Report on the US-Japan-SE Asia Workshop on Monsoon Asia Tropical Forest Carbon Dynamics and Sustainability

January 8-11, 2009, Mekong Institute, Khon Kaen, Thailand

Dennis G. Dye

U.S. Geological Survey (USGS)
Southwest Geographic Science Center

Flagstaff, Arizona, USA

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Outline

- Workshop background and motivations
- Workshop objectives
- Selected carbon-related activities in SE Asia countries
- Workshop results and potential plans

Origins:
Japan-U.S. Joint Workshop on Global Change: *Biodiversity, Ecosystem Function, and Dynamic Human-Nature Interaction*

- Oct. 31-Nov. 2, 2005, JAMSTEC Frontier Research Center for Global Change (FRCGC), Yokohama, Japan
- Recommended that Japan and U.S. Researchers:
  - "Develop new research activities on ecosystem function, diversity and human-nature interaction through innovative approaches in modeling, observation and model-data fusion
  - "Conduct follow-on workshop(s) to identify opportunities for bilateral or multilateral research collaboration..."

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TImeline

- **November 2005**, Japan-U.S. Workshop on Global Change
- **August 2006**, Western Pacific Geophysical Meeting (WPGM), Beijing, China. Special session on satellite time series analysis (US-Japan organizers)
- **October 2006**, Proposals submitted to US-NSF and JSPS for collaborative funding
- **November 2006**, Planning discussions at AsiaFlux Meeting in Chiang Mai, Thailand (special session on remote sensing and flux towers)
- **August 2007**, NSF proposal accepted for workshop in Japan; Venue moved to Thailand
- **March 2008**, Received APN CAPaBLE grant to support participation of SE Asian researchers
- **January, 2009**, Workshop is held in Khon Kaen, Thailand

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Workshop on Monsoon Asia Tropical Forest Carbon Dynamics and SustainabilityWorkshop:

Organizers

- U.S.A.
  - Alfredo Huete, Scott Seleska (U. Arizona)
  - Dennis Dye (USGS), Xiangming Xiao (U. Oklahoma)
- Japan
  - Nobuko Saigusa, Akhiko Ito (NIES)
  - Hiroaki Kondo, Takahisa Maeda (AIST)
- Indonesia
  - Fadli Syamsudin (BPPT)
- Thailand
  - Poonpipope Kasemsap (Kasetsart U.)
- Malaysia
  - Dr. Mohd Haniff Harun, Dr. Firdaus, et al.,

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Workshop on Monsoon Asia Tropical Forest Carbon Dynamics and SustainabilityWorkshop:

Sponsors

- **Financial support**
  - **NSF (USA), APN CAPaBLE, NIES (Japan)**
- **Logistic and Programmatic support:**
  - **Asian Institute of Technology (Thailand)**
  - **Mekong Institute (Thailand), HOST INSTITUTION**
- **Sponsorship:**
  - **Global Carbon Project (GCP)**

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Workshop on Monsoon Asia Tropical Forest Carbon Dynamics and Sustainabiity

January 8-11, 2009, Khon Kaen, Thailand

Workshop Objectives

- ***Facilitate/enhance international communication*** **among researchers/students concerning *Monsoon Asia tropical forest carbon dynamics and sustainability***
- ***Survey research activities and results*** **in tropical Monsoon Asia and other regions (e.g. Amazon)**

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Workshop Objectives (cont.)

- ***Identify key science questions and research priorities (including societal benefits)*, particularly those that require integrated approaches (field observations, process modeling, remote sensing)**

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Workshop Objectives (additional)

- *A framework* for addressing the science questions and research priorities
  - individual, ad hoc projects
  - Larger bilateral/multilateral project(s)
  - Major “umbrella” mission (similar to STORMA, GAME, LBA)
- Plan/propose new international research collaborations

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Pre-Workshop Field Trip: Bangkok to Khon Kaen

Tour of GIC at Asian Institute of Technology (Dr. Lal, Dr. Vivarad)

- Satellite receiving station
- Satellite data processing system
- Training facility

Tour of Sakaerat CO_2 Flux Tower Site

(Dr. Samreong Panuthai, Dr. Kondo, Dr. Maeda)

Participation in US-Japan-SE Asia Workshop

- Total attendance: 57
  - 45 formal participants
  - 12 local observers
  - USA (11), Japan (11), Korea (1), Thailand (18), Indonesia (4), Malaysia (*3, cancelled*)

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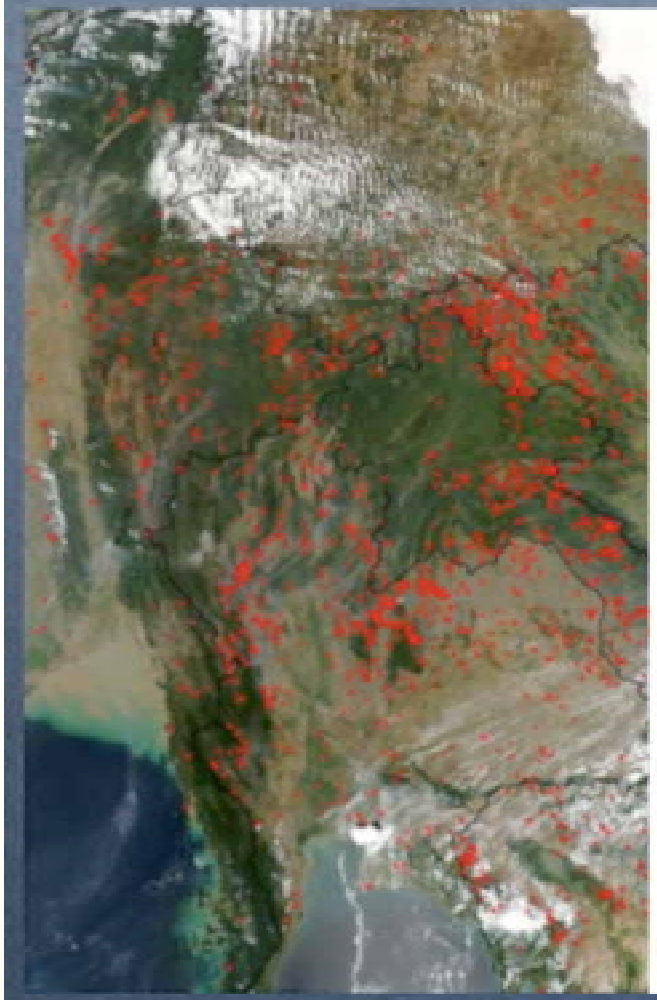
Importance of Tropical Monsoon Asian Forests

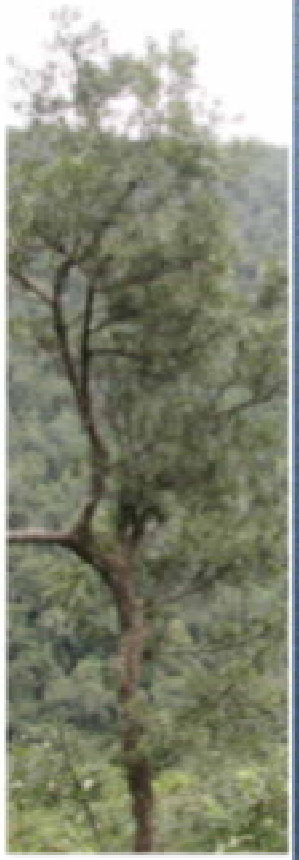


MODIS Fire Detections
SE Asia 04/03/03

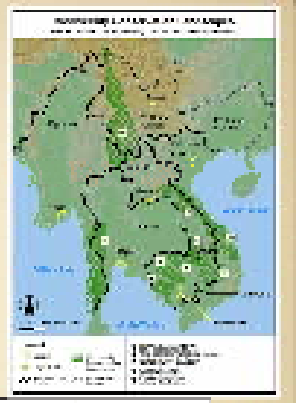
(Descloitres et al)

- Tropical rainforests form a huge reservoir of biodiversity and play an enormous role in the cycling of carbon and water on this planet, yet their seasonal and inter-annual functioning and response to environmental change are poorly understood.

- *Question: what is the role of climate change and human impacts on tropical forest functioning?*

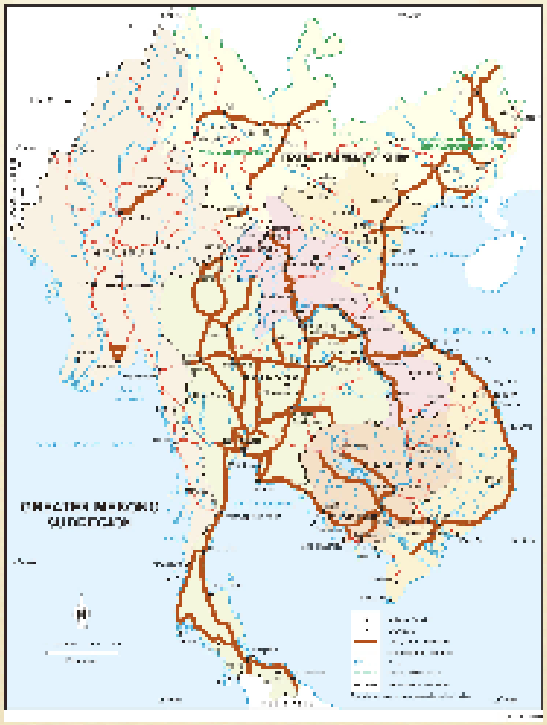


Mekong Region Economic Corridor Development



1992

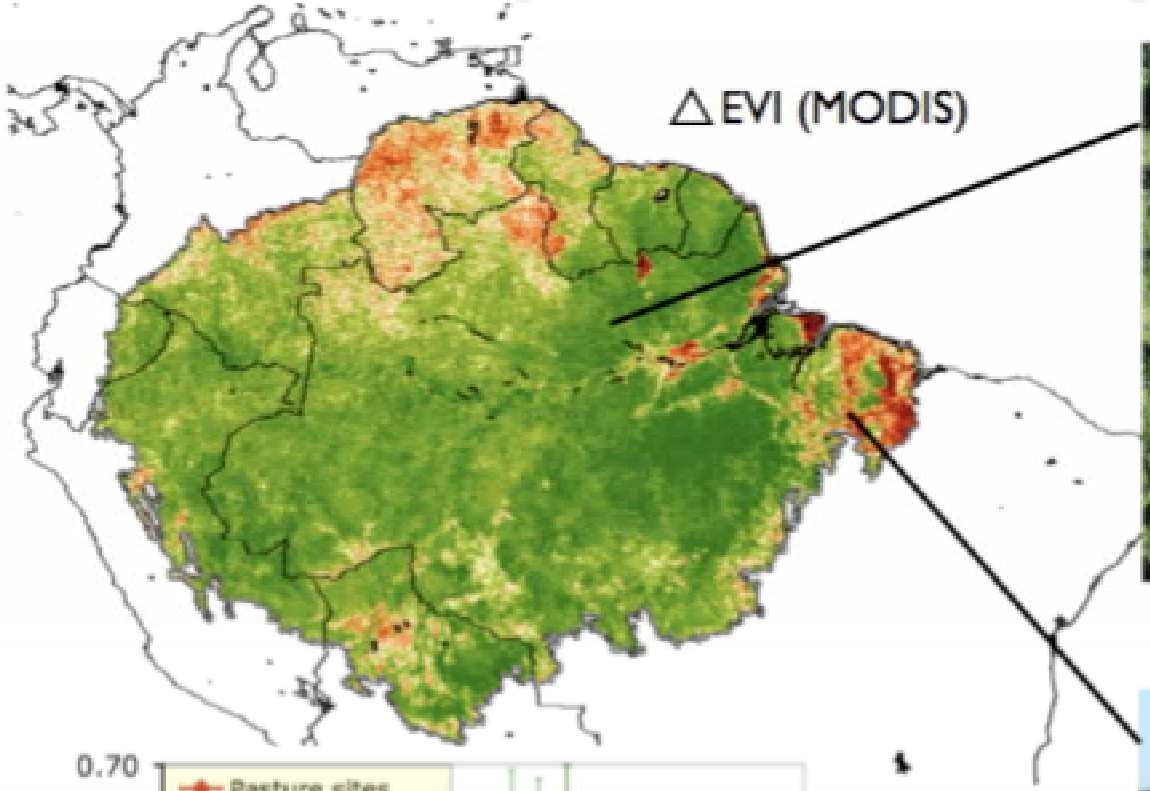
2006



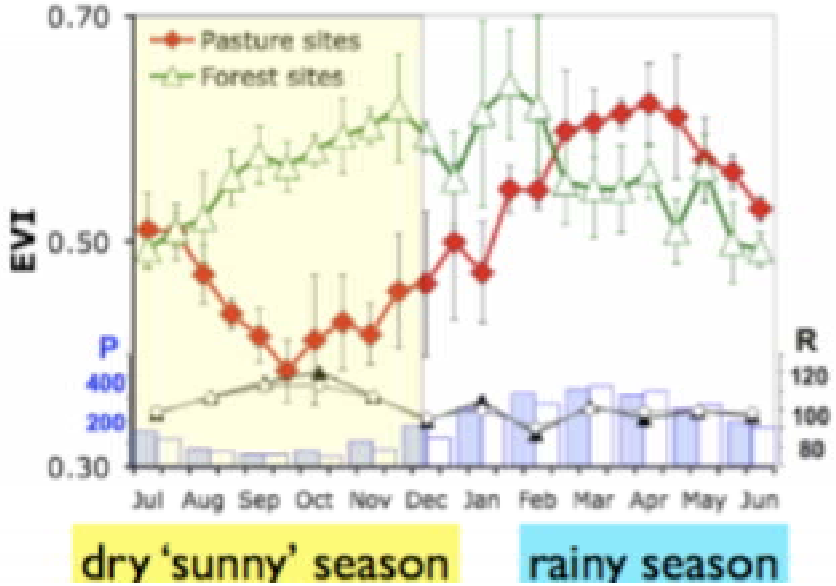
2015

Little is known regarding the resilience of Monsoon Asia tropical ecosystems to increasing human pressures and climate variability, despite the large consequences to carbon cycling, fires, ecosystem services, and the socioeconomic welfare of the region.

Seasonal change in satellite vegetation 'greenness'



Old-growth rainforest

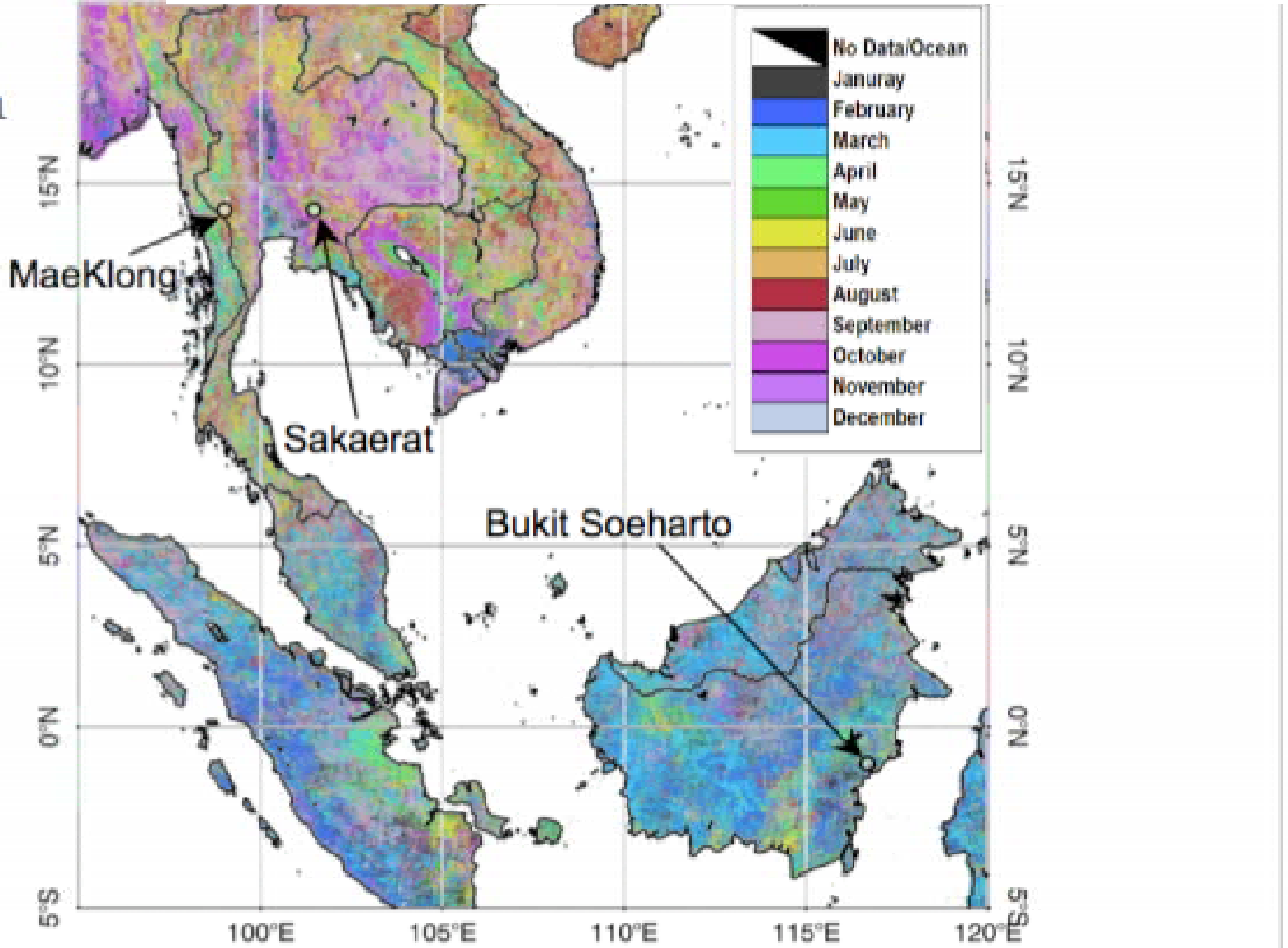


Huete et al., 2006

Converted pastures in dry season

Complexity of SE Asia landcover is reflected in satellite-observed phenology patterns

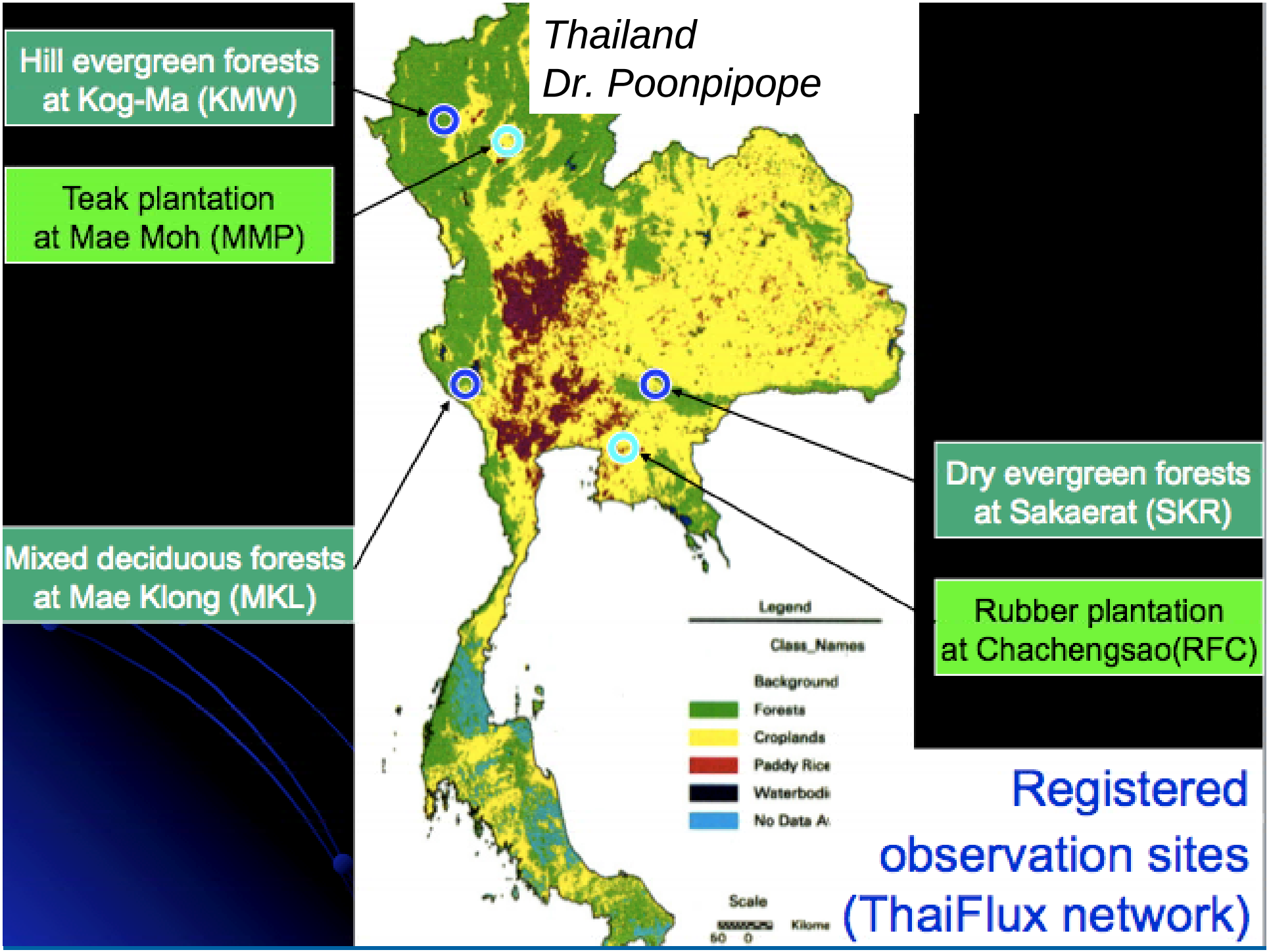
Phenology peak month

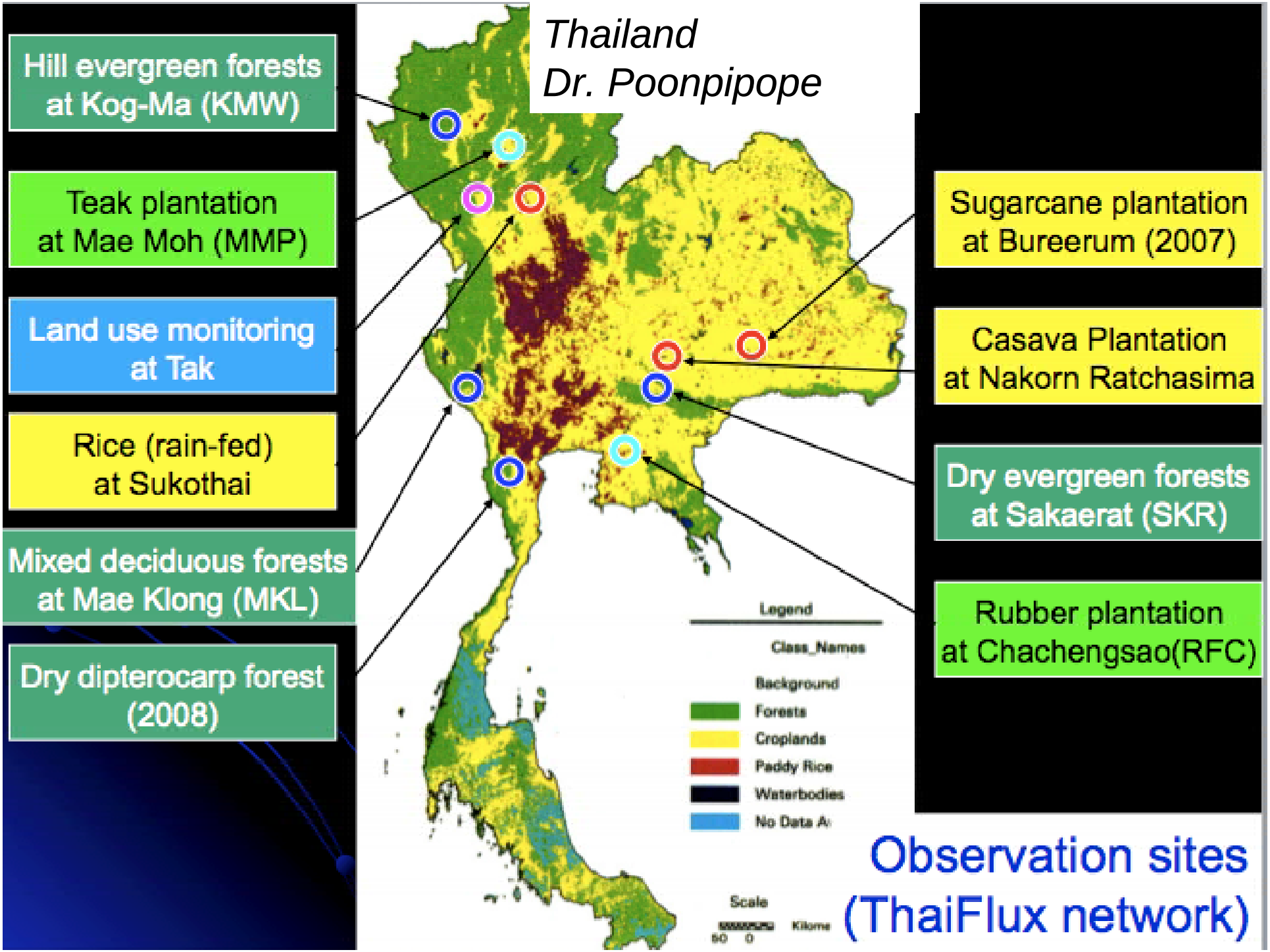


Selected elements of Country Presentations: Thailand

ThaiFlux

Dr. Poonpipope Kasemsap
Katsetsart University


Thailand
Dr. Poonpipope
Hill evergreen forests at Kog-Ma (KMW)
Teak plantation at Mae Moh (MMP)
Mixed deciduous forests at Mae Klong (MKL)
Dry evergreen forests at Sakaerat (SKR)
Rubber plantation at Chachengsao(RFC)
Legend
Class_Names
Background
Forests
Croplands
Paddy Rice
Waterbodi
No Data A
Scale
Kilome
50 0
Registered observation sites (ThaiFlux network)


Thailand
Dr. Poonpipope
Hill evergreen forests at Kog-Ma (KMW)
Teak plantation at Mae Moh (MMP)
Land use monitoring at Tak
Rice (rain-fed) at Sukothai
Mixed deciduous forests at Mae Klong (MKL)
Dry dipterocarp forest (2008)
Sugarcane plantation at Bureerum (2007)
Casava Plantation at Nakorn Ratchasima
Dry evergreen forests at Sakaerat (SKR)
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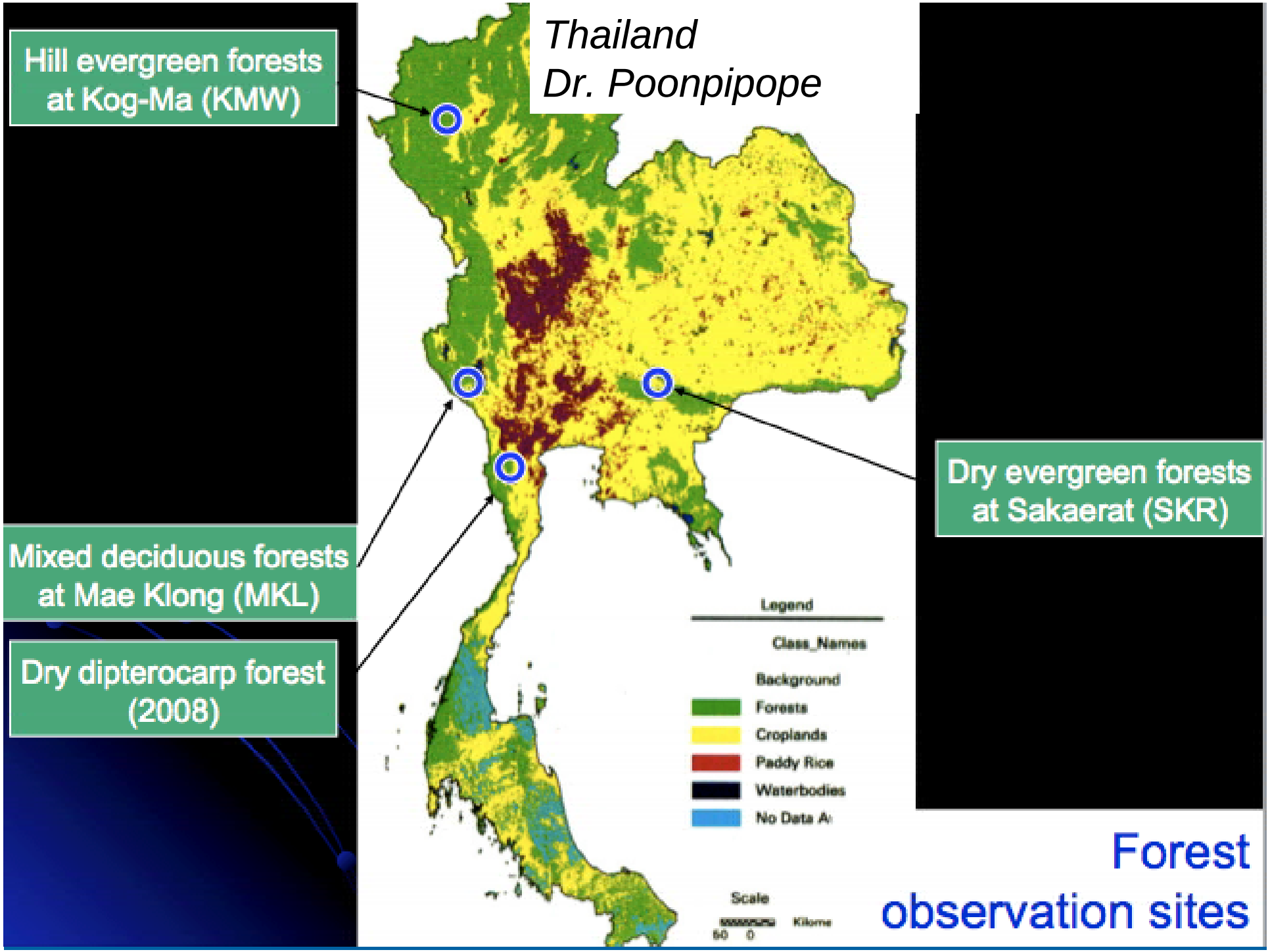
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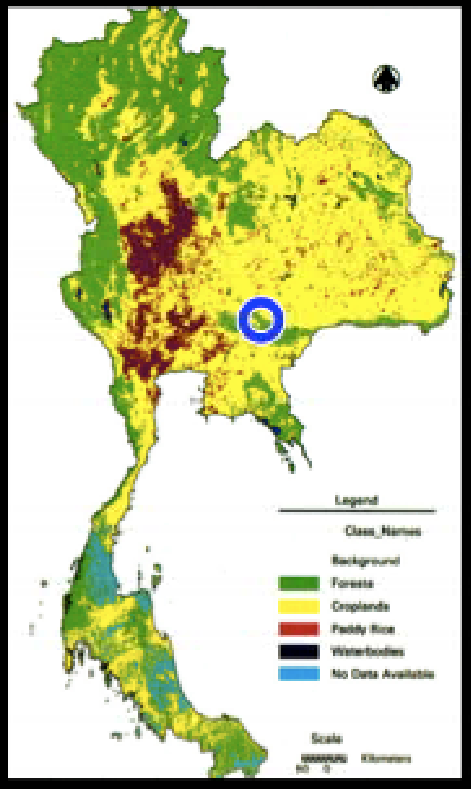
Kilome
50 0
Forest observation sites

Tropical seasonal evergreen forest at Sakaerat (SKR)

Thailand
Dr. Poonpipope

Position	14° 29' 32.5" N, 101° 54' 58.7" E (WGS84,GPS positioning on the top of the tower, as of Dec. 3, 2006)
Elevation	543m (WGS84,GPS positioning on the top of the tower, as of Dec. 3, 2006)
Slope	6m/100m
Terrain Type	Approximately flat
Area	78km^2
Climate	Tropical - desert (Aw)
Mean annual air temperature	24°C
Mean annual precipitation	1200-1300mm
Vegetation Type	Tropical seasonal evergreen forest
Dominant Species (Overstory)	Hopea ferrea Pierre
Dominant Species (Understory)	N/A
Canopy height	35 m
Age	Mature forest
LAI	3.5-4.0 m^2 m^{-2} (PAI)
Soil type	Shallow Stony Ultisols (US Soil Texonomy)




Thailand
Dr. Poonpipope

Selected elements of Country Presentations: Thailand

Indonesia
Dr. Fadli

OCEAN AND CLIMATE RELATED PROGRAMS TO GLOBAL WARMING IN INDONESIA

Fadli Syamsudin

Agency for the Assessment and Application of Technology (BPPT)

- ***Technological roadmap on global warming***
- ***Research facilities***
- ***Ongoing programs***
- ***HARIMAU***
- ***Concluding remarks***

Workshop on Monsoon Asia Tropical Forest Dynamics and Sustainability , Thailand 8-11 January, 2009

BPPT TECHNOLOGY ROADMAP ON GLOBAL WARMING

Technology Content

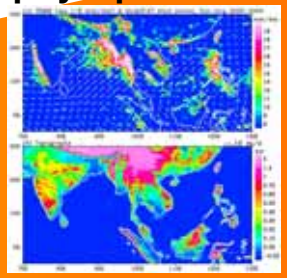
2007 2008 2009 2010 - 2014

CO_2 Budget

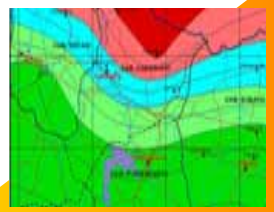
CH_4 Monitoring & Capture in Landfill

Global warming induced Sea level rise

CO_2 reduction by phytoplankton



CO_2 reduction by air-sea interaction



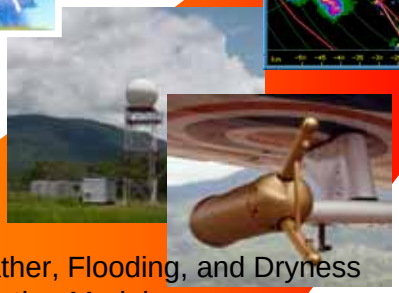
•Flooding Prediction Model

Study of emision & desposition of aerosol

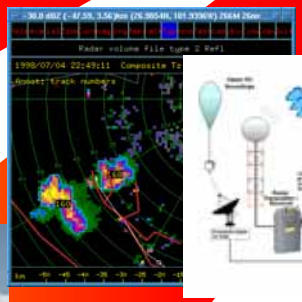
Atmospheric aerosol deposition

•Weather, Flooding, and Dryness Prediction Models

Air Pollution Monitoring by FTIR



•Weather, Flooding, and Dryness Prediction Models



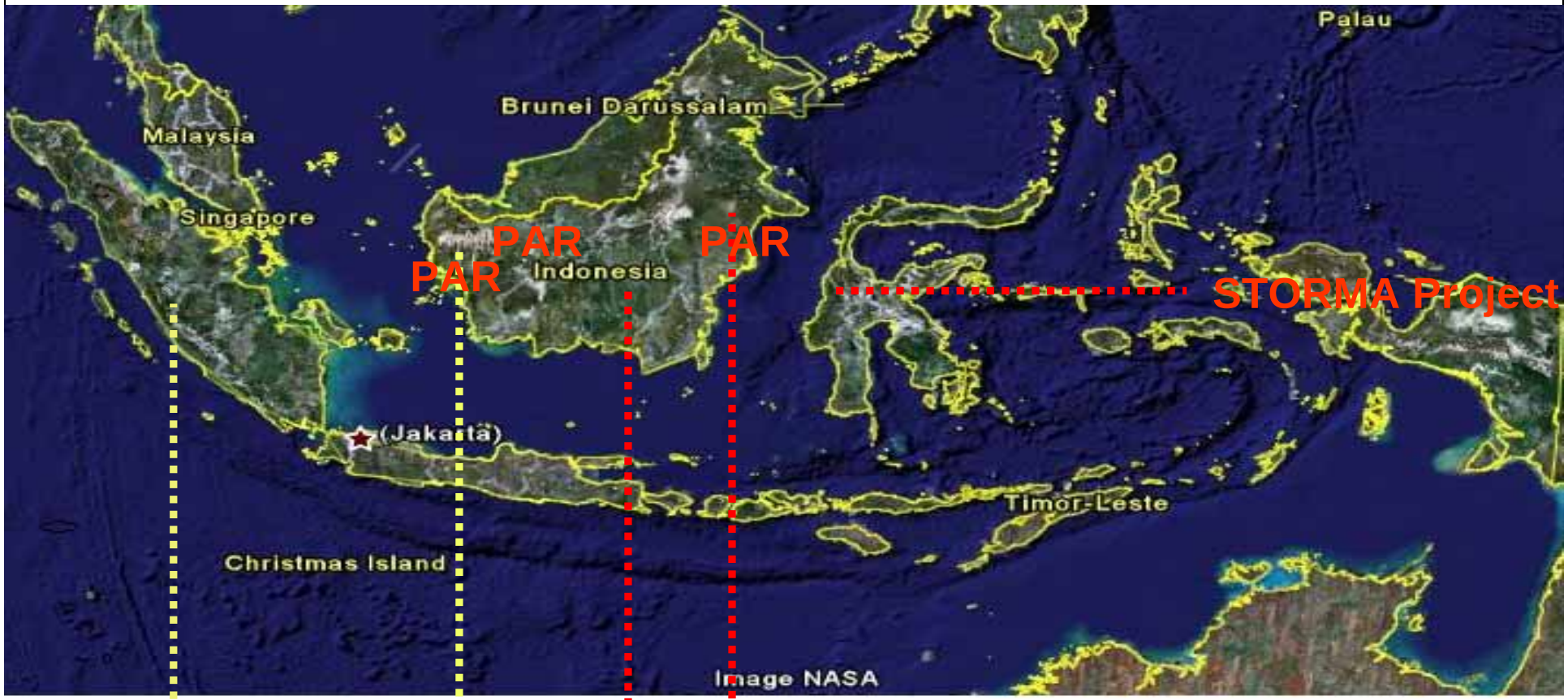
•Weather, Flooding, and Dryness Prediction Models
•Research Vehicle for Atmospheric Aerosol

Indonesia
Dr. Fadli

Existing and Plan for Flux Tower and PAR sensors

Indonesia
Dr. Fadli

BMG



Bukit Suharto (Tropical forest/not operatio

West Kalimantan

Sumatra

Central Kalimantan (Peat forest)

Workshop Conclusions (selected)

- **Research Priorities**
  - **Improved mapping/quantification of deforestation and degradation (e.g. REDD)**
  - **Forest fire monitoring and related atmospheric haze**
  - **Biodiversity monitoring**
  - **Tropical monsoon asia ecosystem response to climate variation & change (pan-tropical comparative studies**

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Workshop Conclusions

- Opportunities
  - Regional data sharing and capacity building
  - Regional scale synthesis
  - Collaboration among remote sensing, modeling and observation (e.g. flux) groups
- Common recognition of benefits for research coordination/collaboration among the participating countries
- Consensus to undertake discussions/planning for specific project(s)

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Initial Prospects for Multilateral Project(s) in Monsoon Asia Region 2009

- New NASA Research Announcement for Interdisciplinary Research (expected mid-Feb. 2009), 1 to 2 million US$ for 3 years
- NSF PIRE program (2 to 8 million US $ total for 4 years) (JPY 200,000,000 to 800,000,000)

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Potential PIRE Project Proposal Participants from Remote Sensing, Modeling and & Observation (Flux) Groups (preliminary)

- Principal Investigator: Xiangming Xiao, U. Oklahoma, USA
- USA (U. Oklahoma, U. Arizona, USGS, Purdue U.)
- Japan (NIES, AIST, U. Tokyo-IIS, others TBD)
- Thailand (AIT, Kasetsart U., others TBD)
- Indonesia (BPPT, others TBD)
- China (ChinaFlux)
- Malaysia (TBD)

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NSF Partnerships for International Research and Education (PIRE): Program Objectives

- promote international engagement in U.S. science community by supporting innovative, international research and education collaborations.
- promote U.S. scientists to establish collaborative relationships with international colleagues to advance new knowledge and discoveries at frontiers of science
- promote the development of a diverse, globally-engaged U.S. scientific workforce.
- facilitate greater student preparation for and participation in international research collaboration

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Initial Concept for PIRE Project Proposal: "Ecosystem Change and Ecological Forecasting in Monsoon Asia"

- 4 Major Questions: (proposed by Dr. Xiao)
  - What are the effects of climate variation on carbon fluxes at multiple time scales (ENSO, Indian Ocean Dipole, etc.)?
  - What are the effects of land use changes and intensification on carbon fluxes in monsoon Asia?
  - What are the impacts of land use changes and intensification on monsoon climate?
  - What are the impacts of changes in land-climate interactions on food and forest production and ecosystem services?

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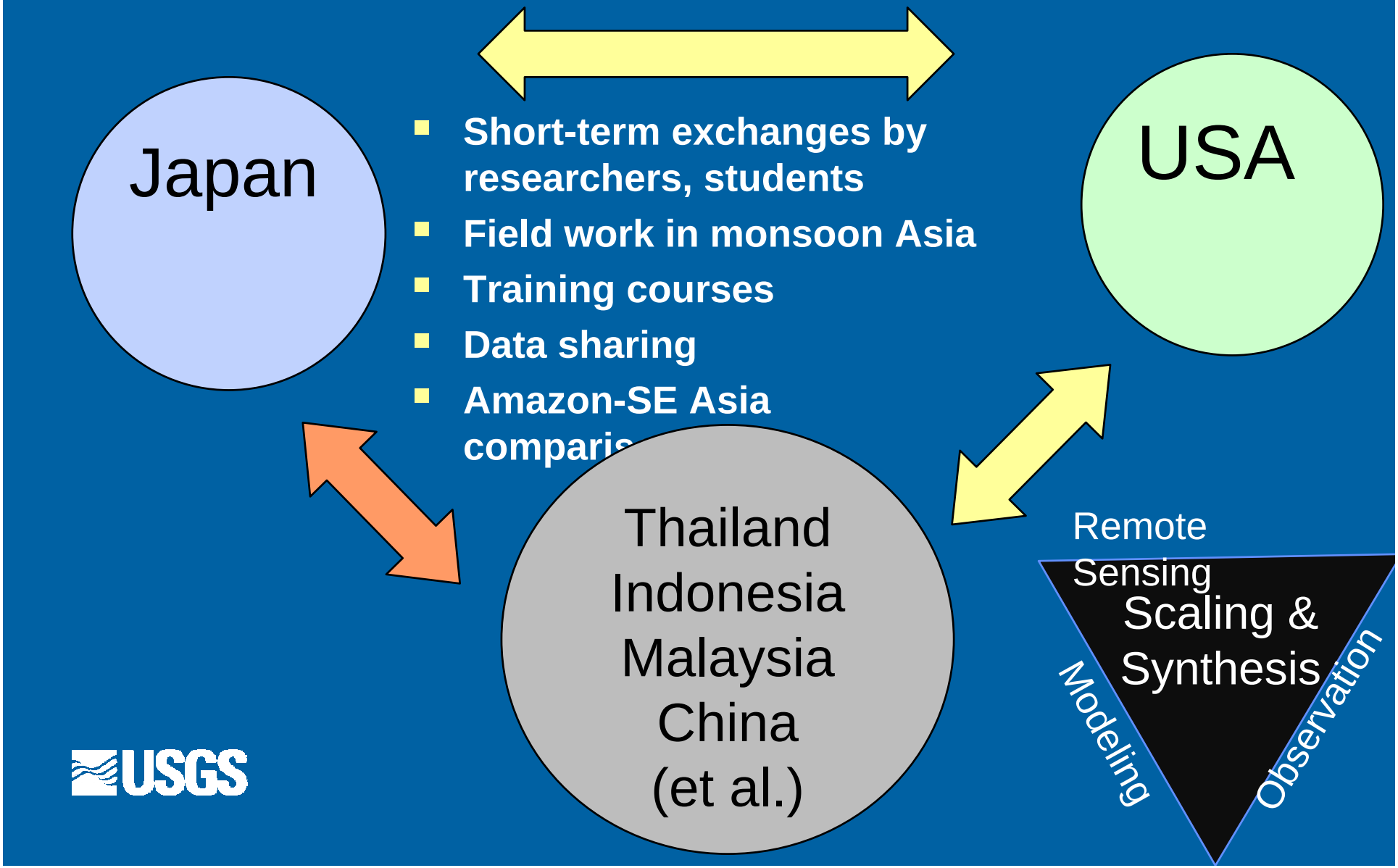
Potential PIRE Project: Promoting International Exchange for Research & Education



Conclusions

- **US-J-SEA Workshop was successful in:**
  - **Enhancing international communication on tropical forest carbon dynamics and sustainability in Monsoon Asia**
  - **Sharing of research activities and results in tropical Monsoon Asia and other regions (e.g. Amazon)**
  - **Identifying key science questions requiring integrated approaches (observations, modeling, remote sensing)**
  - **Developing new international collaborations**
- ***Contributes to strengthening regional and global networking essential for GEOSS***

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US-Japan-SE Asia Workshop on Monsoon Asia Tropical Forest Carbon Dynamics and Sustainability, Jan. 2009

Thank you

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