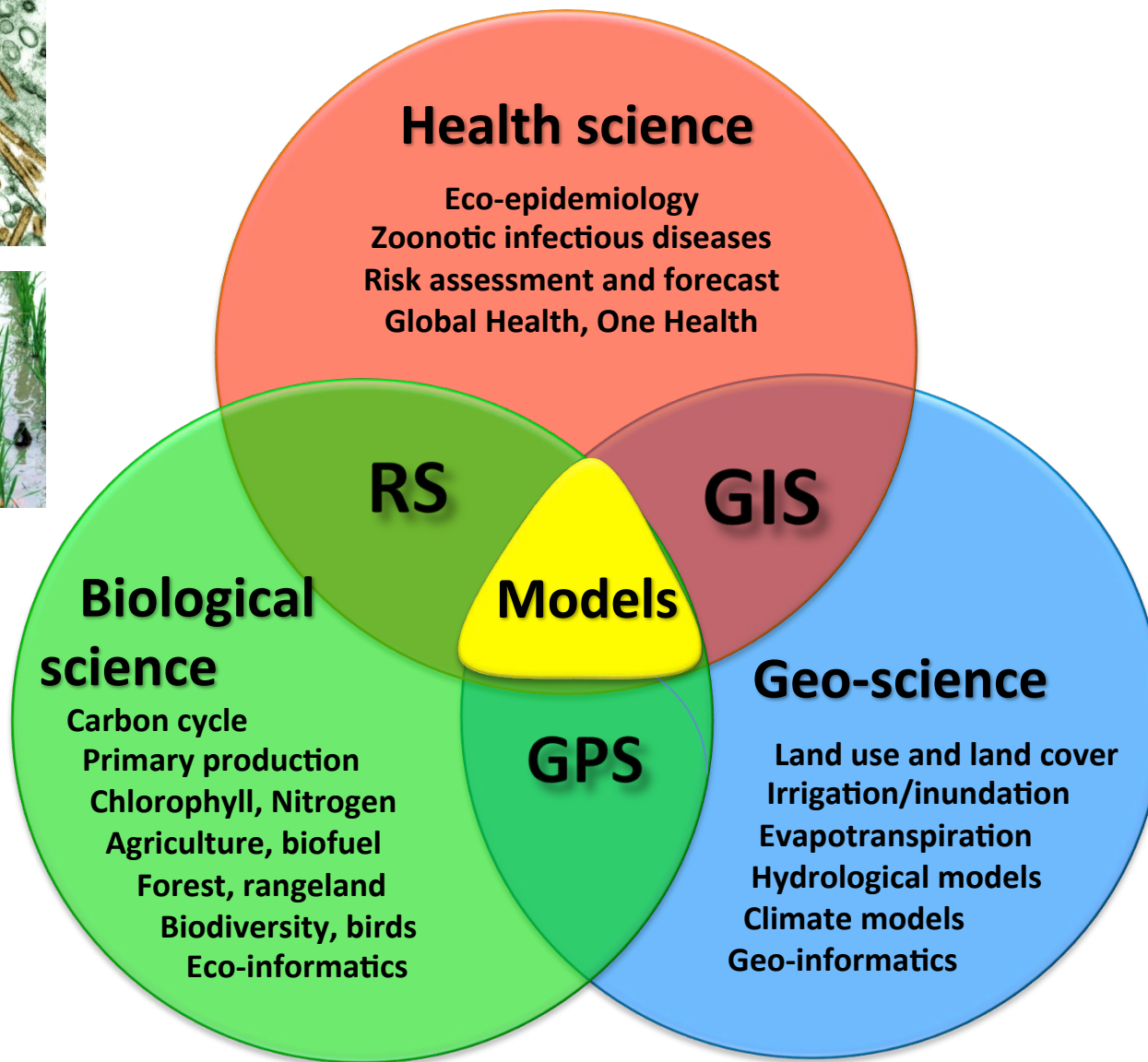
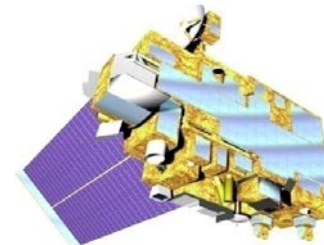
D. Integrated Observation Sites



Earth Observation and Modeling Facility



H5N1



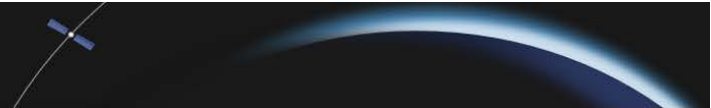
\$1.5 million annual expenditure in FY2012 from federal grants





Outline of the presentation

- Integrated Land Data Portal (<http://www.eomf.ou.edu>)
- Land use and land cover changes
- Water quality and harmful algae
- Carbon and water fluxes of grasslands and croplands
- Drought impact assessment

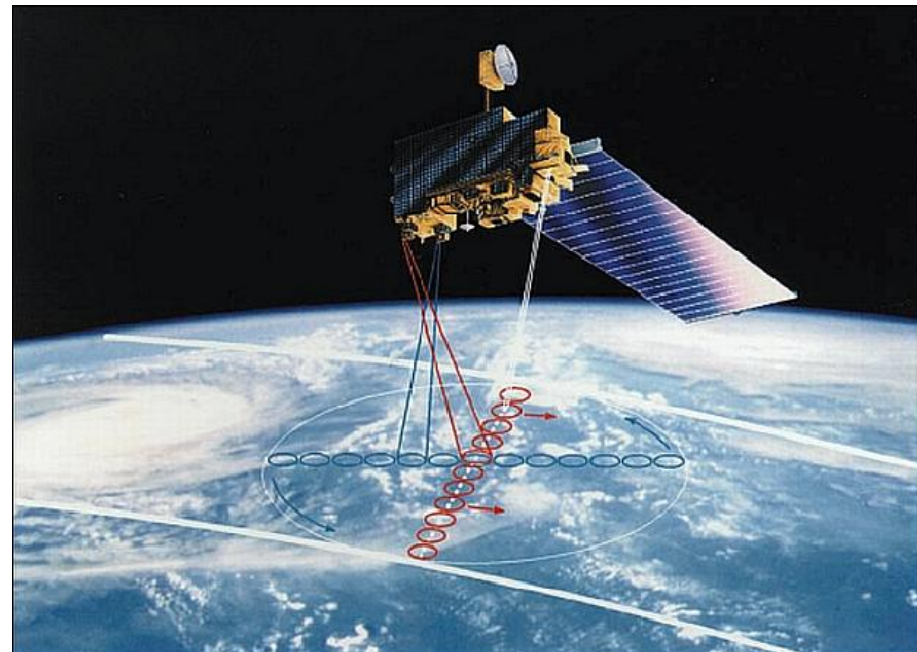


Integrated Land Data Portal (iLand)

<http://www.eomf.ou.edu>

Big Data Science

1. How to empower researchers and millions of people to collect and share in-situ ground reference data?
2. How to integrate and share in-situ data and images from airborne and spaceborne sensors?
3. How to engage researchers and millions of people to participate in data product evaluation and improvement?



Global Geo-Referenced Field Photo Library at the University of Oklahoma

(<http://www.eomf.ou.edu/photos>)

A citizen science data portal for sharing and archiving geo-tagged field photos of cropland, rangeland, forest, wetland, water body, harmful algal bloom, wildlife, fire, drought, flood, diseases in the world. All photos are linked with satellite images (e.g., MODIS) from 2000 to present.



*Share your field photos,
show your footprint of travel and
support monitoring of our planet Earth*



Earth Observation and Modeling
University of Oklahoma

Home About Us Dataset Photo Visualization Models iCarbon GeoHealth GIS Day Workshop Account

Global Geo-Referenced Field Photo Library

Welcome, you are xiao2007
[Home](#) | [Browse](#) | [Map](#) | [My Photos](#) | [Upload](#) | [Log out](#)

Search by coordinates: Longitude min: Longitude max: Search by date: From: Search by metadata: Categories: Search by region: Countries:
 Latitude min: Latitude max: To: Users: Geographical:
 All All All All

Search by keywords: **Field Photo** App is freely available in Apple store and Google Play store

Submit

50460 photos

Greenland, Iceland, Sweden, Norway, Poland, Ukraine, Kazakhstan, Russia, United Kingdom, Germany, France, Italy, Turkey, China, South Korea, Japan, Spain, Saudi Arabia, Iraq, Iran, Afghanistan, Pakistan, India, Nepal, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam, Philippines, Malaysia, Singapore, Brunei, Indonesia, Australia, New Zealand, South Africa, Madagascar, Botswana, Namibia, Angola, Tanzania, Kenya, Ethiopia, Sudan, Chad, Nigeria, Mali, Niger, Libya, Algeria, Egypt, Venezuela, Colombia, Peru, Brazil, Bolivia, Chile, Argentina, Mexico, Canada, United States, Greenland.

Imagery ©2012, Map data ©2012 - Terms of Use

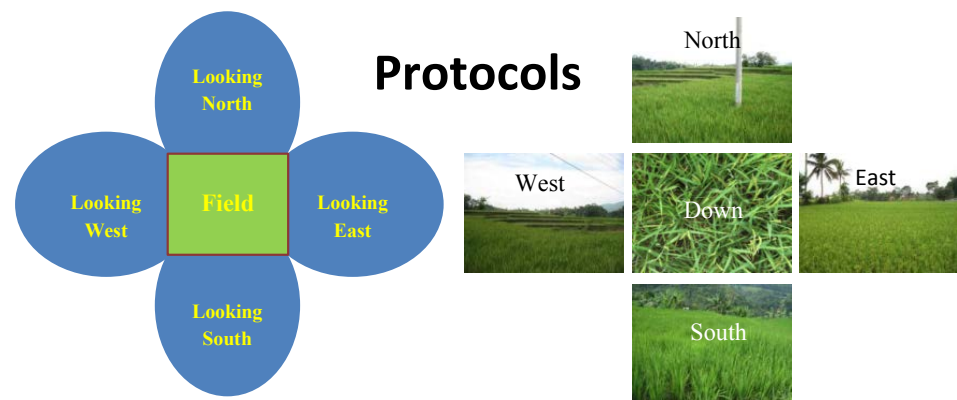
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| Date: 2011-08-16 122.5048 °E, 17.8887 °S Aspect: N Category: Mixed Forest Field notes: DLCMv1 class# 34 | Date: 2011-08-16 122.5048 °E, 17.8887 °S Aspect: E Category: Mixed Forest Field notes: DLCMv1 class# 34 | Date: 2011-08-16 122.5048 °E, 17.8887 °S Aspect: W Category: Mixed Forest Field notes: DLCMv1 class# 34 | Date: 2011-08-16 122.5048 °E, 17.8887 °S Category: Mixed Forest Field notes: DLCMv1 class# 34 |

[View MODIS time series data](#) [View MODIS time series data](#) [View MODIS time series data](#) [View MODIS time series data](#)

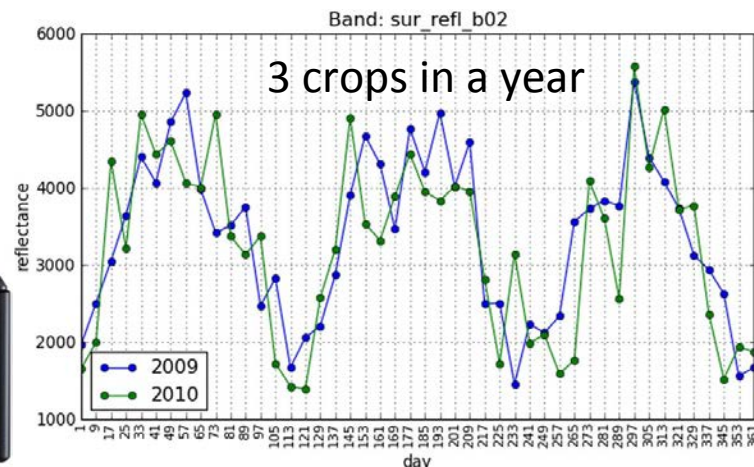
Integration of in-situ field data and images

1. Smartphone App "Field Photo"
2. Geo-referenced field photo library
3. Images (MODIS, Landsat, PALSAR)

The screenshot shows the 'Global Geo-Referenced Field Photo Library' interface. It includes a search bar, filters for coordinates, date, metadata, and region, and a map of India with numerous photo locations marked. Below the map are four photo thumbnails with their respective dates and coordinates.



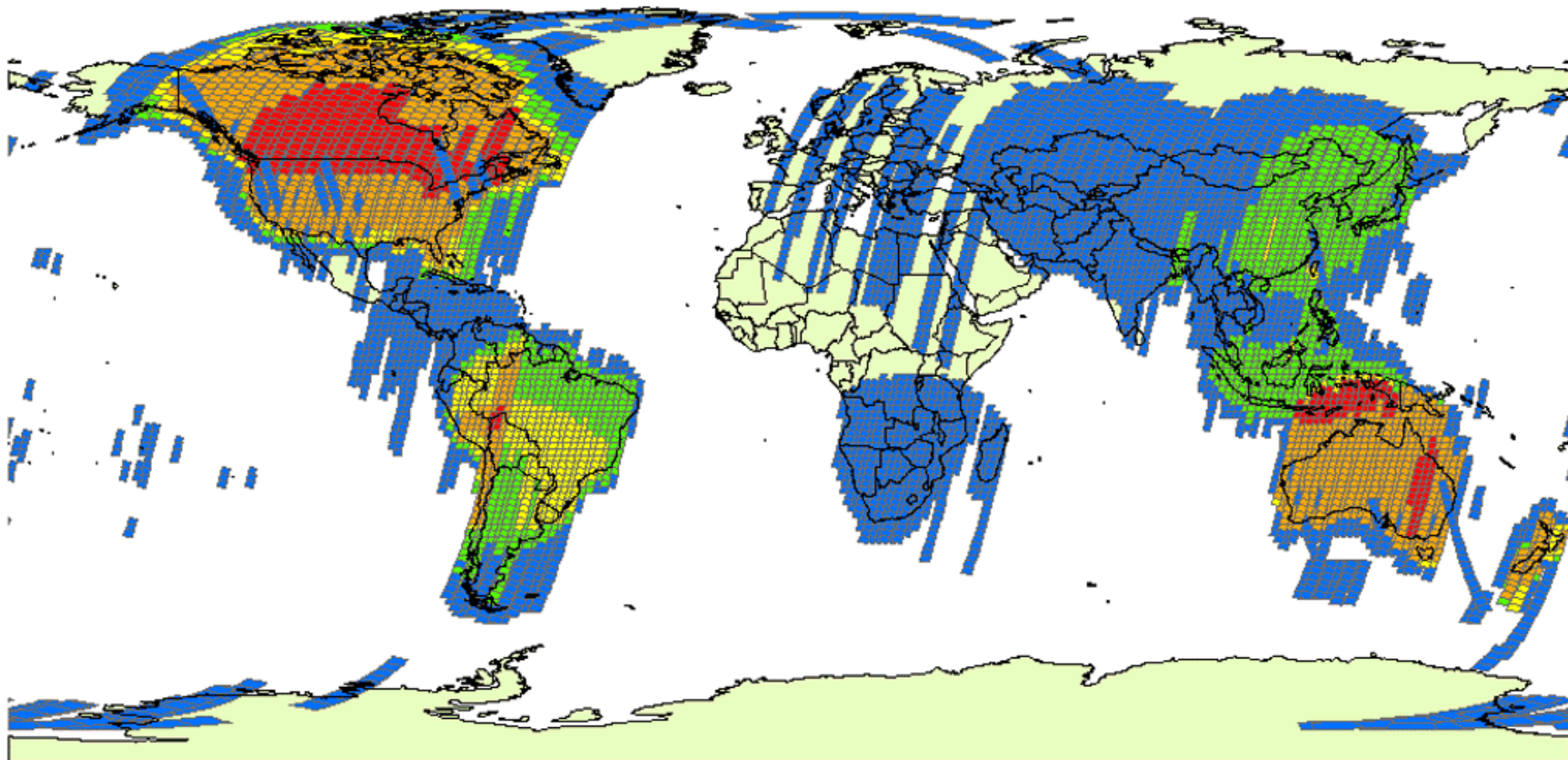
Individual photos are linked with time series MODIS data (2000 - present)



Measurement, Reporting and Verification of Land Use and Land Cover Changes

<http://www.eomf.ou.edu/>

Track land use and land cover changes at 30-m spatial resolution from 1980s to present



LGAC WRS2 Scenes

Status as of July 31, 2012

Acquisition Date Range: August 22, 1982 through July 30, 2012

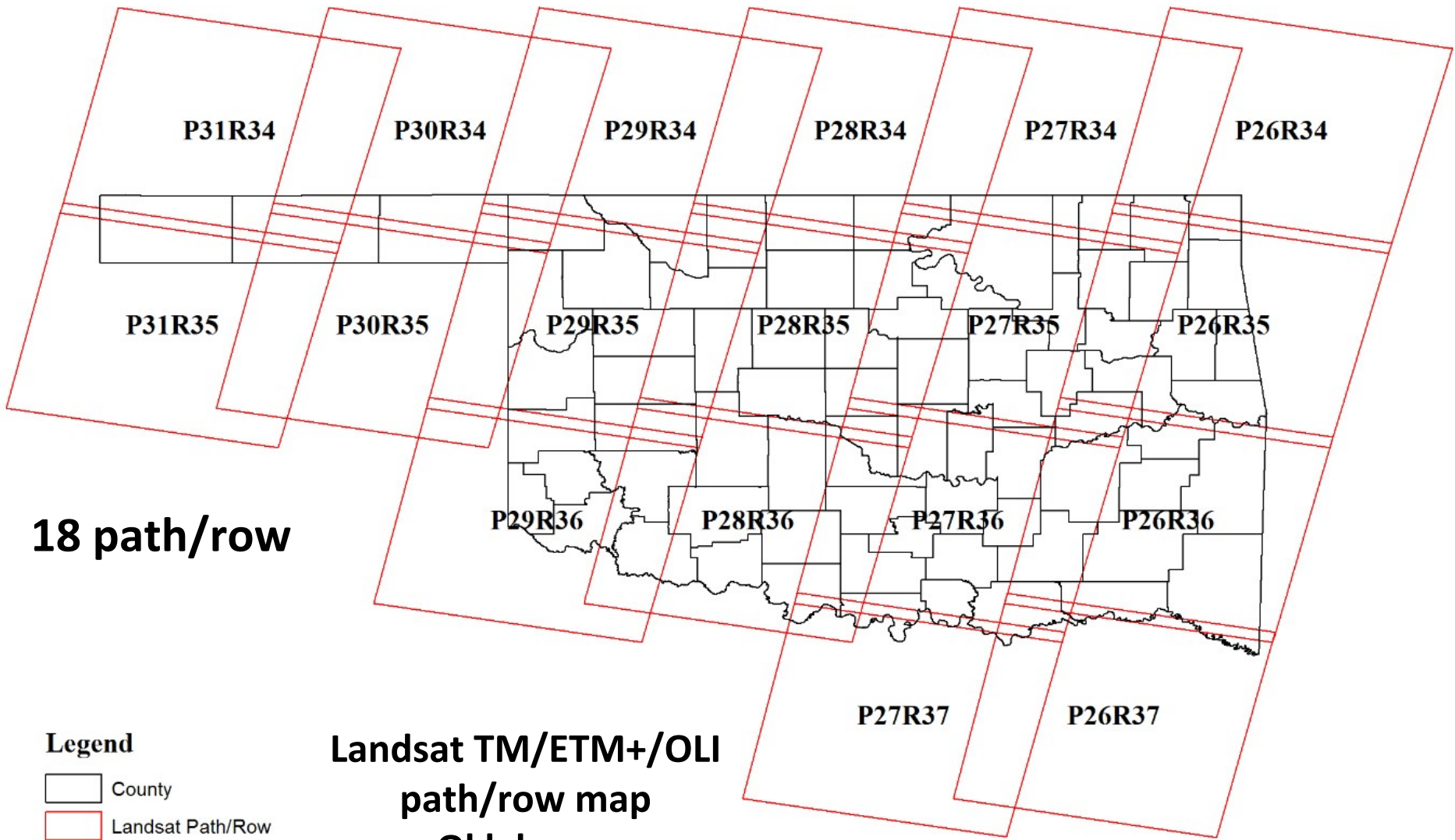
1,051,226 Total Scenes Acquired

8,580 Unique Path/Rows



Landsat TM, ETM+, OLI time
series images

Land Cover and Land Use Changes in 1984 – 2014, Oklahoma



18 path/row

Legend

-  County
-  Landsat Path/Row

**Landsat TM/ETM+/OLI
path/row map
Oklahoma**

Land Cover and Land Use Changes in 1984 – 2014, Oklahoma

- Agriculture, grasslands, woody plant encroachment, urbanization
- Carbon/water/energy fluxes

Image numbers of P28/r35 (as of 6/20/2014)

Landsat 4, 5 TM: 552
Landsat 7 ETM+: 338
Landsat 8 OLI: 27
Total number = 917

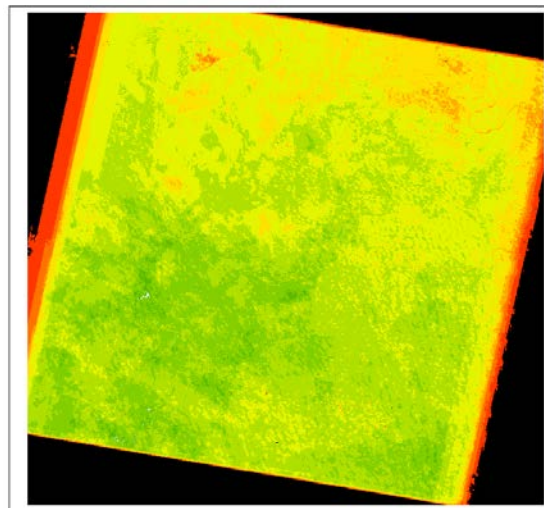
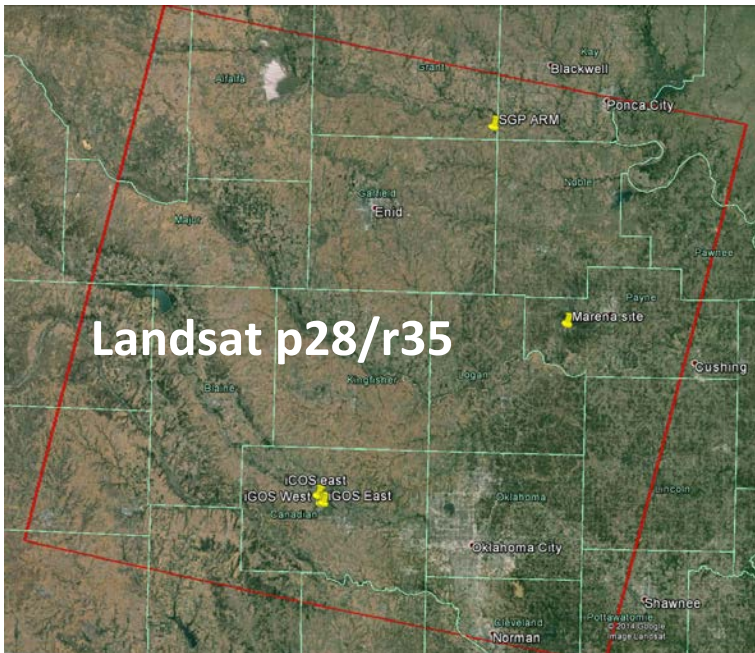
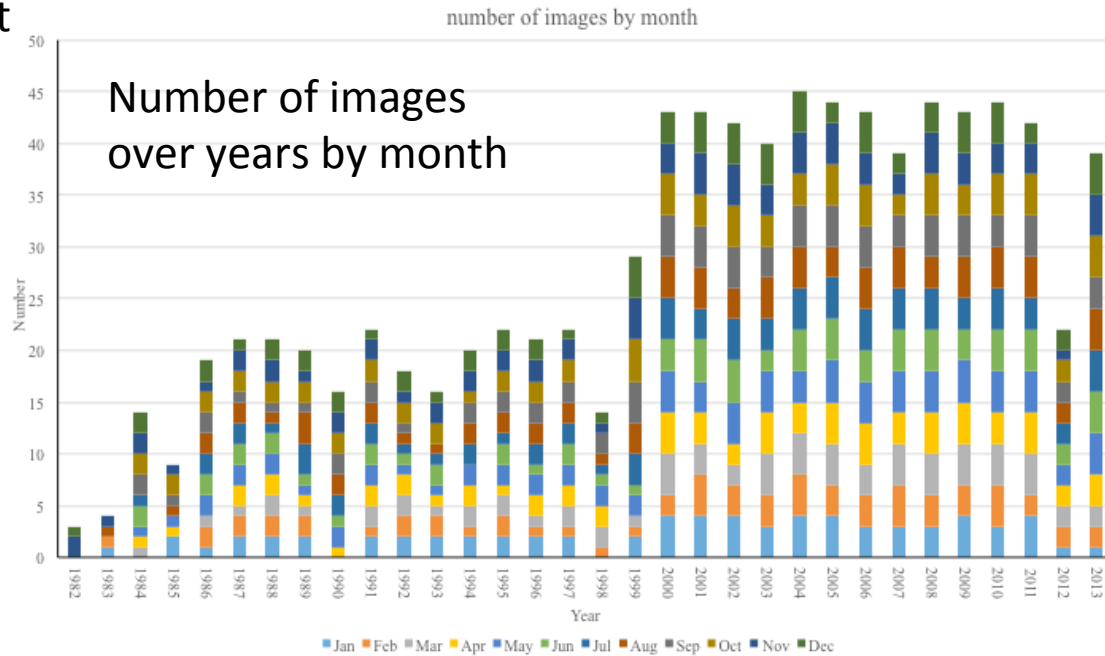
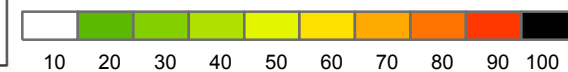


Image quality

Frequency of bad-quality observations (clouds, cloud shadow, SLC-off, snow)

Frequency



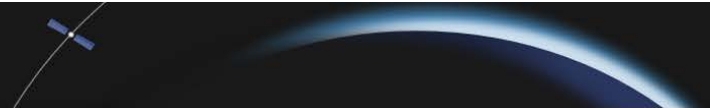
The screenshot shows a web browser window displaying the 'Global Geo-Referenced Field Photo Library' on the website www.eomf.ou.edu/photos/map/. The page features a navigation menu with options like Home, About Us, Photo, Datasets, Visualization, GeoHealth, GIS Day, POI / AOI, and Account. A sidebar on the left includes 'PHOTOS ACTIONS' (Overview, Browse, Map, My Photos, Upload, Working Photos, Log out) and a search section with filters for Longitude, Latitude, Date, Categories, Username, Countries, Geographical, and keywords. The main content area shows a map of Oklahoma with numerous orange dots representing photo locations. Below the map, it indicates '17434 photos' and '8 photos' are currently displayed. A list of five photos is shown at the bottom, each with a thumbnail, date (May 18, 2011 or July 26, 2011), coordinates (99.0403 °W, 36.1904 °N), and 'Unclassified' status. A 'MODIS' label is present under each photo.

In-situ field data collection, management, visualization

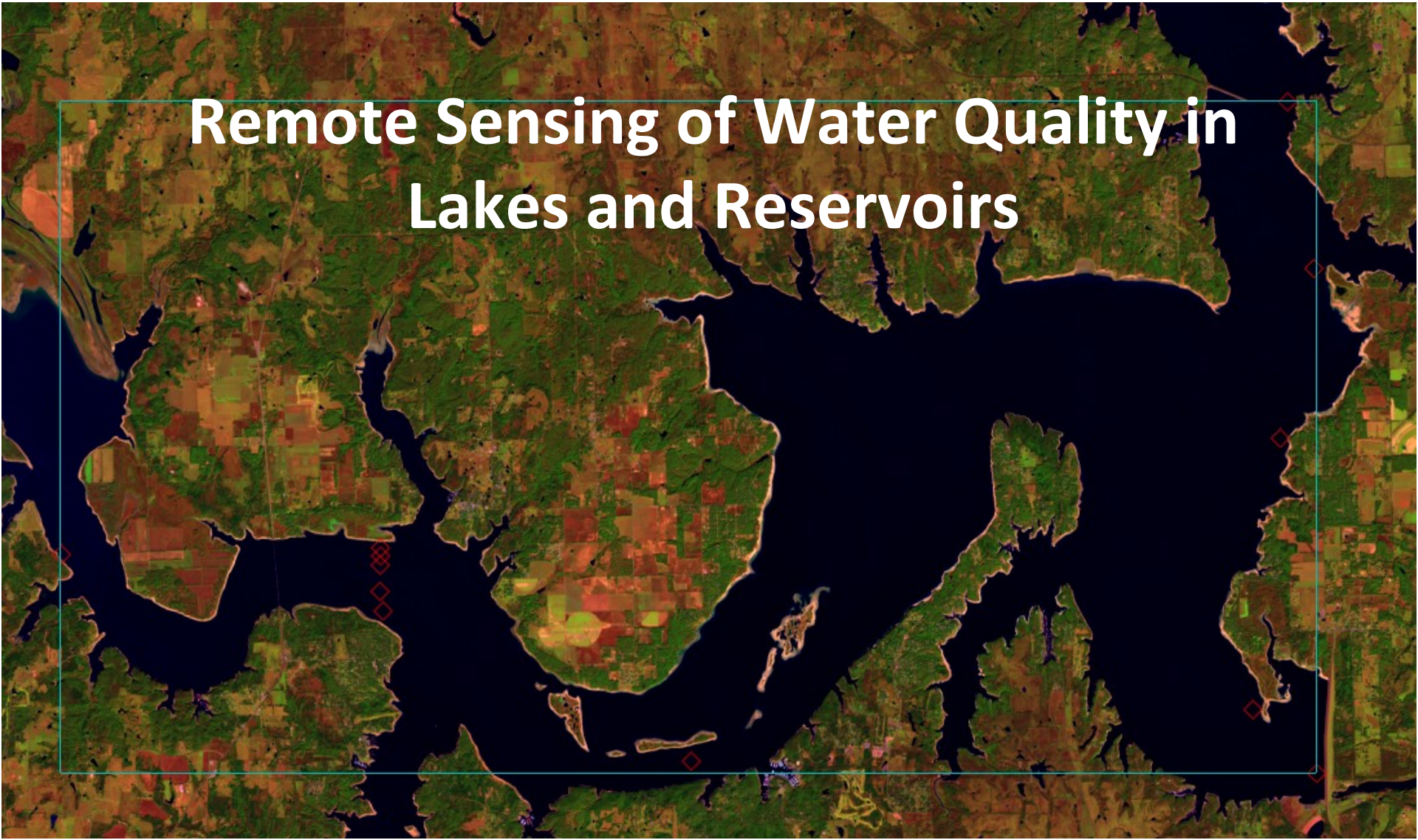
- ✓ Smartphone app “Field Photo” (IOS, Android)
- ✓ Photos are linked with time series MODIS data in 2000 – 2014

*Share your field photos
and
Your contribution is
essential for us to develop
better data products*

<http://www.eomf.ou.edu>



Remote Sensing of Water Quality in Lakes and Reservoirs



In collaboration with Karl D. Hambright (OU) & Andy Dzialowski (OSU)

Long-term goal of the project

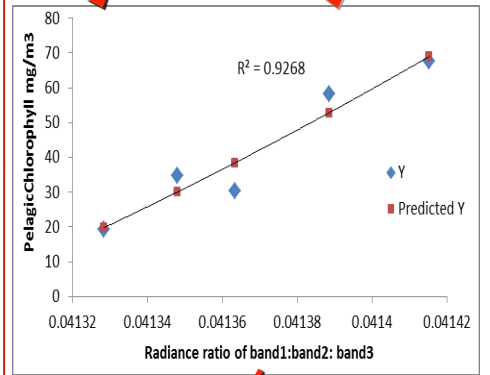
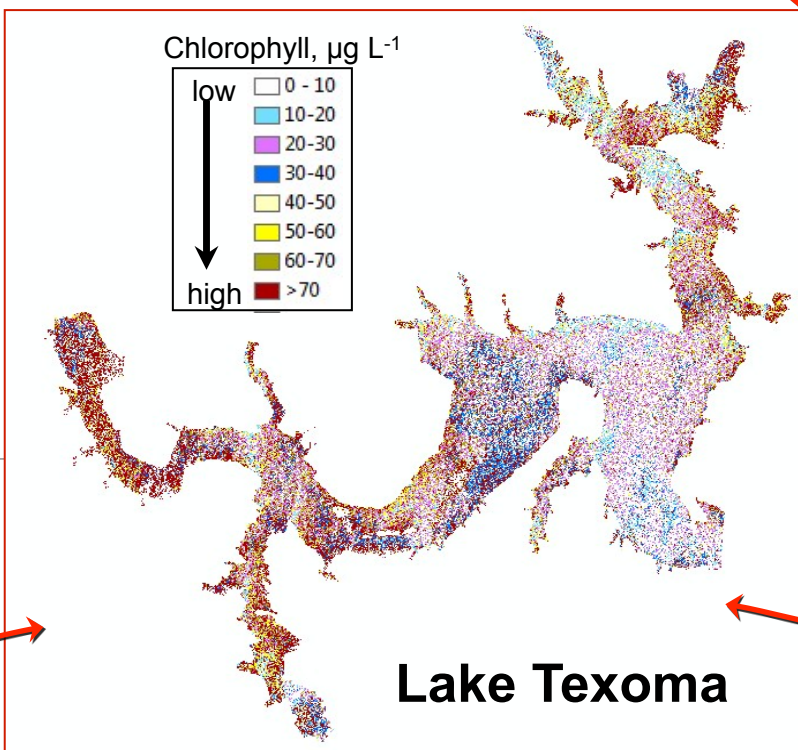
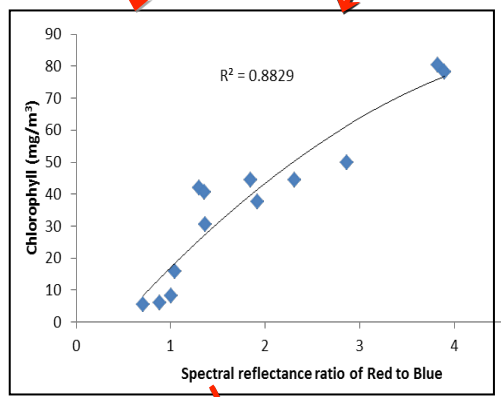
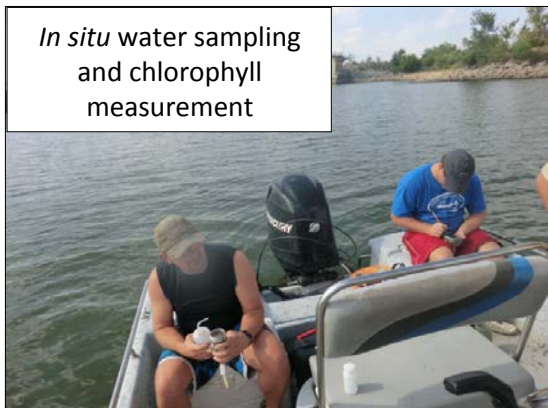
To devise an effective and affordable program for monitoring water quality and harmful algal bloom (HABs) of lakes in Oklahoma

Specific objectives of the project

Provide a proof-of-concept demonstration of the use of satellite- and digital camera- based imagery to quantify and monitor HABs across space and time in Lake Texoma and Grand Lake

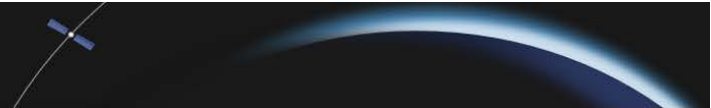
HABs in
Oklahoma





Water Quality

Chlorophyll
Phycocyanin



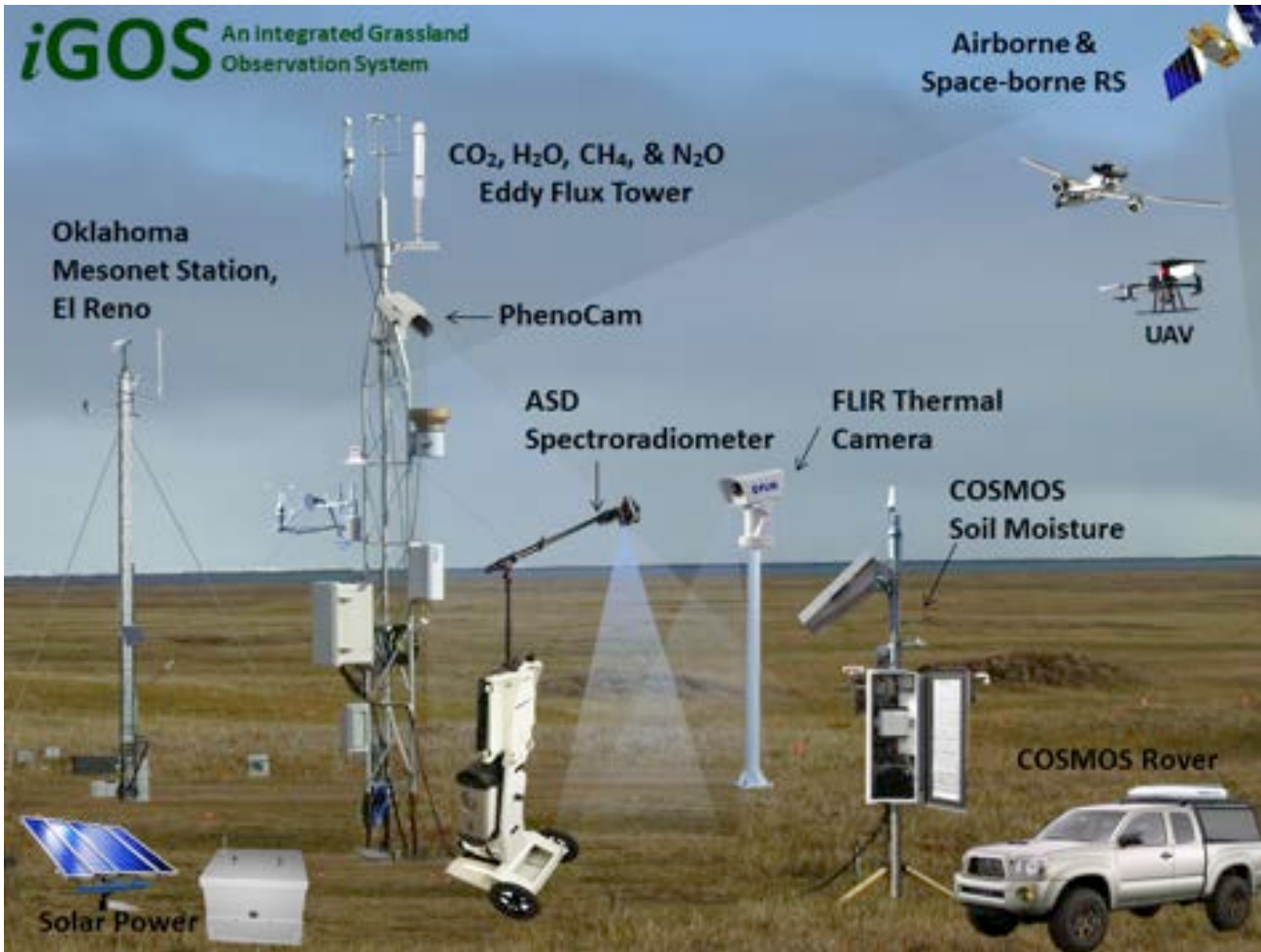
Carbon and Water Fluxes of Grasslands and Croplands

Integrated Grassland & Cropland Observation Sites in Oklahoma

- *Multi-sensor and multi-scale observations for better understanding of agro-ecosystems and land-atmosphere interaction*
- *Testbeds for (1) airborne and spaceborne sensors and (2) model development and evaluation*



Integrated grassland and cropland observation sites (IGOS and ICOS) in El Reno, Oklahoma, USA



IGOS sites (2)
native prairie
Improved pasture

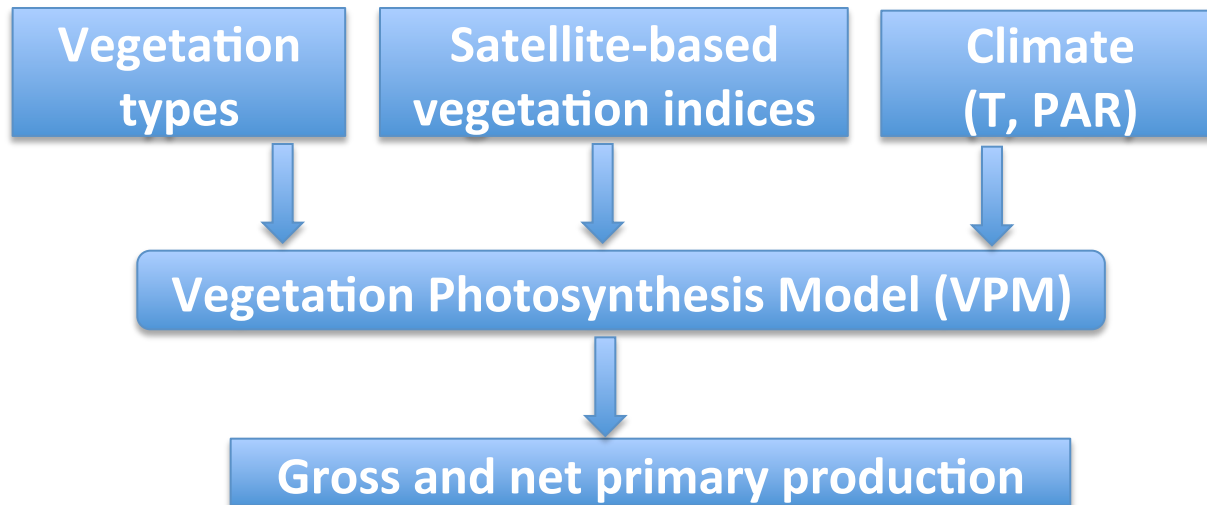
ICOS sites (2)
winter wheat
no-till vs. till

Year 2013 – 2018

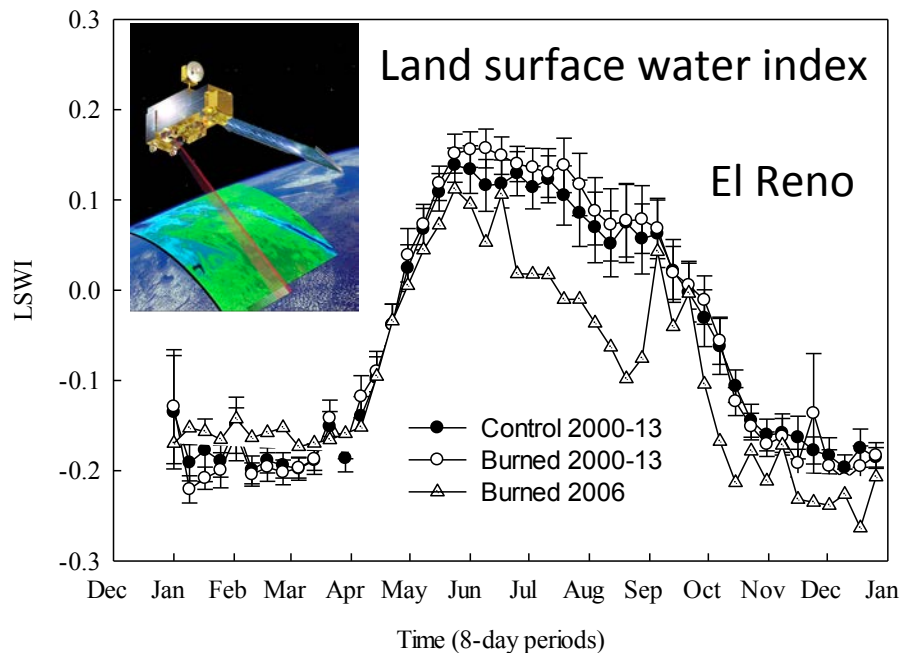
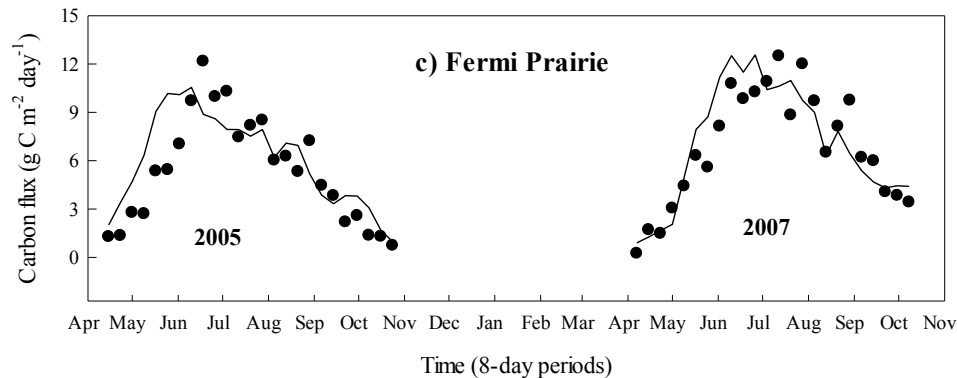
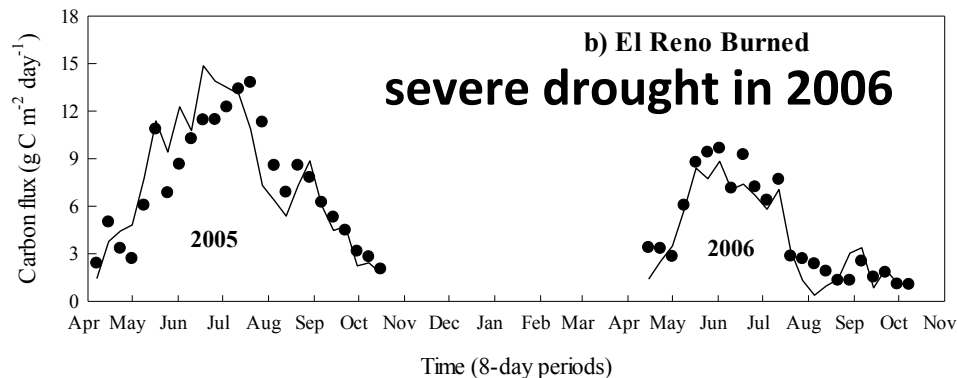
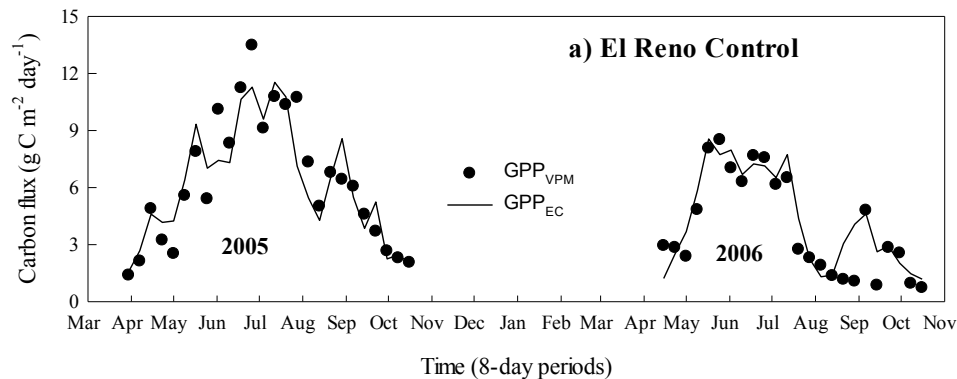
OU, USDA/ARS GRL

Attribution of changing climate, soil moisture, land use and management

Satellite-based Modeling of Gross & Net Primary Production of Grasslands and Croplands



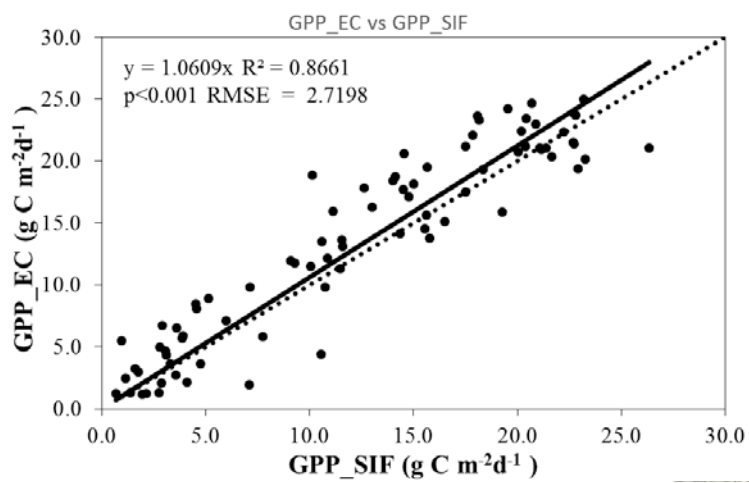
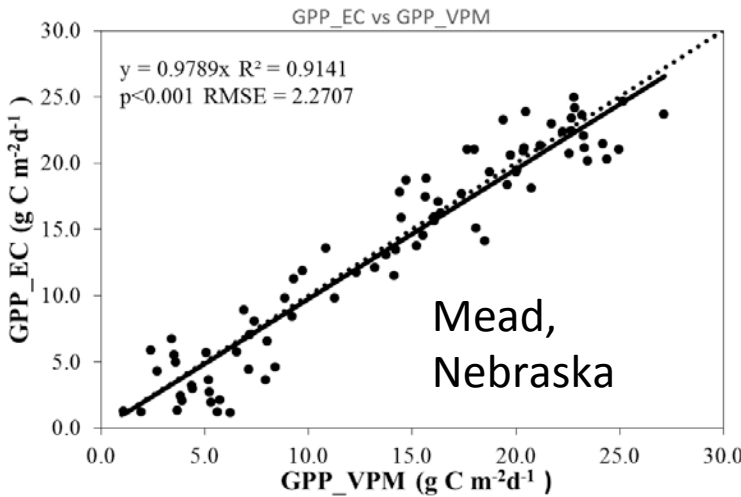
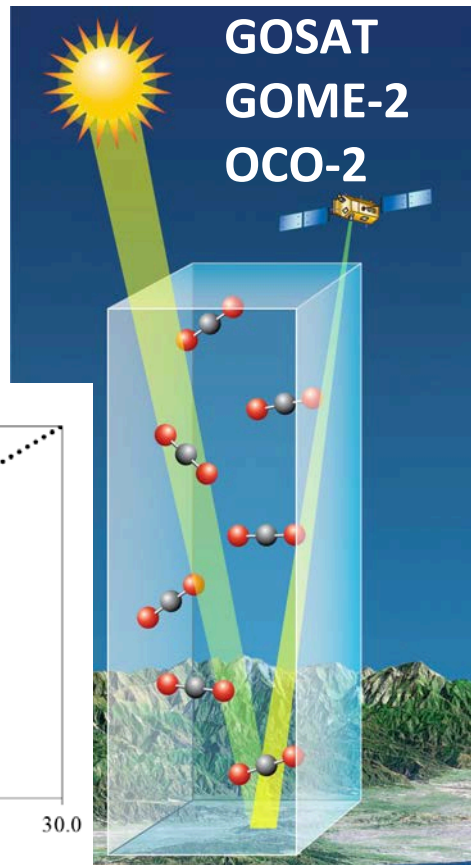
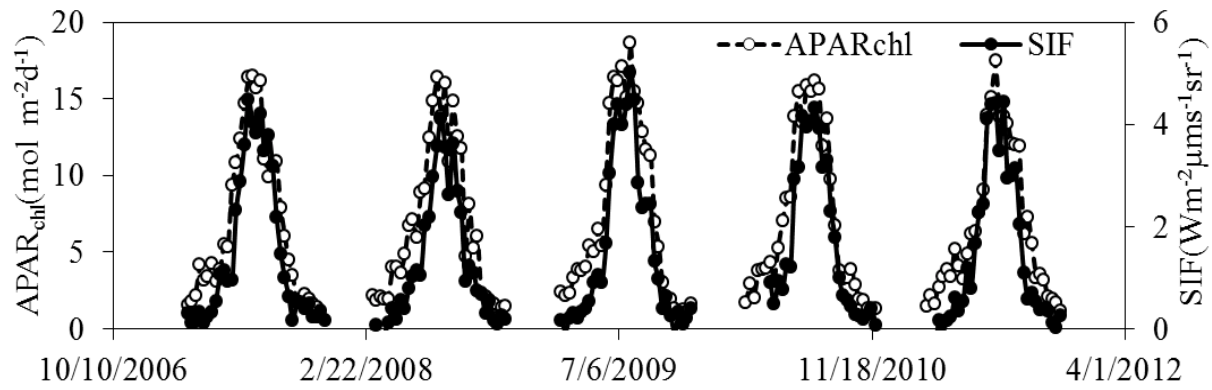
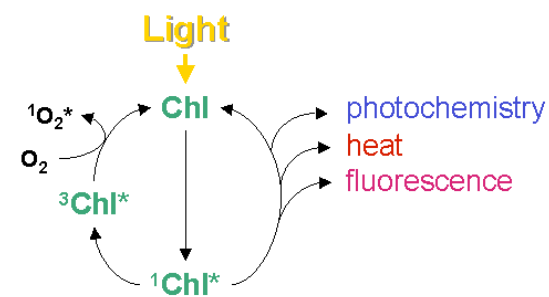
The impacts of drought on vegetation index and GPP of grasslands

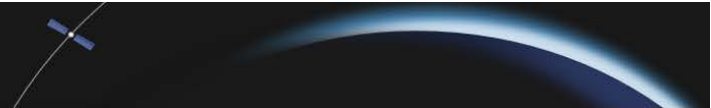


How to evaluate VPM-predicted GPP at regional to global scales ?

Sun-induced chlorophyll fluorescence data

-- GOME-2 sensor

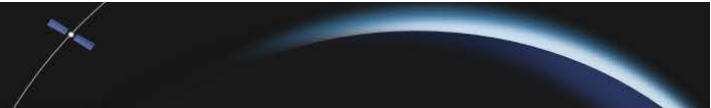




Measurement, Reporting and Verification of Agricultural Drought



Three slides were removed, as they are not published, yet.



1. Continue to improve Integrated Land Data Portal (<http://www.eomf.ou.edu>)
2. Continue to integrate time series data from MODIS, Landsat and other sensors (e.g., Sentinel-2) to generate maps of grassland, croplands, forests
3. Continue to integrate optical sensors (Landsat, Sentinel-2) for water quality and harmful algal bloom in lakes and reservoirs
4. Continue to provide data service to the community and to establish new research collaborations in the region



Rubber



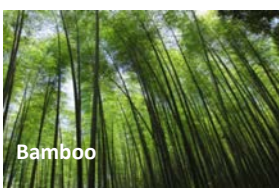
Teak



Oil palm



Eucalyptus



Bamboo



Acacia



Thank you

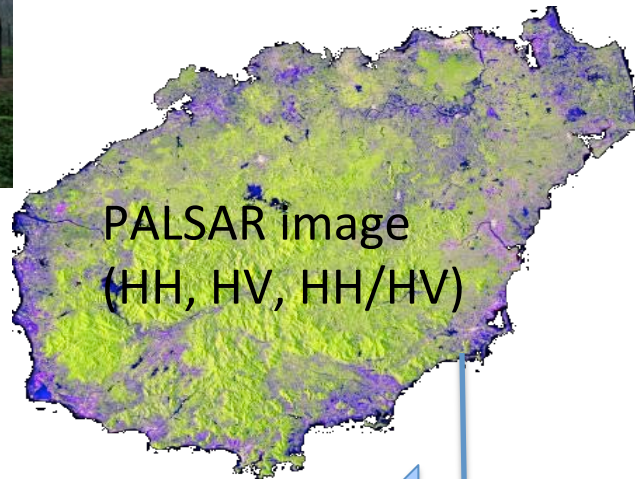
<http://www.eomf.ou.edu>



Workflow from field photos, photo library, images to land cover map



Photo uploading, editing



forest in
Hainan Island,
China

Earth Observation and Modeling
University of Oklahoma

Home About Us Dataset Photo Visualization Models iCarbon GeoHealth Education Workshop

Global Geo-Referenced Field Photo Library

Welcome, you are Guest

[Home](#) | [Log in](#) | [Register](#) | [Query](#) | [Map Query](#) | [Summary](#)

Search by coordinates: Longitude min: Longitude max: From: To: Latitude min: Latitude max: Search by date: Search by metadata: Search by region: Categories: Countries: Users: Geographical:

Search by keywords: rubber

Submit

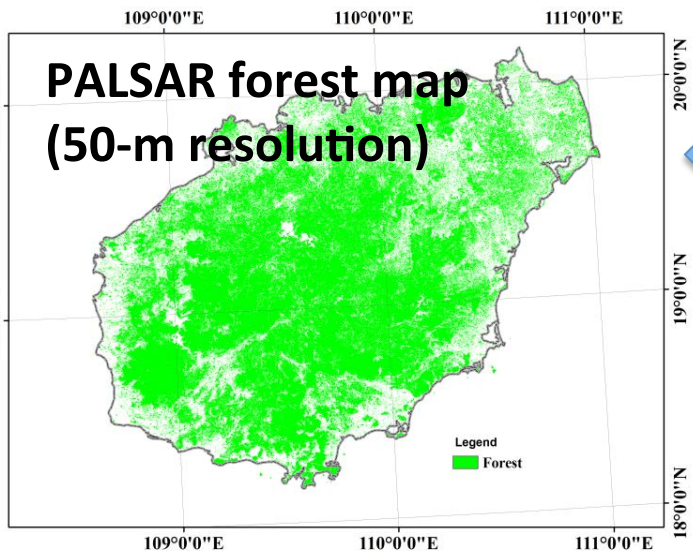
Photos found: 51

Check All | Uncheck All

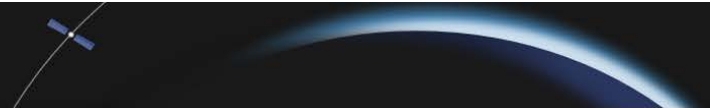
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|---|--|--|--|
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| Date taken: 2011-08-03 109.483 °E, 19.5243 °N Category: Not Set MODIS time series data: View | Date taken: 2011-08-03 109.4831 °E, 19.5244 °N Category: Not Set MODIS time series data: View | Date taken: 2011-08-03 109.4881 °E, 19.5298 °N Category: Not Set MODIS time series data: View | Date taken: 2011-08-03 109.488 °E, 19.5298 °N Category: Not Set MODIS time series data: View |
| | | | |
| Date taken: 2011-08-03 109.4844 °E, 19.526 °N Category: Not Set MODIS time series data: View | Date taken: 2011-08-22 109.5276 °E, 19.6033 °N Category: Plantations MODIS time series data: View | Date taken: 2011-08-22 109.5278 °E, 19.6031 °N Category: Plantations MODIS time series data: View | Date taken: 2011-08-22 109.5278 °E, 19.6031 °N Category: Plantations MODIS time series data: View |

POI, AOI,
Algorithm,
Evaluation

High-resolution
images &
Google Earth



(Dong et al., 2012. JPRS)



Integrated Cropland Observation Site (iGOS) at EL Reno, Oklahoma





PALSAR-based Forest and Plantation Maps

<http://www.eomf.ou.edu/>

Map and Monitor Forests from PALSAR, Landsat & MODIS imagery

Remote Sensing of Environment 127 (2012) 60–73



Contents lists available at SciVerse ScienceDirect

Remote Sensing of Environment

journal homepage: www.elsevier.com/locate/rse



A comparison of forest cover maps in Mainland Southeast Asia from multiple sources: PALSAR, MERIS, MODIS and FRA

Jinwei Dong ^{a,*}, Xiangming Xiao ^a, Sage Sheldon ^a, Chandrashekhar Biradar ^a,
Nguyen Dinh Duong ^b, Manzul Hazarika ^c

OPEN ACCESS Freely available online



A 50-m Forest Cover Map in Southeast Asia from ALOS/ PALSAR and Its Application on Forest Fragmentation Assessment

Jinwei Dong ¹, Xiangming Xiao ^{1*}, Sage Sheldon ¹, Chandrashekhar Biradar ², Geli Zhang ^{1,3}, Nguyen Dinh Duong ⁴, Manzul Hazarika ⁵, Ketut Wikantika ⁶, Wataru Takeuchi ⁷, Berrien Moore III ⁸

Map and Monitor Plantations from PALSAR, Landsat & MODIS imagery

- Rubber, Eucalyptus, Oil Palm
- Teak, Acacia, Bamboo

ISPRS Journal of Photogrammetry and Remote Sensing 74 (2012) 20–33



Contents lists available at SciVerse ScienceDirect

ISPRS Journal of Photogrammetry and Remote Sensing

journal homepage: www.elsevier.com/locate/isprsjprs



Remote Sensing of Environment 134 (2013) 392–402



Contents lists available at SciVerse ScienceDirect

Remote Sensing of Environment

journal homepage: www.elsevier.com/locate/rse



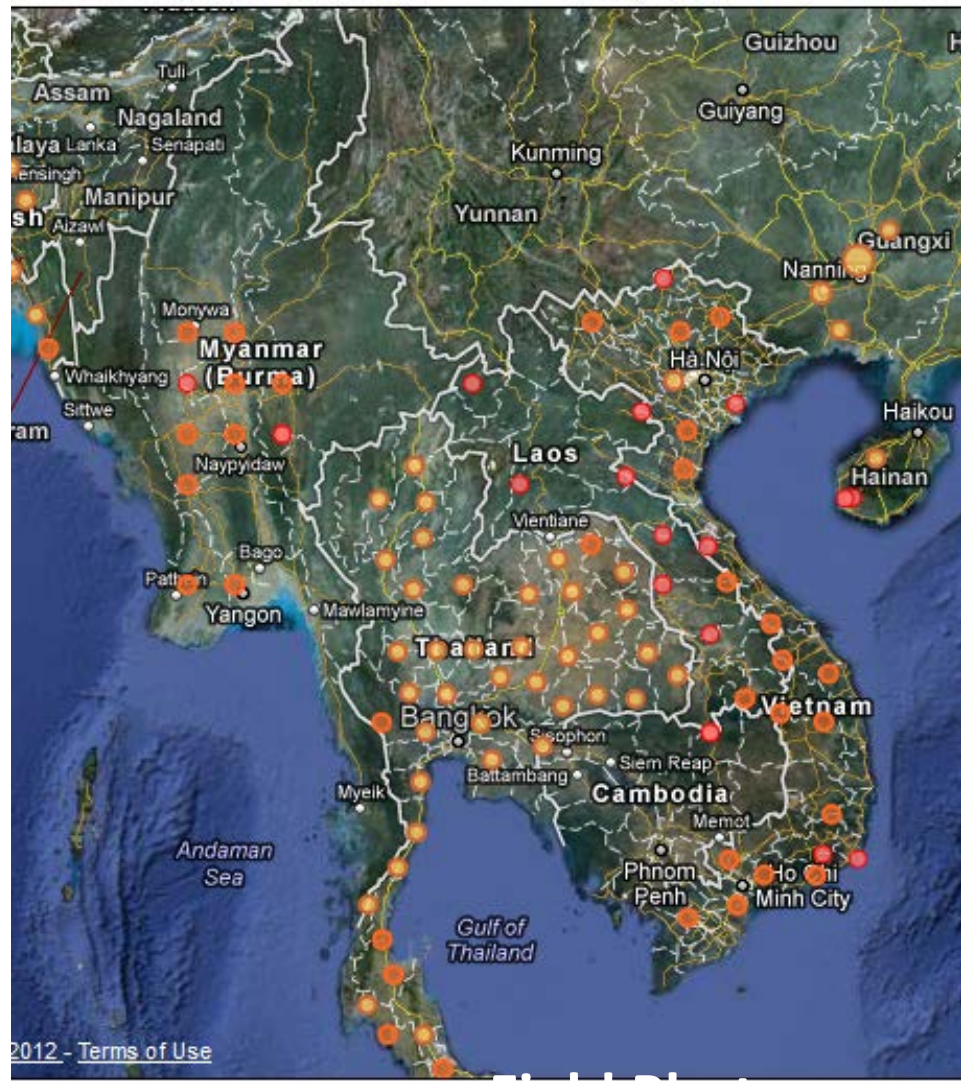
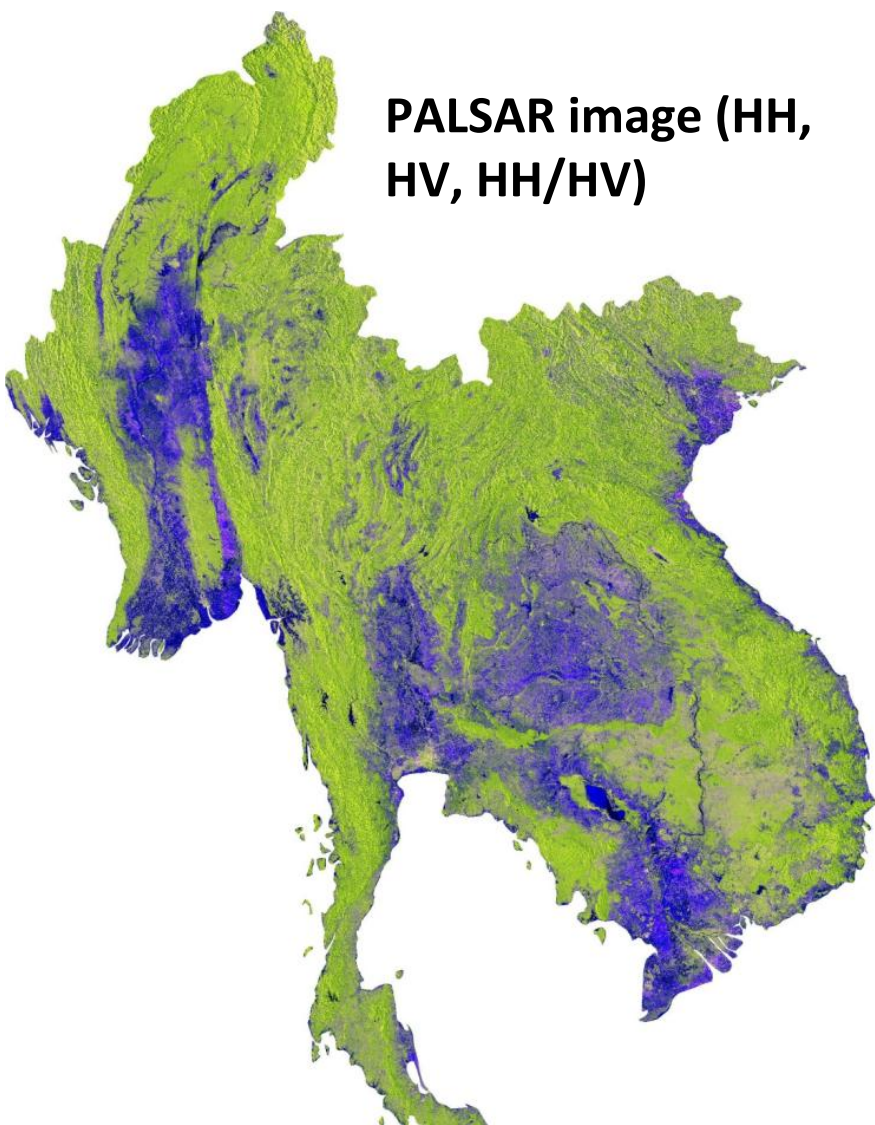
Mapping deciduous rubber plantations through integration of PALSAR and multi-temporal Landsat imagery

Jinwei Dong ^a, Xiangming Xiao ^{a,*}, Bangqian Chen ^b, Nathan Torbick ^c, Cui Jin ^a,
Geli Zhang ^d, Chandrashekhar Biradar ^a

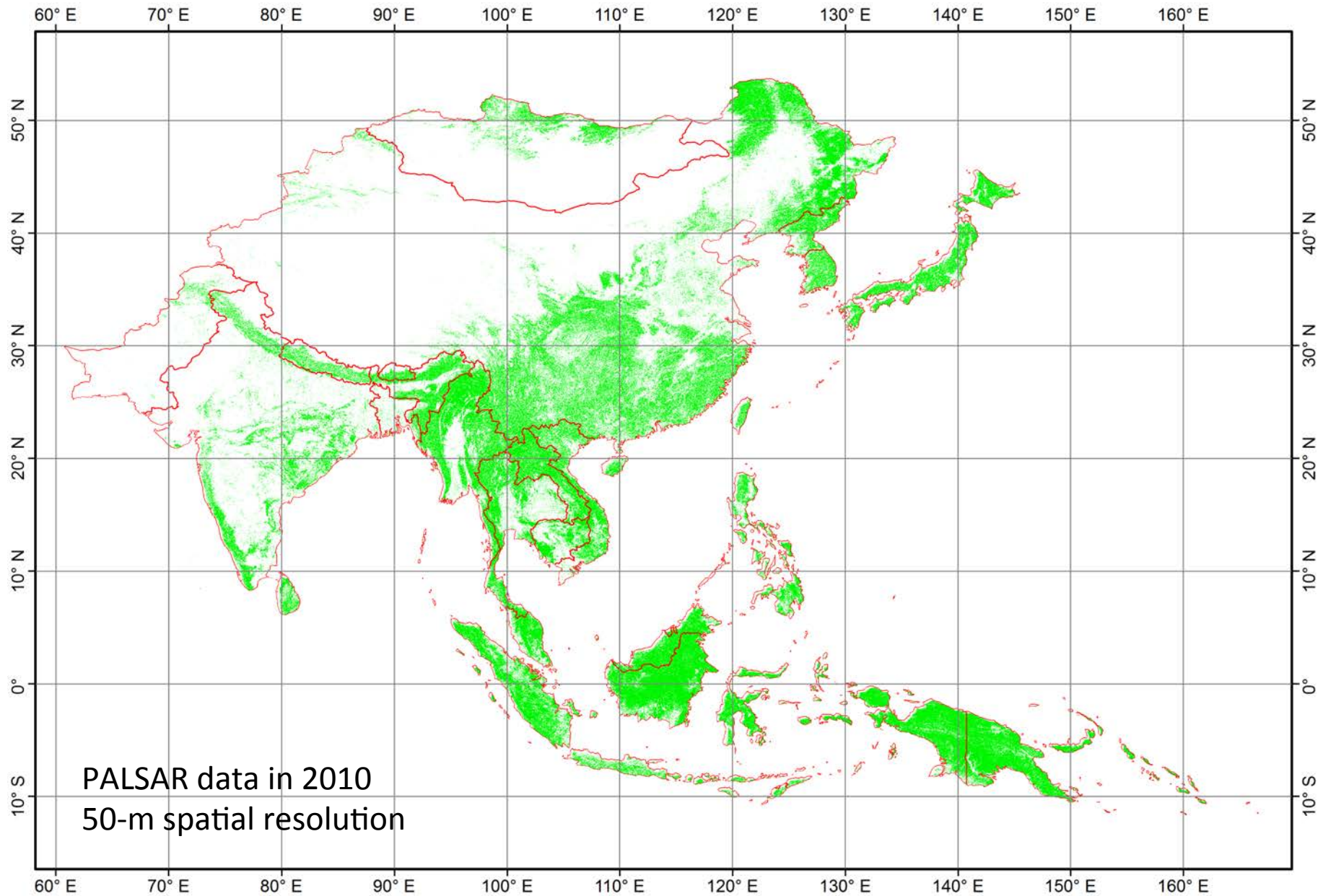
Mapping tropical forests and rubber plantations in complex landscapes
by integrating PALSAR and MODIS imagery

Jinwei Dong ^{a,*}, Xiangming Xiao ^a, Sage Sheldon ^a, Chandrashekhar Biradar ^a, Guishui Xie ^b

Mapping forest cover in mainland Southeast Asia at 50-m resolution



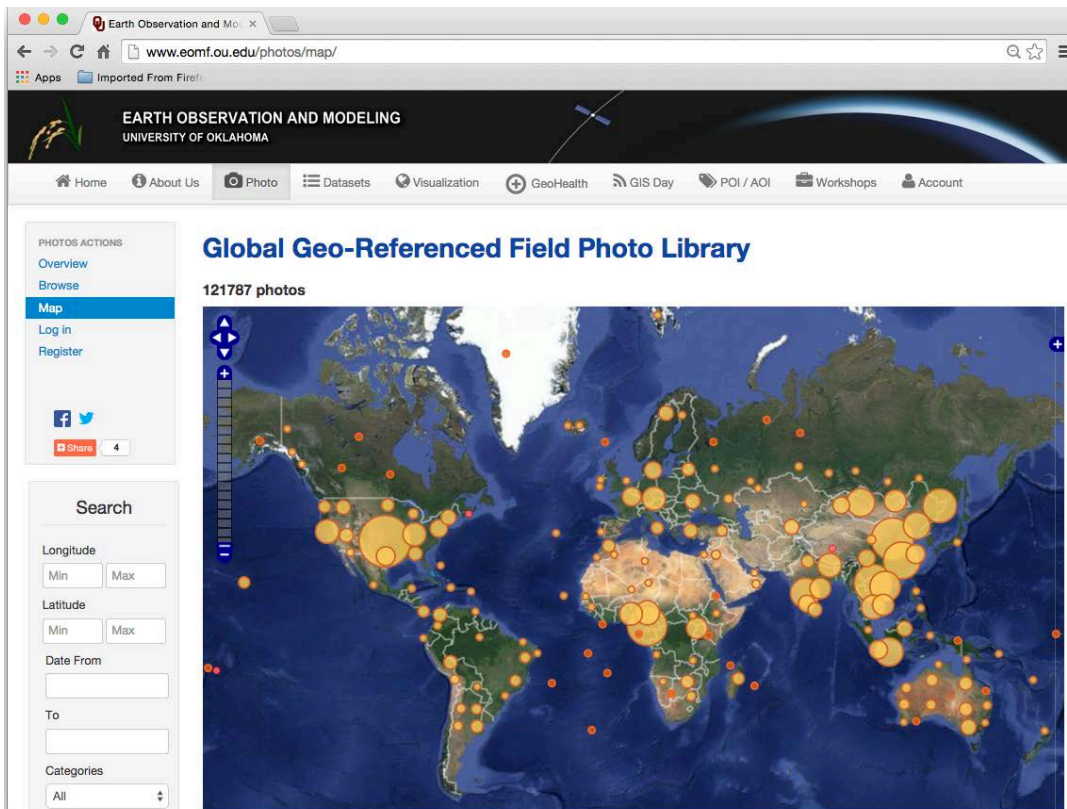
Map of Forests in Monsoon Asia in 2010



Integrated Land Data Portal (iLand)

[\(<http://www.eomf.ou.edu>\)](http://www.eomf.ou.edu)

Cyberinfrastructure for Big Data Science
Geo- and Eco-Informatics



The screenshot displays the Earth Observation and Modeling (EOM) website interface. The browser address bar shows the URL www.eomf.ou.edu/photos/map/. The website header includes the EOM logo and navigation links: Home, About Us, Photo, Datasets, Visualization, GeoHealth, GIS Day, POI / AOI, Workshops, and Account. The main content area is titled "Global Geo-Referenced Field Photo Library" and shows "121787 photos". A world map is displayed with numerous orange circular markers of varying sizes, indicating the geographic locations of the field photos. On the left side, there is a "PHOTOS ACTIONS" menu with options: Overview, Browse, Map (selected), Log in, and Register. Below the menu are social media sharing icons for Facebook and Twitter, and a "Share" button. A search section is also visible, with fields for Longitude (Min/Max), Latitude (Min/Max), Date From/To, and Categories (All).

Data Storage Facility

Petabyte off-line data archive system (OU/OSCER PetaStore, tapes)

Petabyte near-line data storage system (OU/OSCER PetaStore, disks)

Petabyte online data processing system (OU/EOMF, disks)

