

*Interdisciplinary collaboration between
“Ecosystem - Climate Change - Disaster”*

Co-Chair:

Yoshiaki Yamagata (NIES) , Alex Held (CSIRO)

Objective of the session

- Strengthen collaborations in efforts of observation and data sharing in the fields of climate change, ecosystem management, and disaster prevention for “Cross-cutting data sharing in the Asia-Pacific Region” .
- Especially, we consider how the new GEO task “Forest Carbon Tracking” can be integrated to the relevant fields such as Bio-Diversity, Ecosystem modeling and Data-base.

Session program (part 1)

1. Collaboration with ecosystem research and forest carbon observation

Linkage with JaLTER and Monitoring 1000 (H. Shibata, Hokkaido U.)

Linkage with AsiaFlux (N. Saigusa, NIES)

2. Collaboration with remote sensing technologies

Forest remote sensing with ALOS (M. Shimada, JAXA)

Forest Remote Sensing in Thailand (Dr. Chaowalit Silapathong, GISTDA)

Linkages to the regional Sentinel-Asia Initiative (Alex Held, CSIRO)

Session program (part 2)

3. Integration with forest carbon modeling

Ecosystem modeling for global forest carbon monitoring
(Akihiko Ito, NIES)

Forest carbon monitoring studies in SE Asia (Denis Dye, USGS)

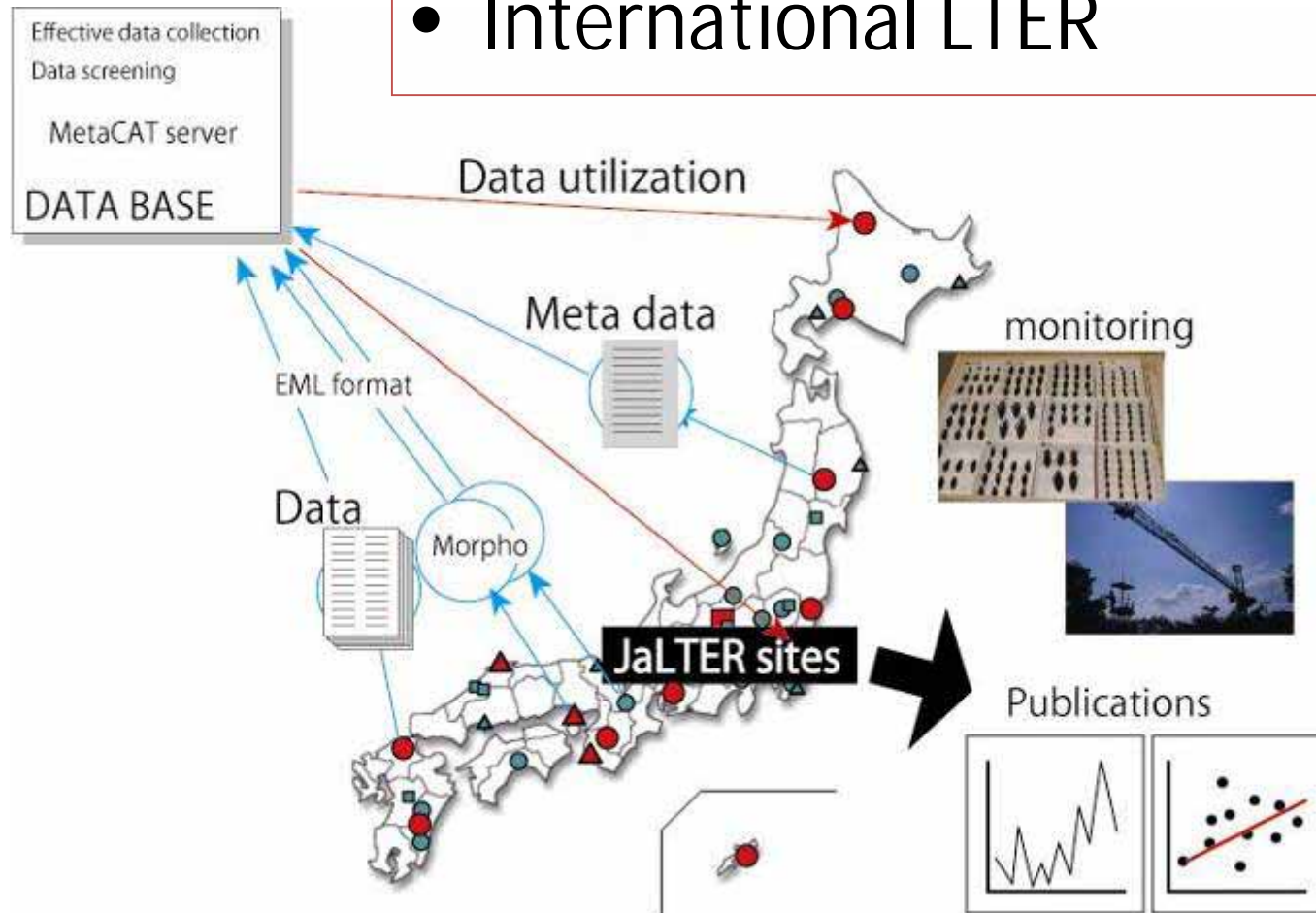
Linking Carbon budget models and remote sensing of forest change (Gary Richards/Rob Waterworth, Dept. Climate Change, Australia)

Application to ecosystem vulnerability assessment (Daniel Murdiyarso, CIFOR)

4. General discussion and session summary

Data-sharing and international collaboration

- EML for ecological database
- International LTER

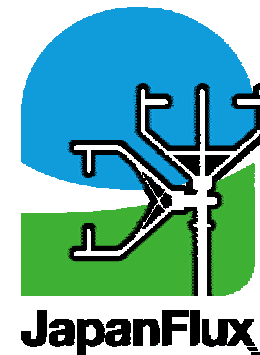


3. Needs and next step to integrate terrestrial observation networks for long-term ecosystem responses and feedbacks

Action program of JapanFlux & JaLTER

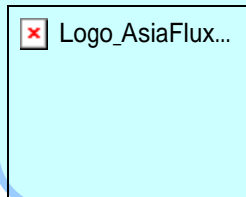
- ✓ Share sites and data
 - ✓ Share technical skills
 - ✓ Expand from Japan to Asia
- JapanFlux

Comprehensive, coordinated and sustained terrestrial monitoring network



Needs and the next step

Network terrestrial observation networks



JaLTER

Monitoring-
site 1000

Phenological
Eyes Network

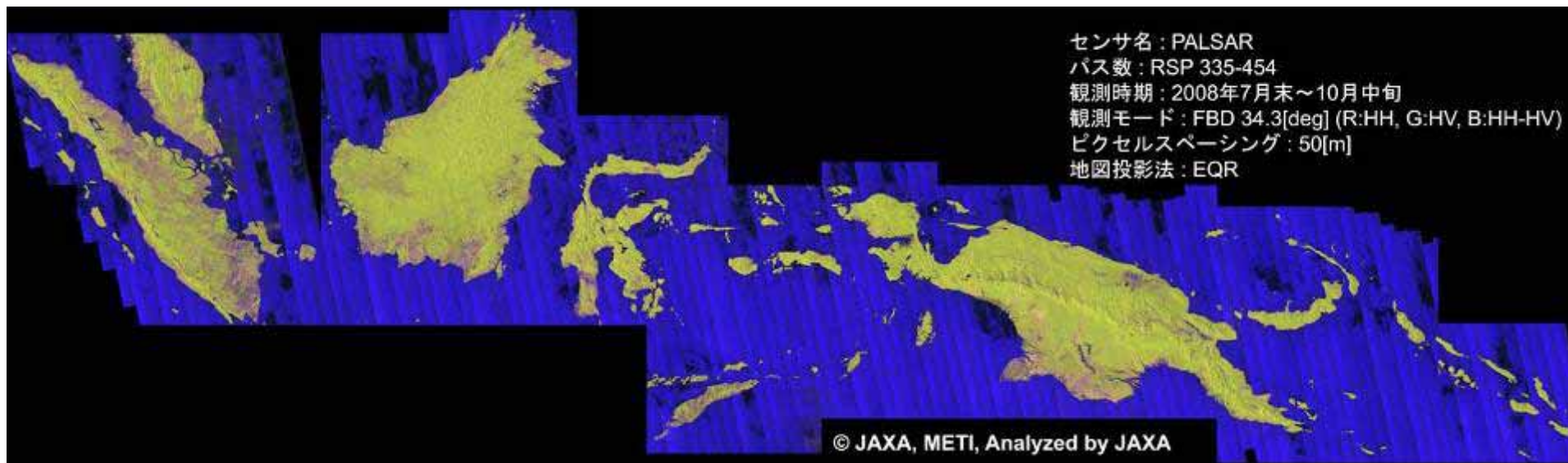
- ✓ Share core sites
- ✓ Observe comprehensively
- ✓ Reduce uncertainty

- ✓ Share interdisciplinary datasets
- ✓ Integrate analyses

Comprehensive, coordinated and sustained terrestrial monitoring network for long-term ecosystem responses and feedbacks

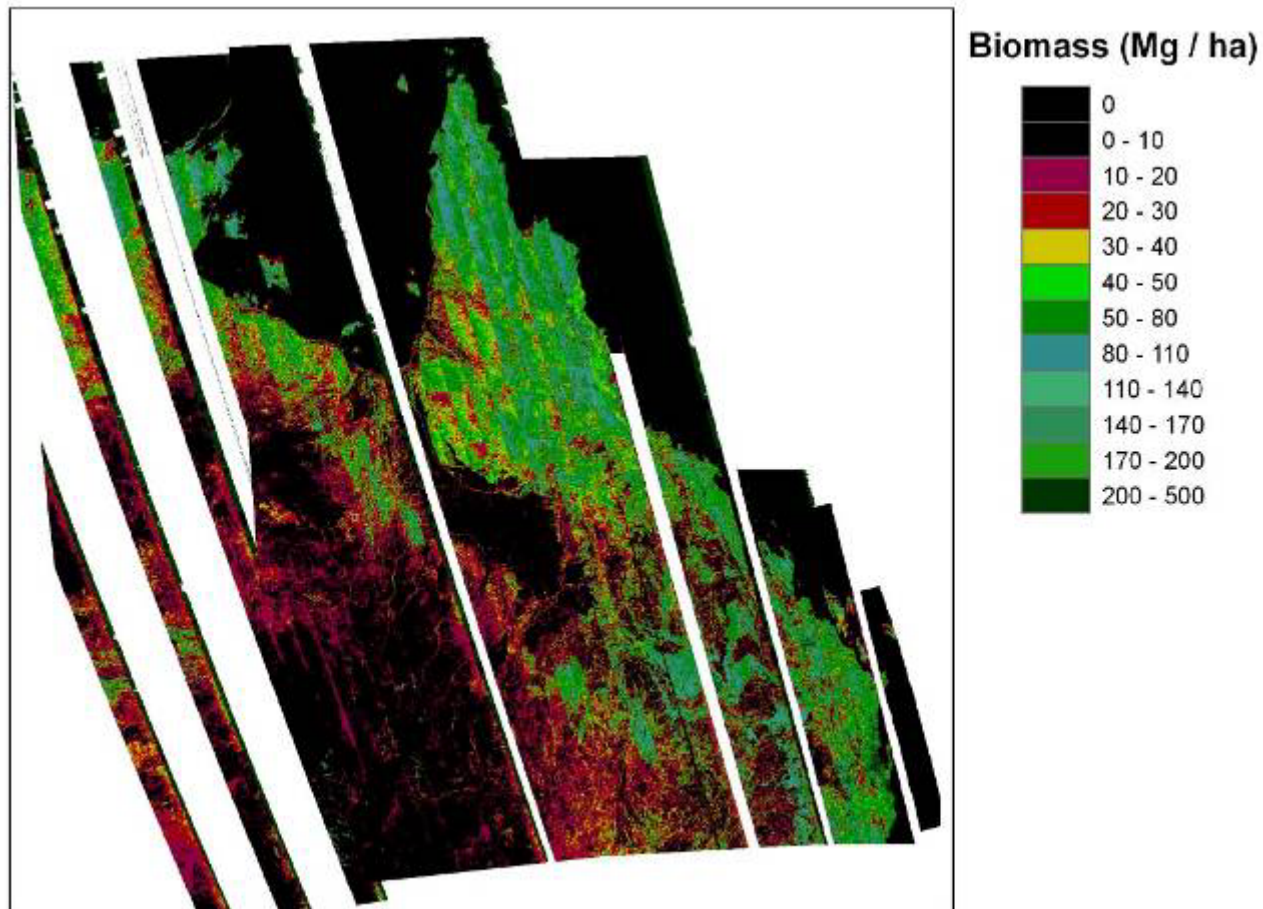
3 . 2 . 2 . 4 Forest mosaic

South east asis mosaic 2008

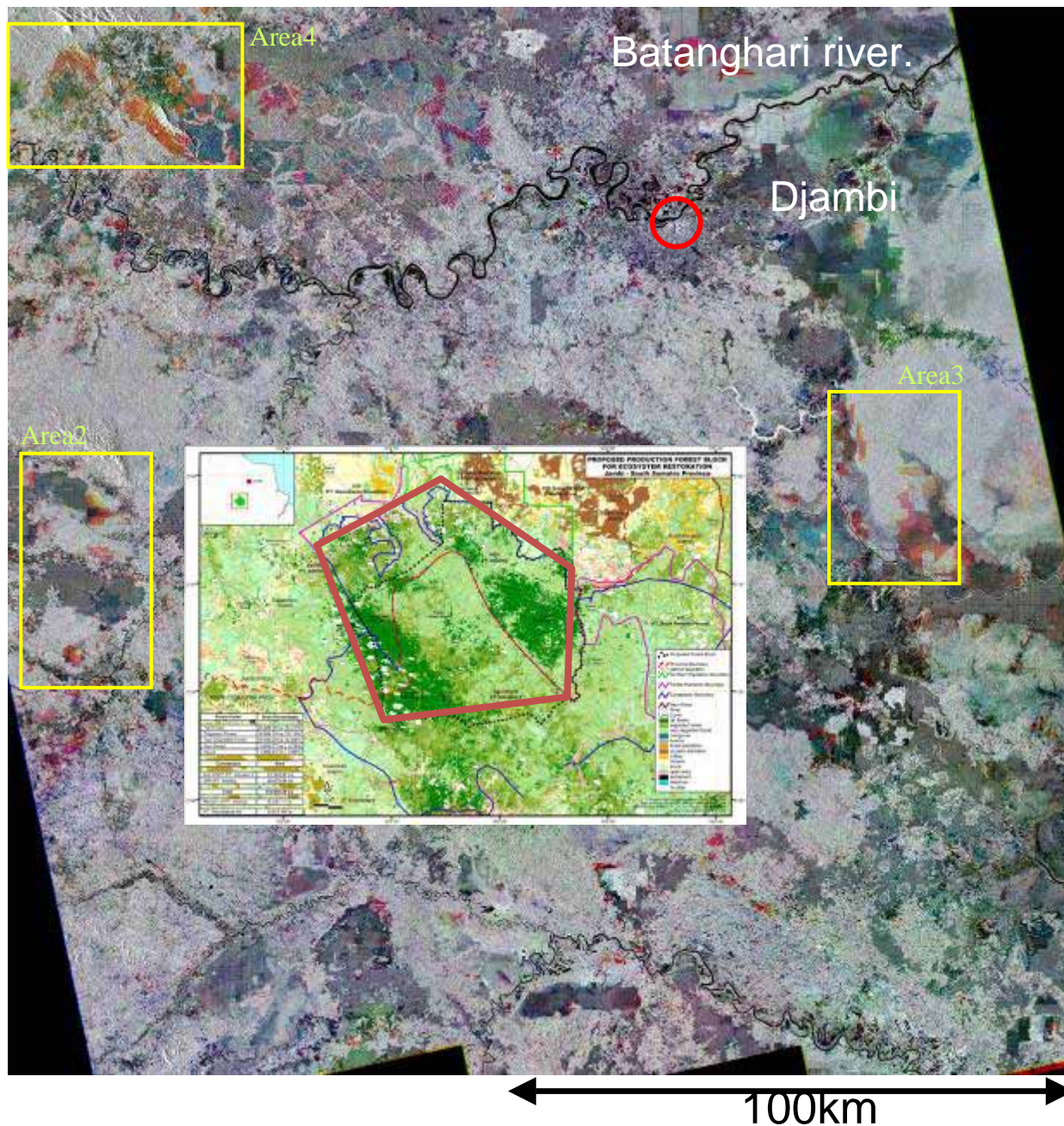


3 . 2 . 2 . 6 Biomass map

There are two ways for estimating the biomass. 1) use the relationship between NRCS of forest in HH and HV and biomass gives the distribution of the biomass. The below figure shows the biomass map of the north australia ffrom the PALSAR data. 2) the height estimation of the forest using the polarimetric SAR ineterferometry.



Forest Change Detection between June 2007~Sept 2008



Sensor: PALSAR
Polarization:HV

Color assignment

R: June/July, 2007

G: June/July, 2008

B: Aug./Sept., 2008

Red: deforestation
between 2007 and 2008
Yellow : recent
deforestation in 46 days
(between June, 2008 and
Sept., 2008)

Blue/Green: Regrowth or
recover this year.

Dark gray: deforestation
as of June 2007

Bright gray: Forest as of
Sept., 2008

K&C support to the GEO Task on Forest Carbon Tracking

At the recent K&C meeting (KC#11, Jan. 2009), the Science Team were asked to support the GEO Task through

1. Advice on **optimal SAR data modes and thematic products** for annual, medium resolution forest-cover change monitoring
2. Guidelines to CEOS agencies for the development of sensor synergistic **SAR data acquisition strategies** to support the GEO Task
3. **Standards for the generation** of annual, ortho-rectified, terrain illumination corrected regional-scale **SAR mosaics**
4. **Methodologies for forest change & trend monitoring** using SAR, that is interchangeable with optical methods (e.g. PRODES/Brazil, NCAS/Australia), and **corresponding accuracy assessment**.
5. **Demonstration projects** for “near-real time annual” SAR monitoring of deforestation and degradation, to show at COP15.

The Science Team is interested and able to contribute. Points 1, 2 & 3 already on-going.

Close collaboration with the GEO Task leaders required. Time is short!

Earth Observation Satellite Data Services

Satellite Data Archives & Services:

- LANDSAT, SPOT, MOS, ERS, JERS, ADEOS, RADARSAT, IRS, ALOS, IKONOS, QuickBird, WorldView
- TERRA-MODIS (cooperation with AIT& U. of Tokyo)

Value-added Products Services:

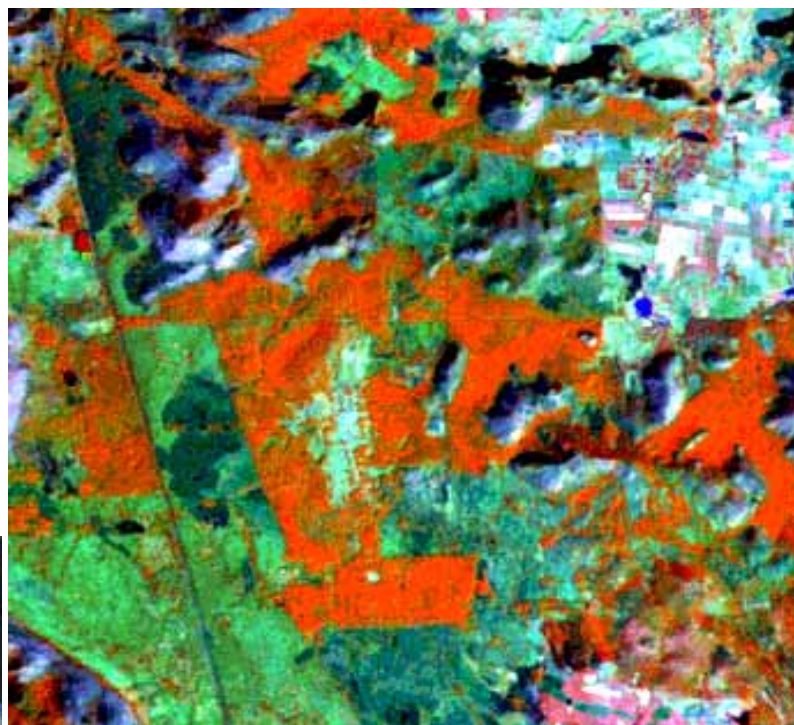
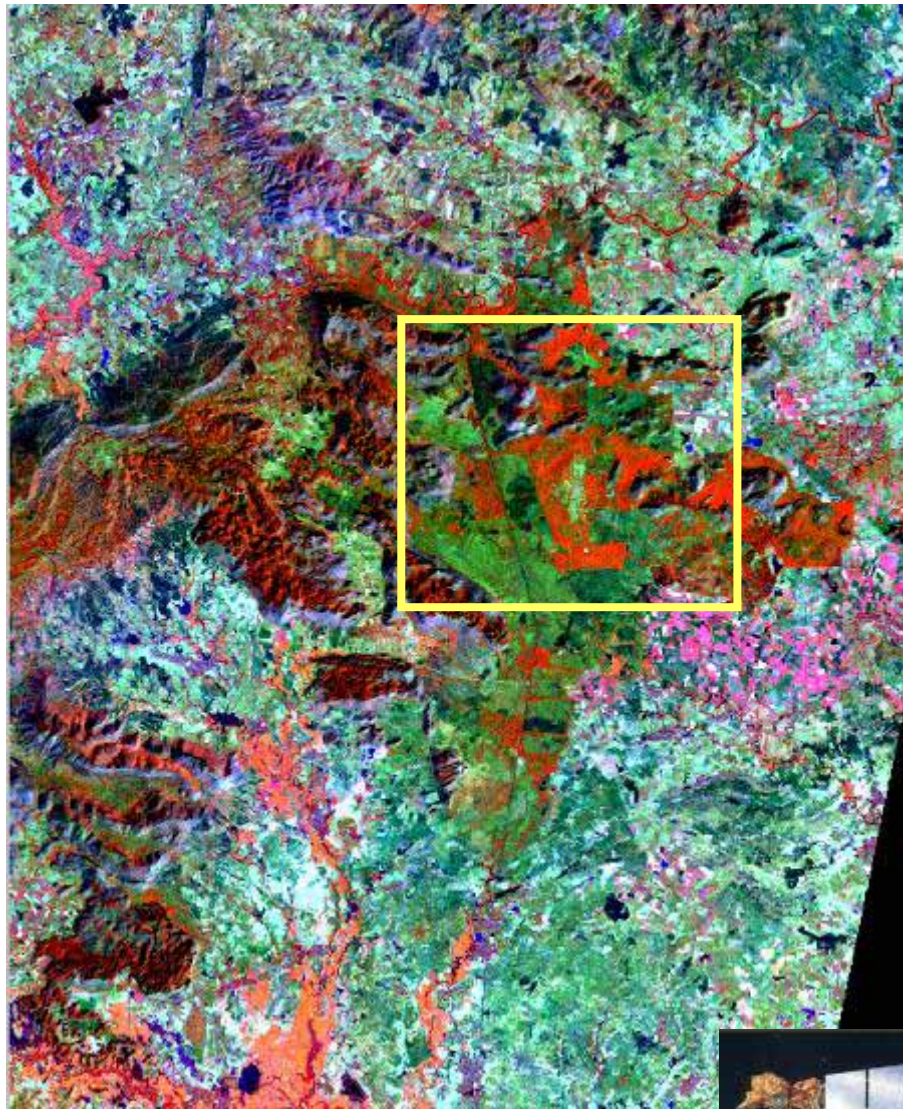
- Image-maps
- Customer oriented products

On-line services:

- CBS (Web based satellite data browsing system)
- Web page: <http://www.gistda.or.th>



Deforestation monitoring from satellite imagery



Way Forwards / Operational

Use of EOS in Forestry

- Development of standard algorithm for forest land cover mapping and forest land cover change monitoring (national/regional/global)
- Auto / semi-auto deforestation detection system
- Real time / very near real time information (not data) available for forest fire
- More application of SAR data to overcome cloud cover problem

Observation and modeling

Flux (*JapanFlux*)



Experiment



Soil



Soil survey



Soil gas

CO₂/CH₄/N₂O exchange

NEE (GPP/RE)
ET

CO₂/Temp
Water, nutrient

Phenology

SW, Rn
PAR



Radiation

Ecosystem (*JaLTER*)

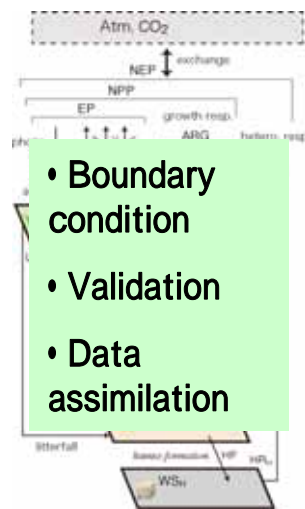


Field survey



Matter flow

Stock
Structure
NPP
NEP



- Boundary condition
- Validation
- Data assimilation

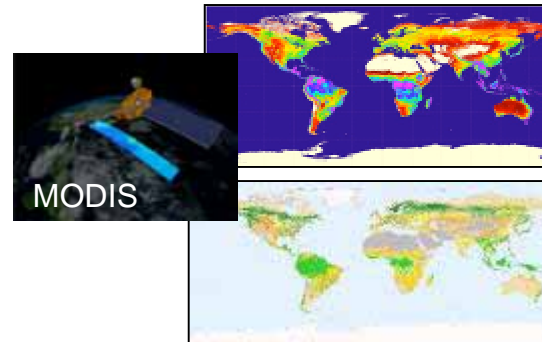
Observation and modeling

JAXA & JAMSTEC

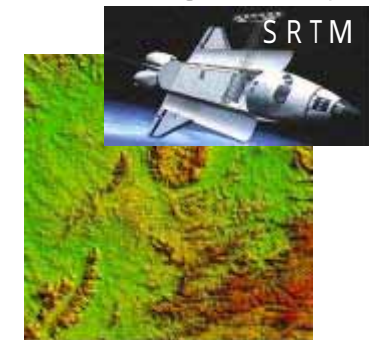
Data archive

- NOAA/AVHRR
- Landsat, SPOT
- TRMM etc.

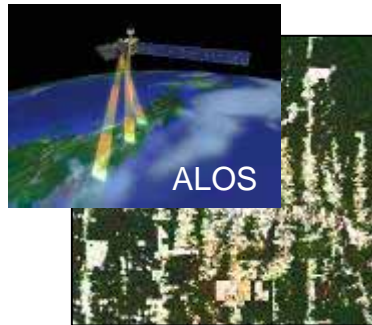
Vegetation



Topography



Land-use/cover change



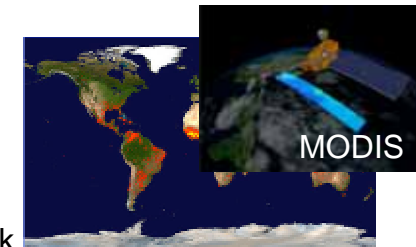
LAI, biome, etc.

cf. ASTER

Deforestation

Altitude

Disaster



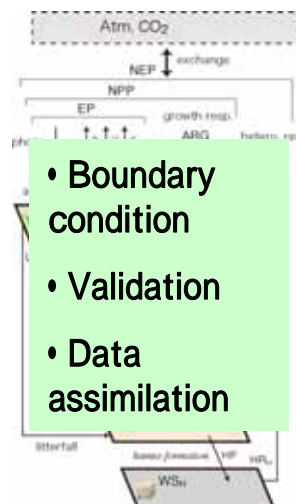
Fire
Flood
Outbreak
Etc.

Greenhouse gases



CO₂ level & flux
CH₄ level & flux

cf. SCIAMACHY, OCO



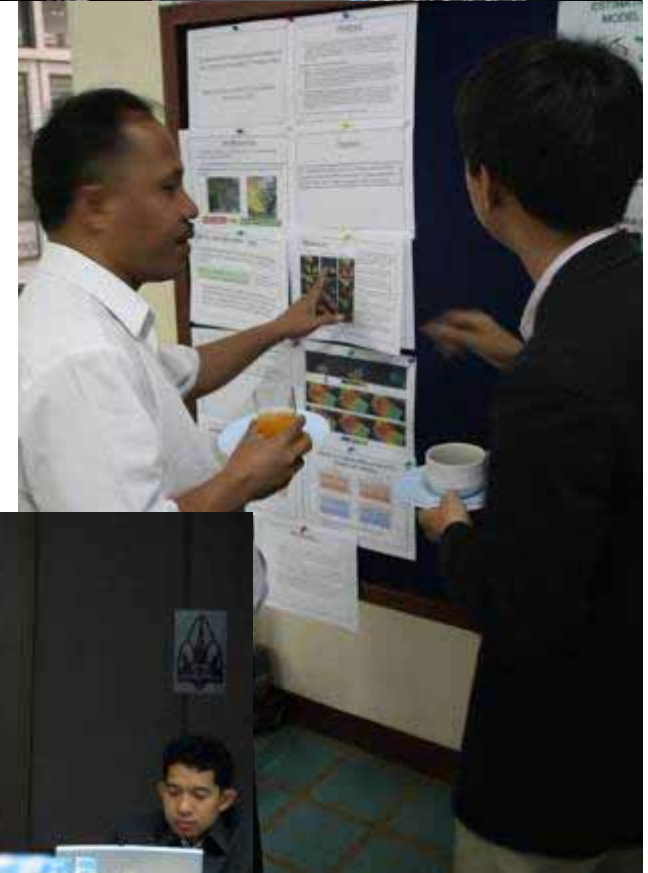
- Boundary condition
- Validation
- Data assimilation

Future missions

- DESDynI
- GCOM etc.

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*)



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)

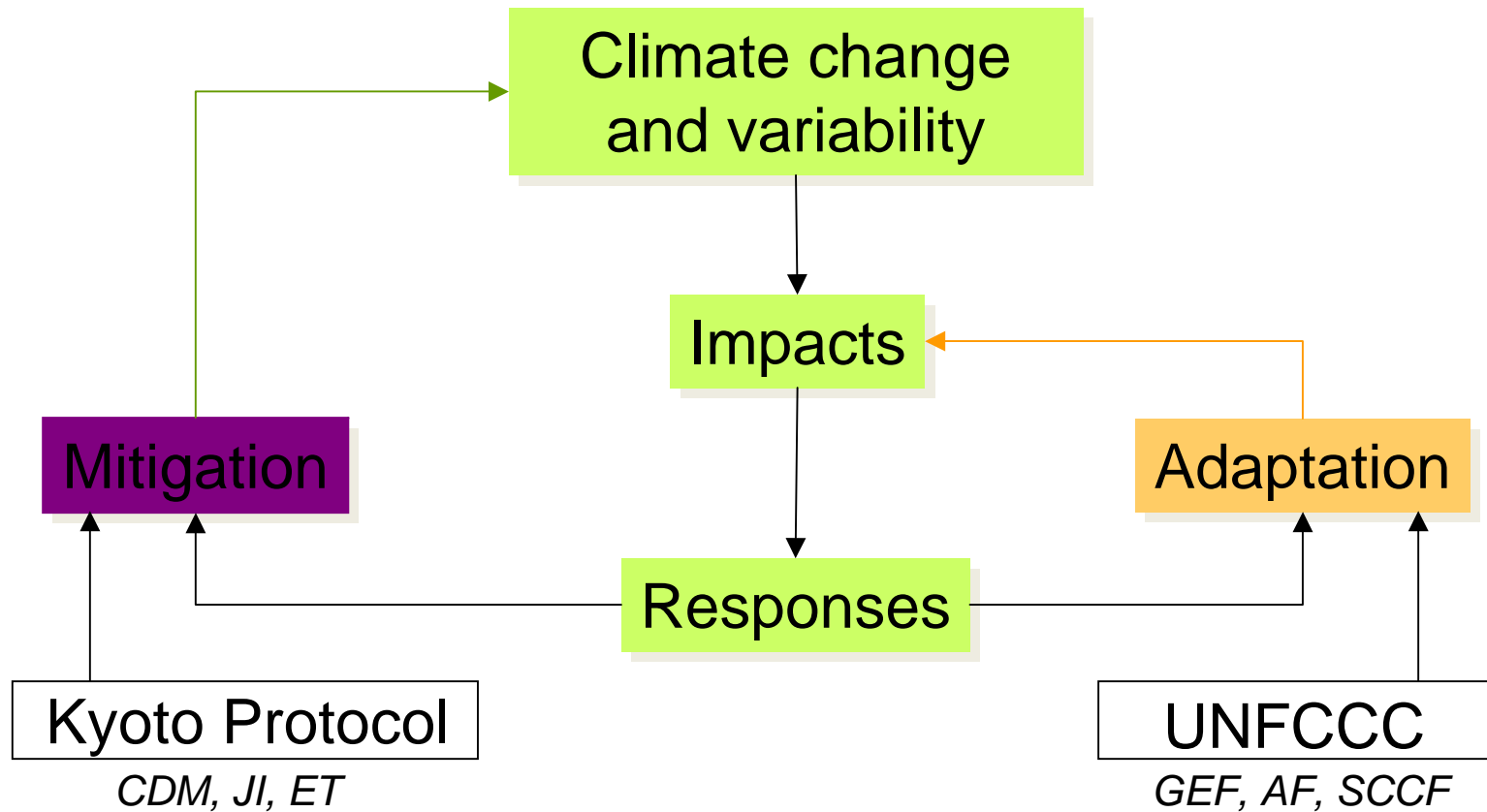
Workshop Conclusions

- 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)

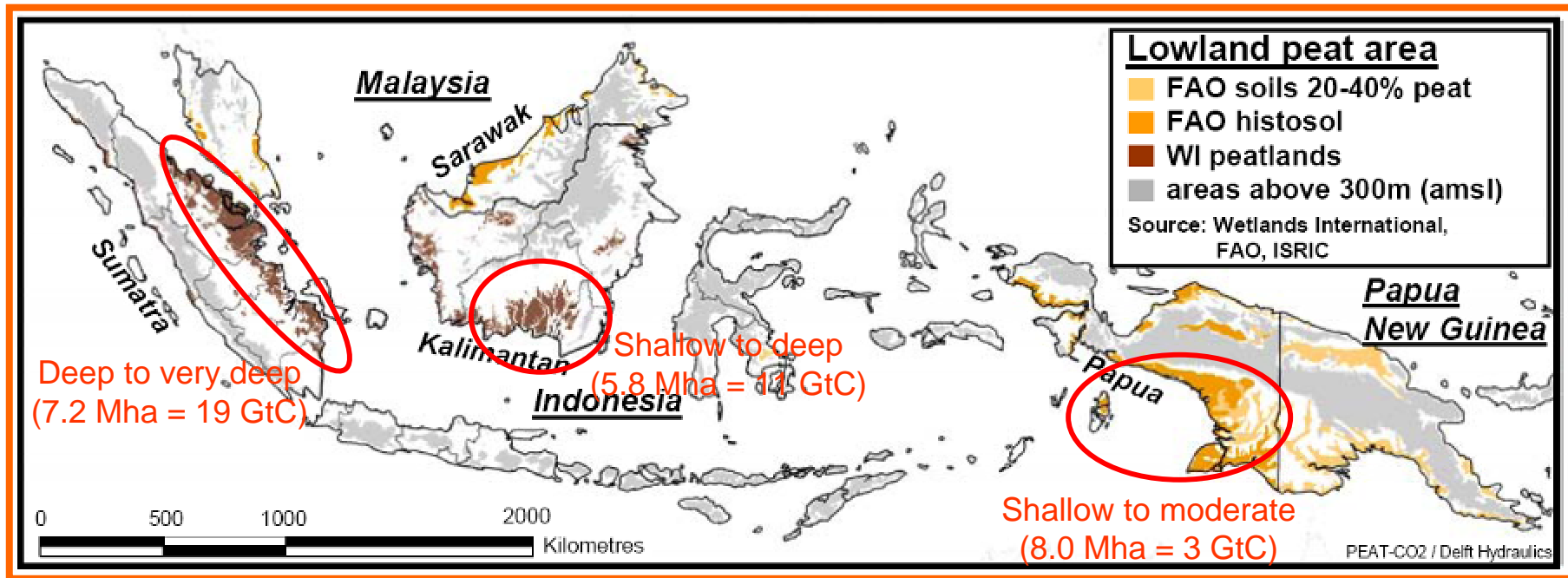
Conclusion

- The linkage of time series, wall-to-wall remote sensing linked to ecosystem models is one of several approaches to deriving carbon inventories, however it is;
 - it is the method that gives the highest order of policy response and flexibility in reporting
 - provides a basis for projections under anticipated climate change, and
 - supports land surface feedback to climate modelling

Linking adaptation and mitigation



Where are the hotspots located?



		1990	2002
Global	400 Mha (528 Pg)		
Tropics	40 Mha (191 Pg)		
SE Asia		35-40 Mha	25-30 Mha
Indonesia		21 Mha (33 Pg)	17 Mha (?)

Shallow: 0.5 – 1 m
 Moderate: 1 – 2 m
 Deep: 2 – 4 m
 Very deep: 2 – 4 m
 Extremely deep: > 8 m

Summary

- The vulnerability of forest ecosystems, including the dependant society to CC may be assessed
- There is a need to test C&I for the ecosystems vulnerability to climate change
- Field and remotely sensed data are crucial for adaptation (and mitigation) strategies
- Enhancing the role of forests for climate change mitigation (REDD) could be used as entry point to reduce ecosystem vulnerability

Synergies between GEO Forest & Carbon Task, Ecosystem Monitoring and Disaster Monitoring



- Forest Cover information can be used as an indicator of potential risk of future disasters (eg Landslides) or loss in ecosystem services (eg clean water, biodiversity, etc.)
- A joint system encourages a common monitoring frameworks and data-sharing, consistent with GEOSS interoperability principles
- Uses of many common earth observation datasets (eg satellite data, in-situ forest assessments)
- Use common regional information delivery concepts and backbones