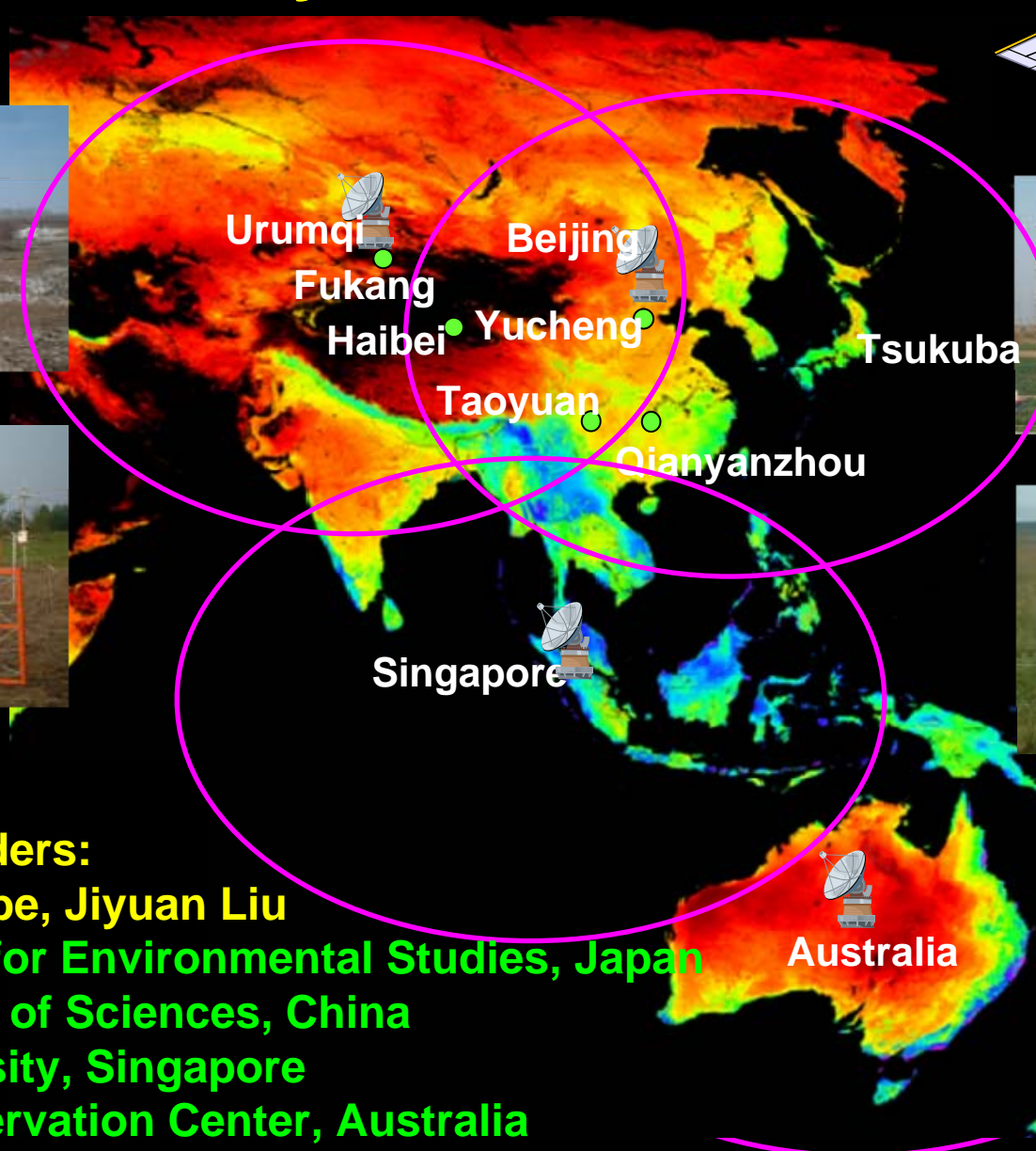
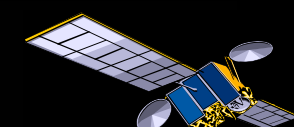


Integrated Environmental Monitoring for Sustainability in Asia-Pacific Region



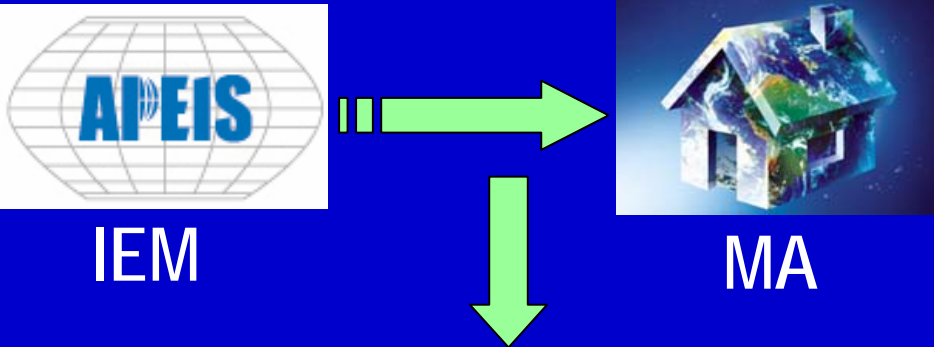
IEM Sub-project Leaders:

Masataka Watanabe, Jiyuan Liu

- **National Institute for Environmental Studies, Japan**
- **Chinese Academy of Sciences, China**
- **Singapore University, Singapore**
- **CSIRO Earth Observation Center, Australia**

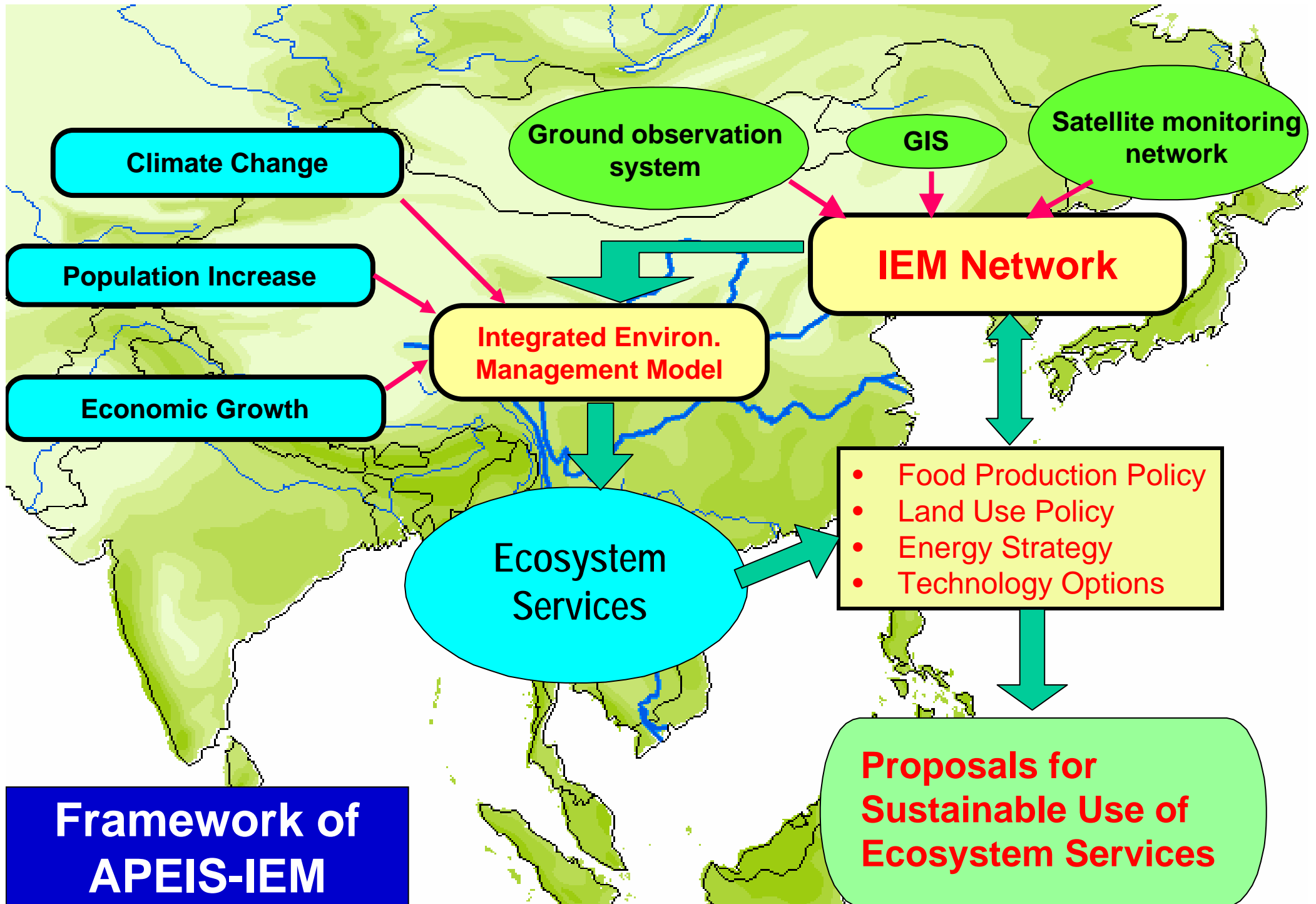
Objectives of IEM

- Establishment of IEM Network
- Assessment of Ecosystem Services for Sustainable Use



Approximately **60%** (15 out of 24) of the ecosystem services evaluated are being degraded or used unsustainable (MA Launching Ceremony, 8 major cities, Mar. 31, 2005)

Ecosystem Services	Status
Air quality regulation	↓
Climate regulation	↓
Erosion regulation	↓
Water purification and waste treatment	↓
Natural hazard regulation	↓
Crops, livestock, aquaculture	↑
Capture fisheries, wild foods	↓
Timber, cotton, silk	+/-
wood fuel	↓
Genetic resources	↓
Biochemicals, medicines	↓
Fresh water	↓
Recreation and ecotourism	+/-



IEM Progresses

1. Establishment of MODIS Observation Network:

- High Quality MODIS Dataset, such as Vegetation Index, Surface Temperature, Land Cover, Net Primary Production, etc.

2. Advanced Assessment of Ecosystem Services:

- Water Use Capacity
- Flood Control Capacity
- Carbon Fixation Capacity
- Food Productivity, etc.

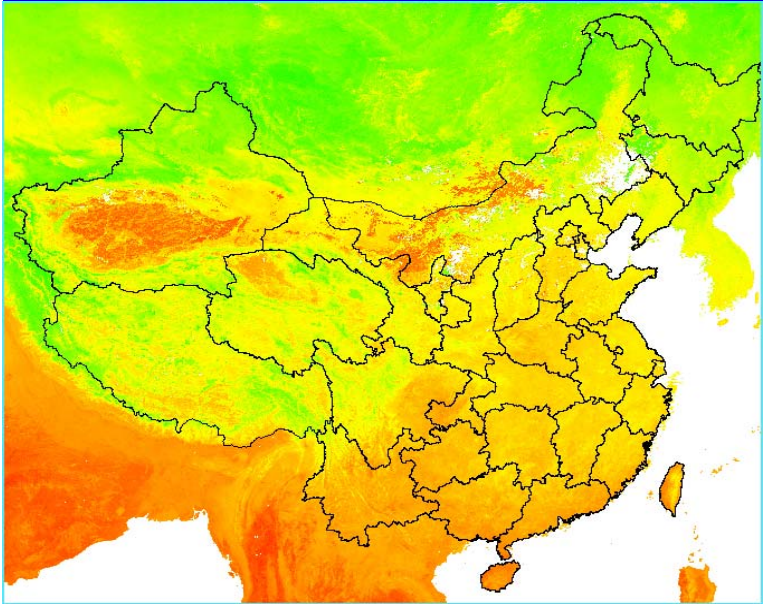
3. Cooperative International Network:

- 3rd IEM Workshop , 9 - 11 December 2004, Singapore
- MA Launching Ceremony in Tokyo and Beijing

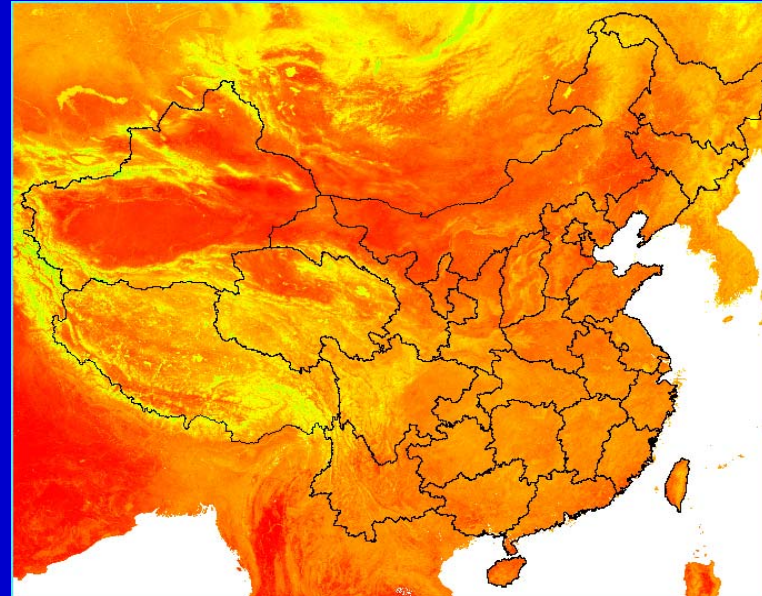
4. Contribution to International Organizations, such as Eco Asia, MA, CSD12, Water Forum, etc.

High Quality Environmental Database

(a) Dynamic changes of land-surface temperature

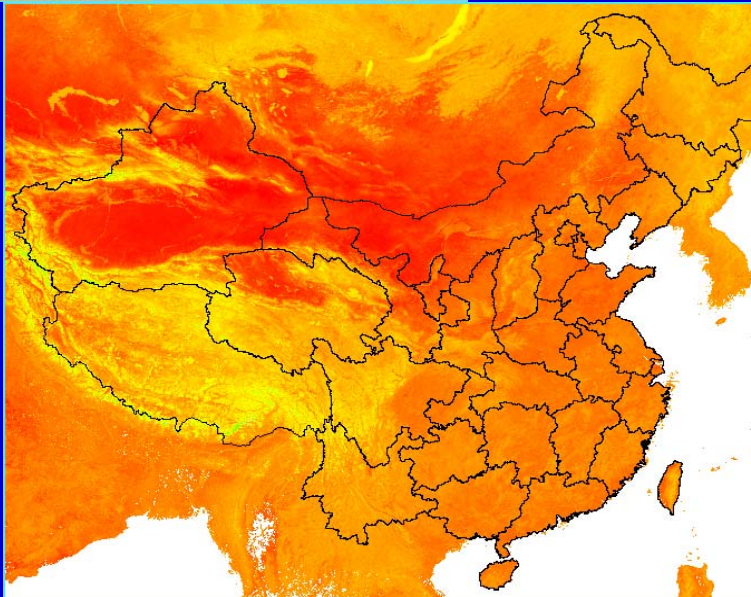


Spring

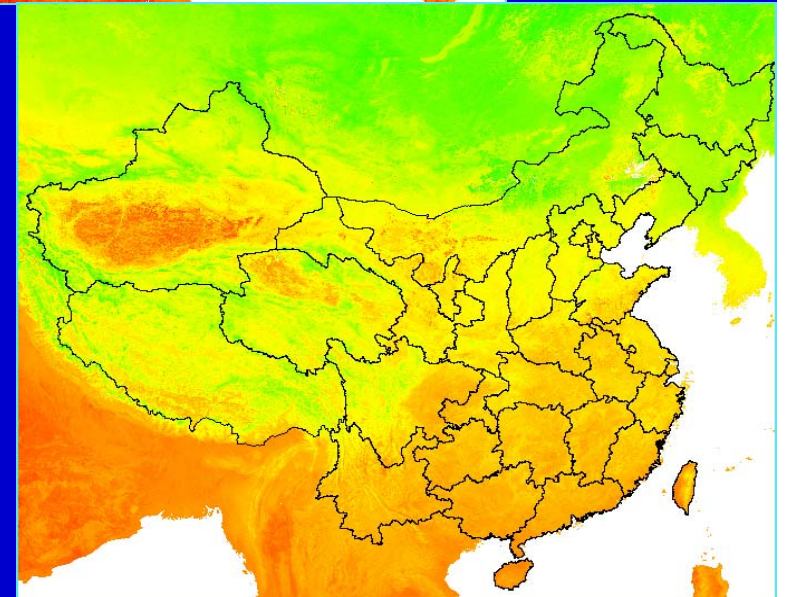


Autumn

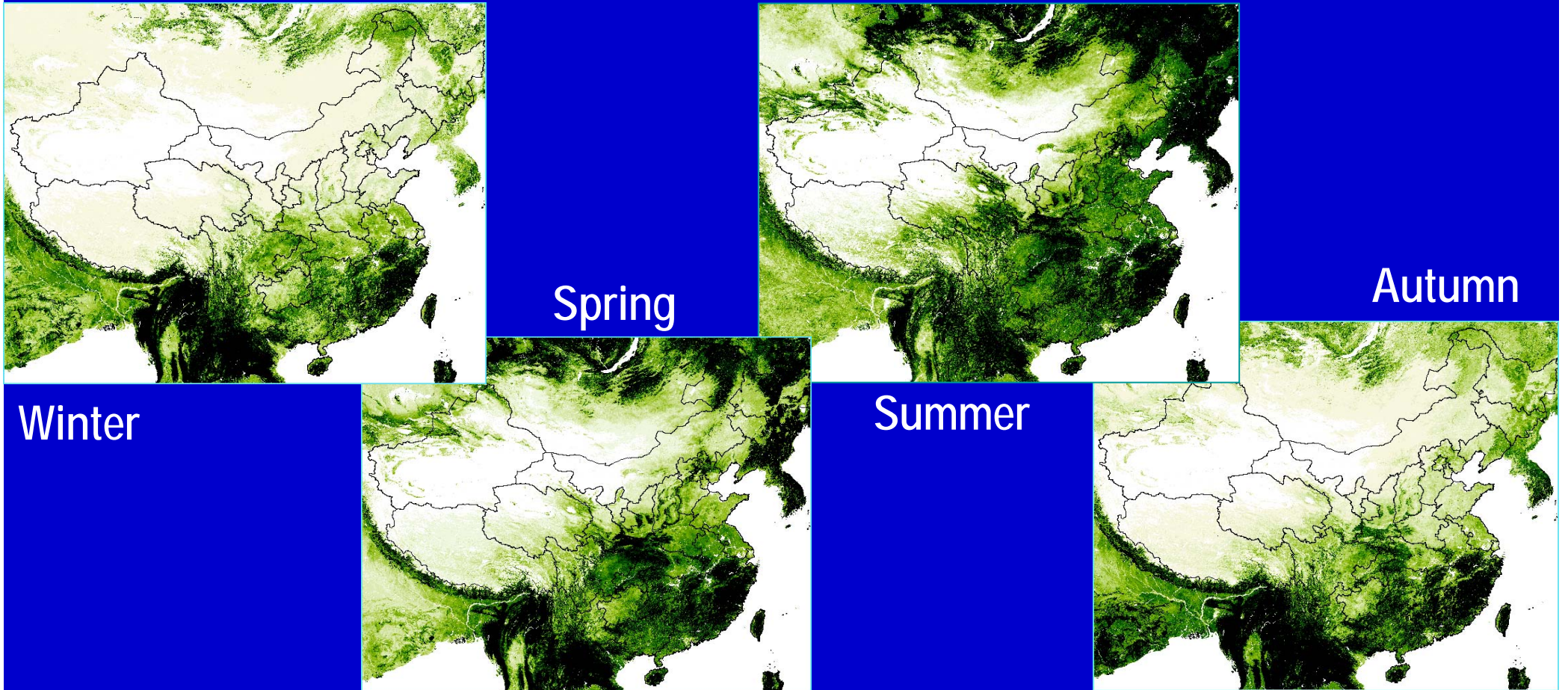
Winter



Summer



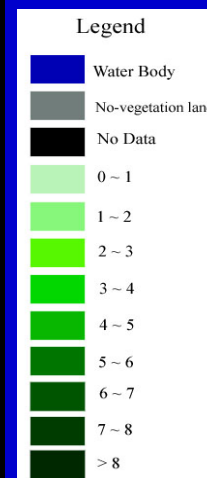
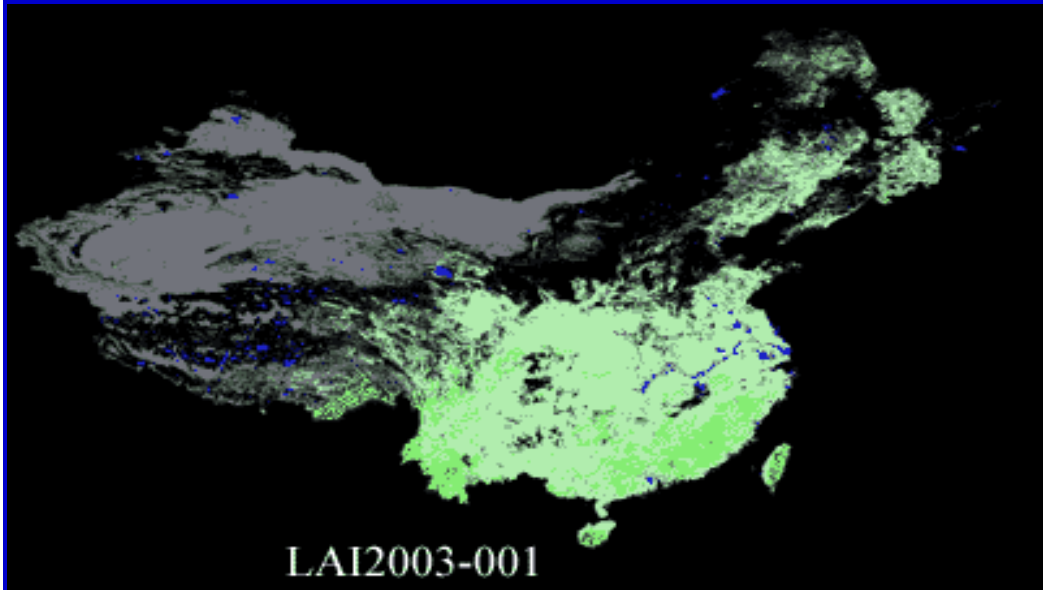
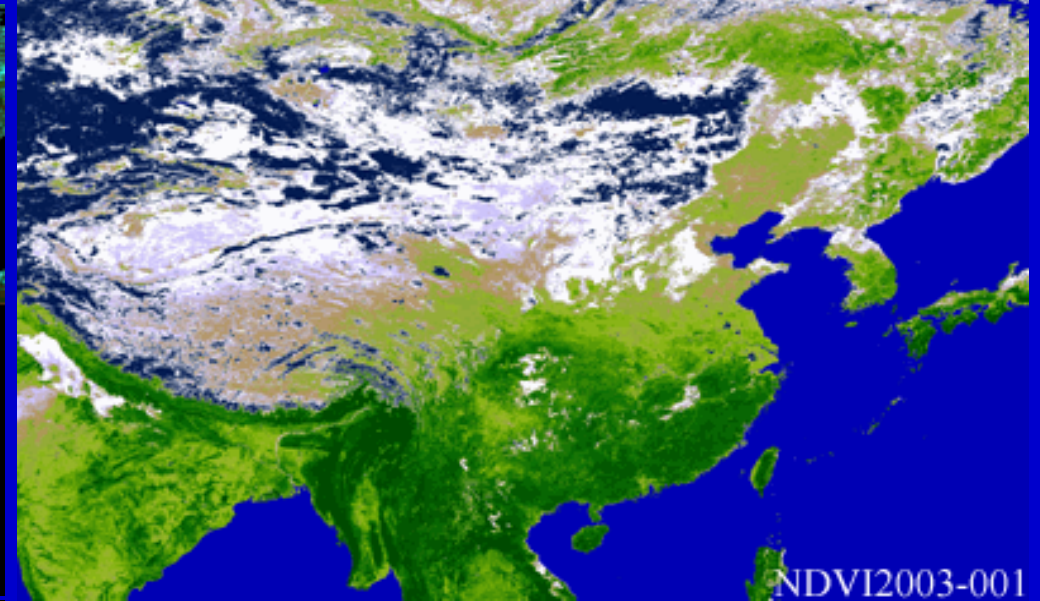
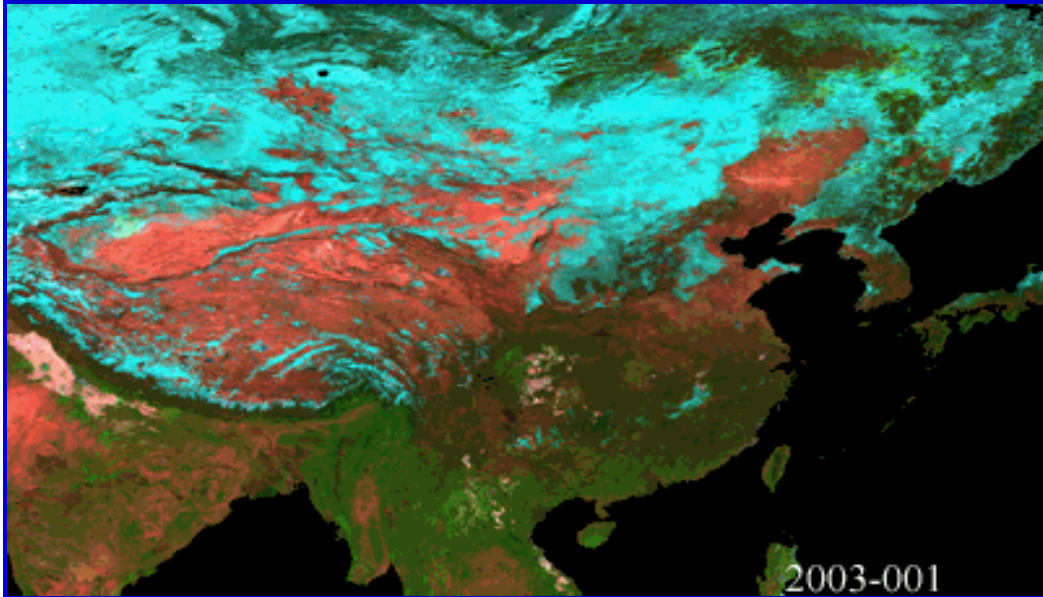
(b) Dynamic Changes of Leaf Area Index



The new algorithm have improved than MODIS product algorithm:

- The view and solar angle information was added as input;
- The more accurately regional land cover map was used;
- Many parameters of the algorithm were measured and validated in Asia;

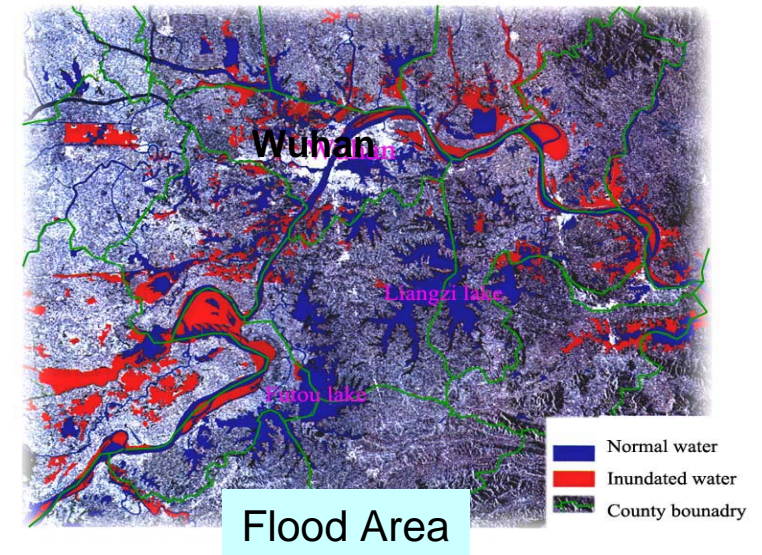
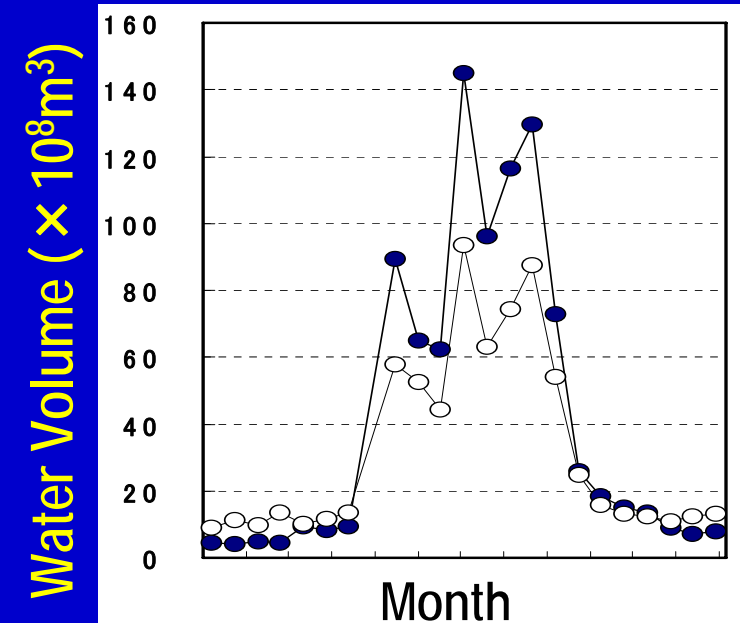
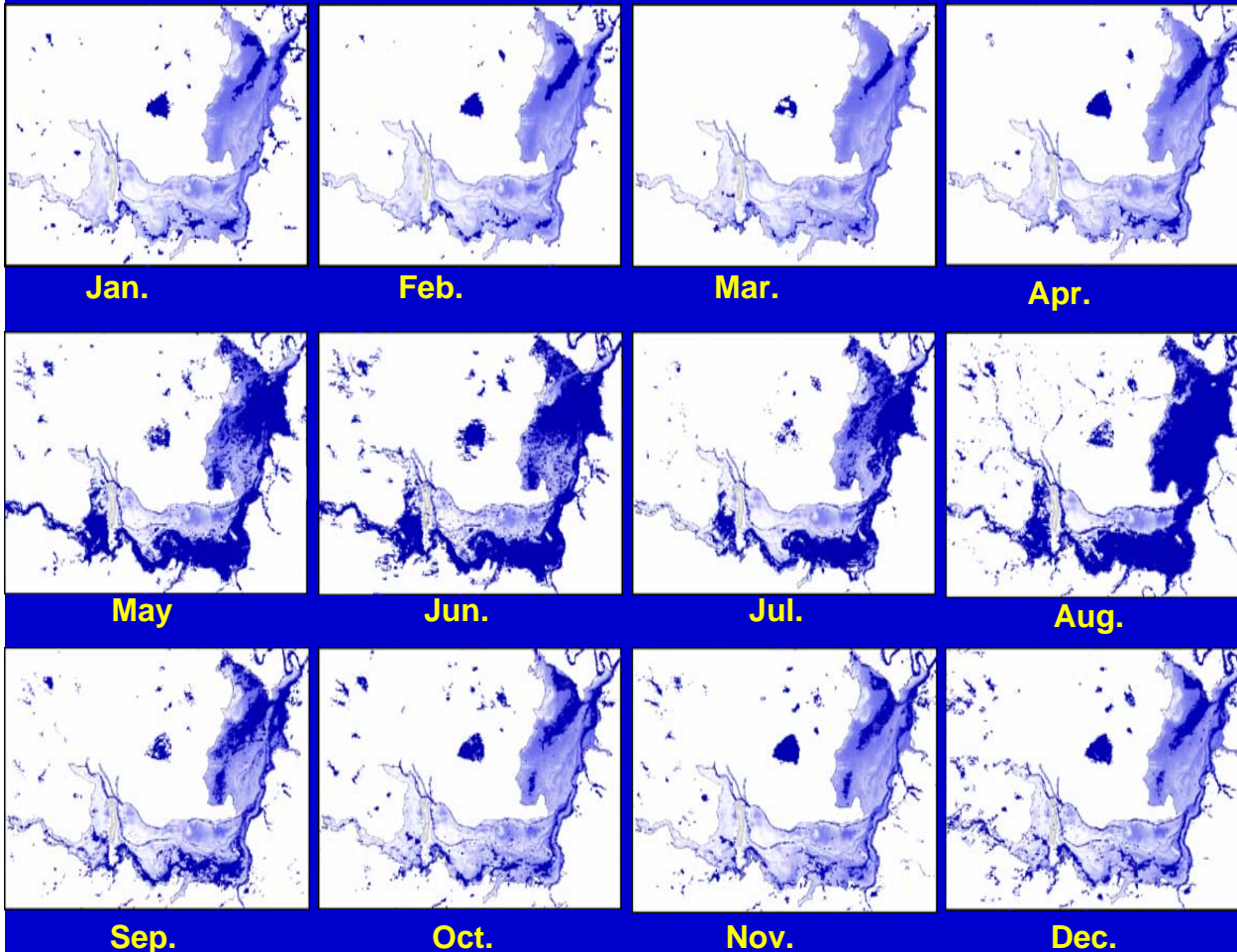
(c) Dynamic changes of plants and vegetation



Inter-annual change of false color land surface images, vegetation index (NDVI) and leaf area index (LAI)

Assessment of Ecosystem Services

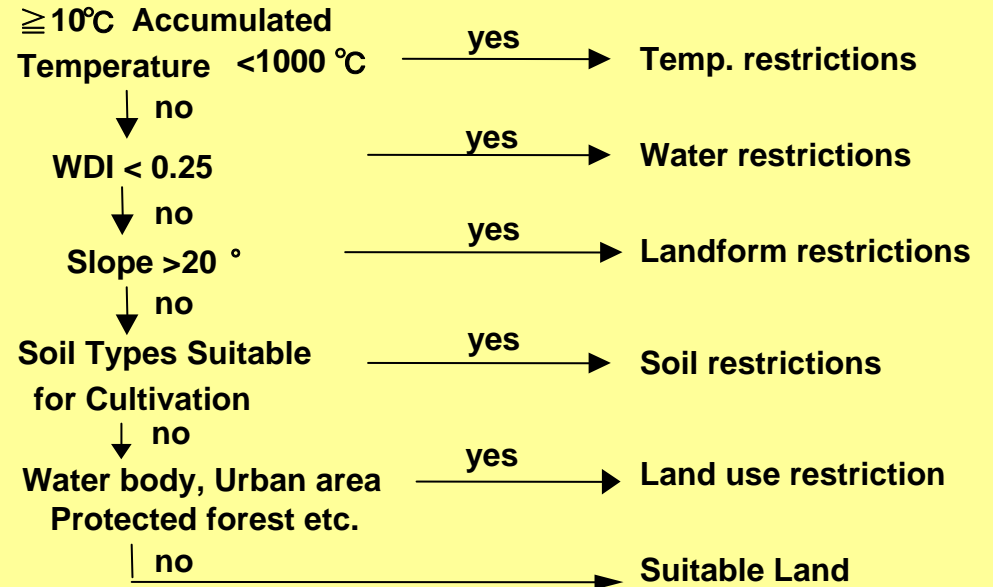
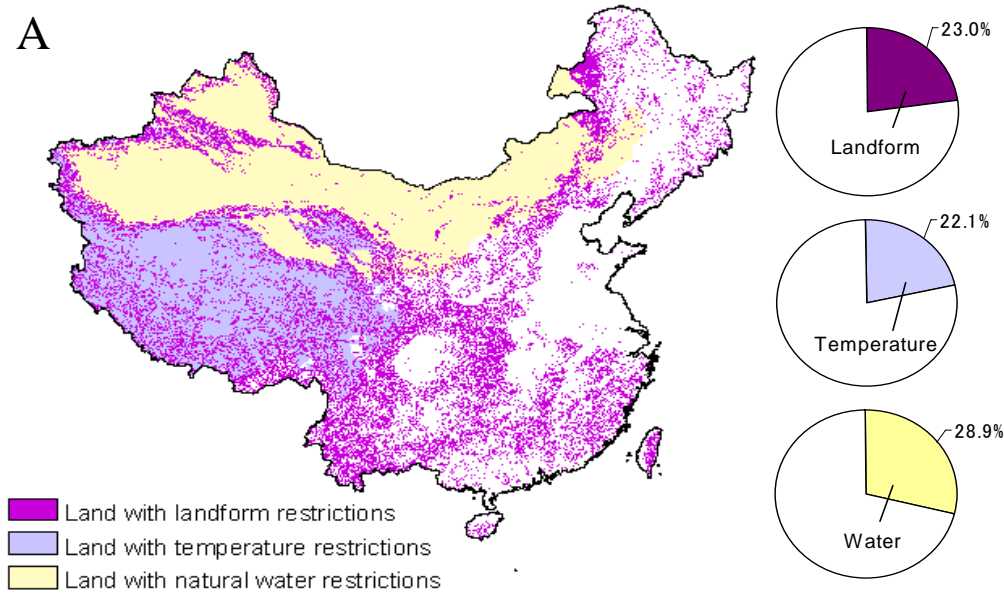
(a) Flooded area and water-volume



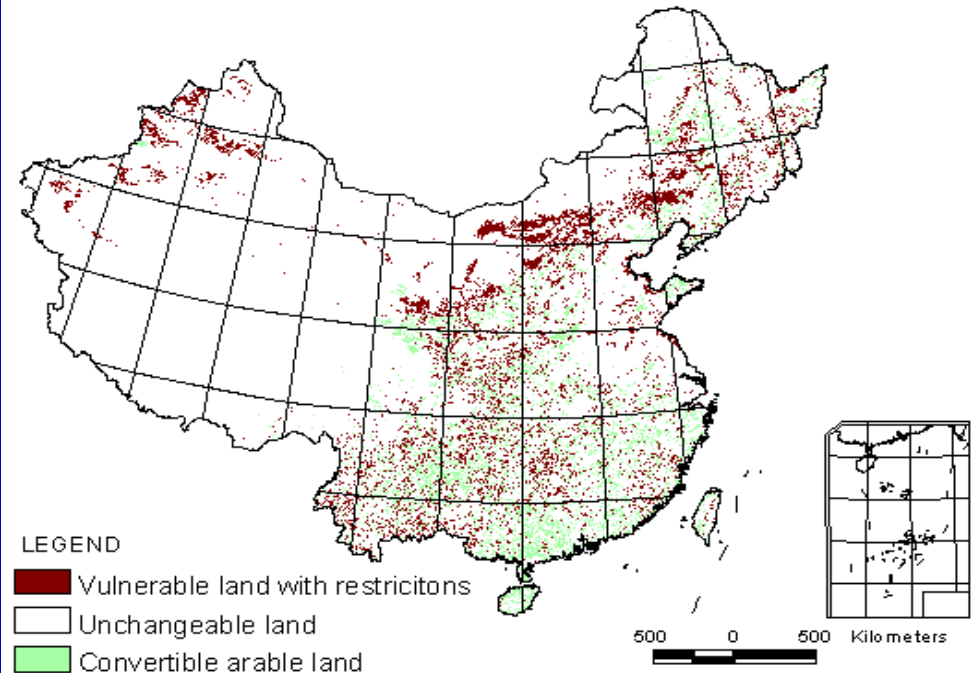
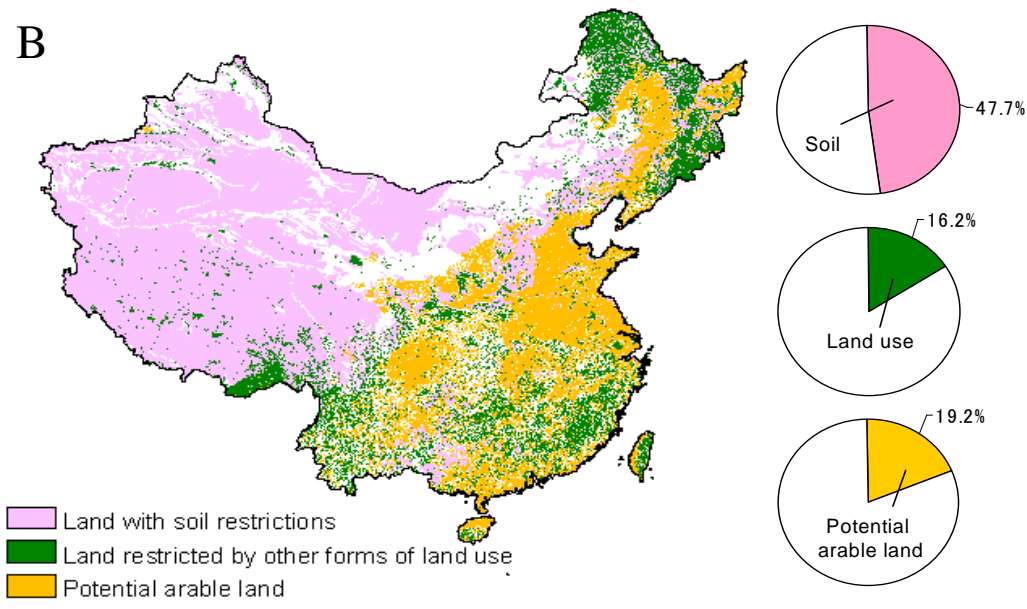
A case study of Tongting Lake, 2002
(*Geographica Sinica*, 59 (1): 88-94)

(b) Arable Land Vulnerability

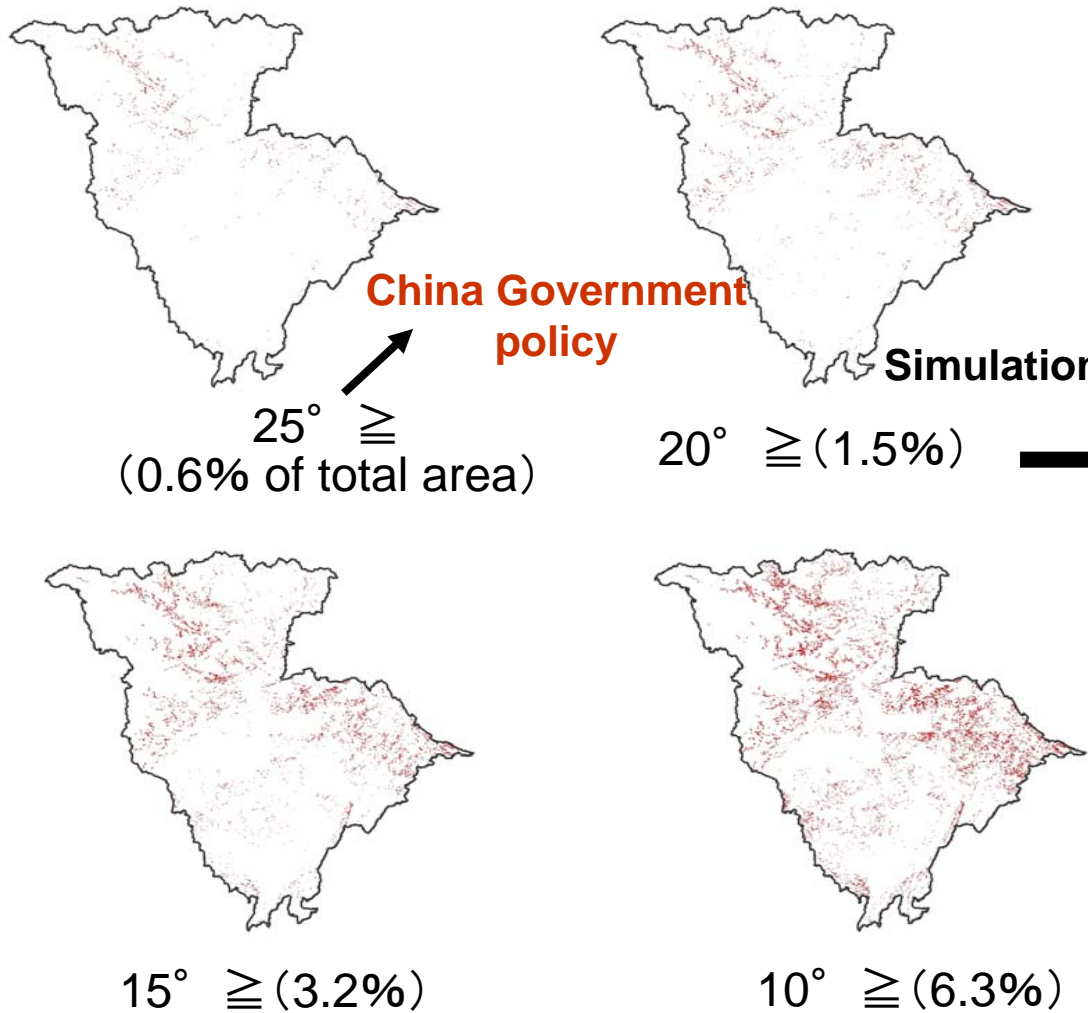
A



B

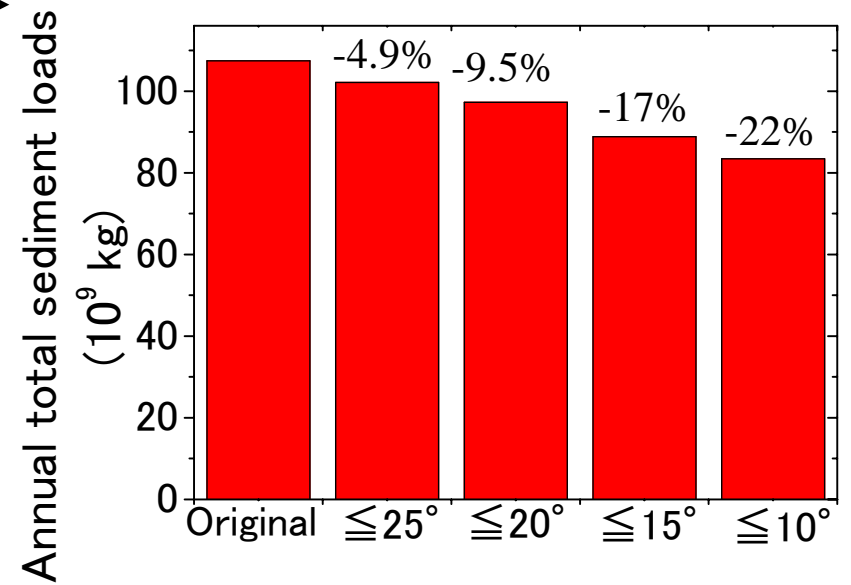


(c) Policy of returning farmland to forest and its effects on prevention of runoff and sediment loads



No significant effect on flood control

Maximum flood peak value only decreased 2.2% in the case of threshold 10° in the whole catchment



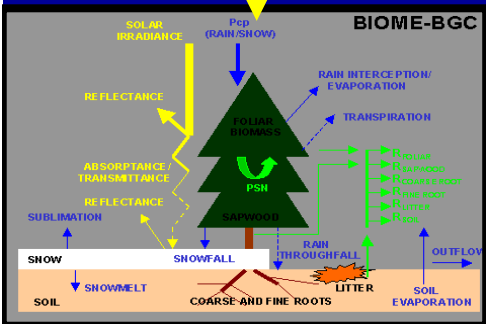
Sediment production could be reduced due to the increase of threshold

(d) Carbon fixation by vegetation

Measurements

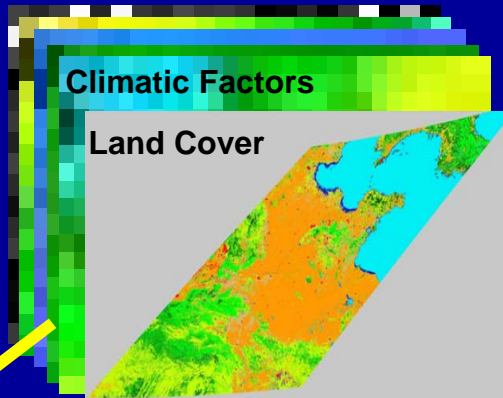


Input



Modeling

Validation

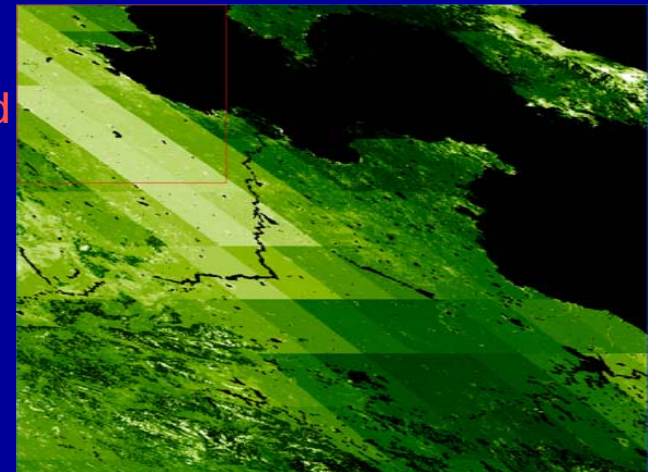


GIS Input Layers

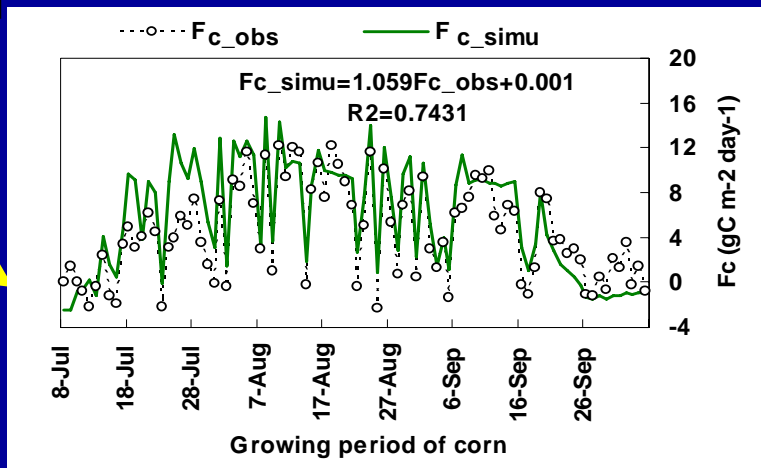
Input

Carbon Fixation (Mg C ha⁻¹)

Before improved

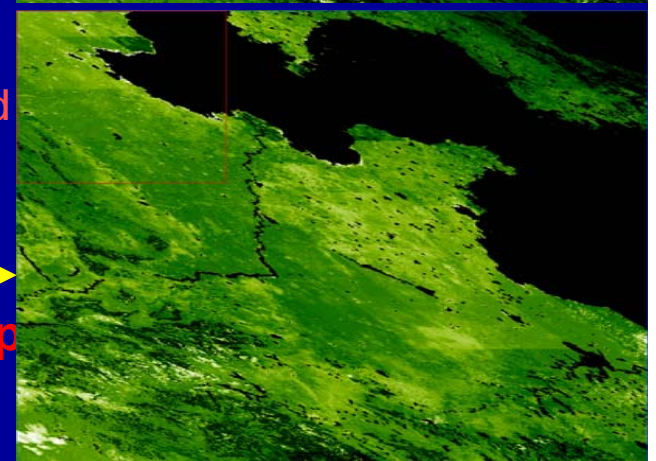


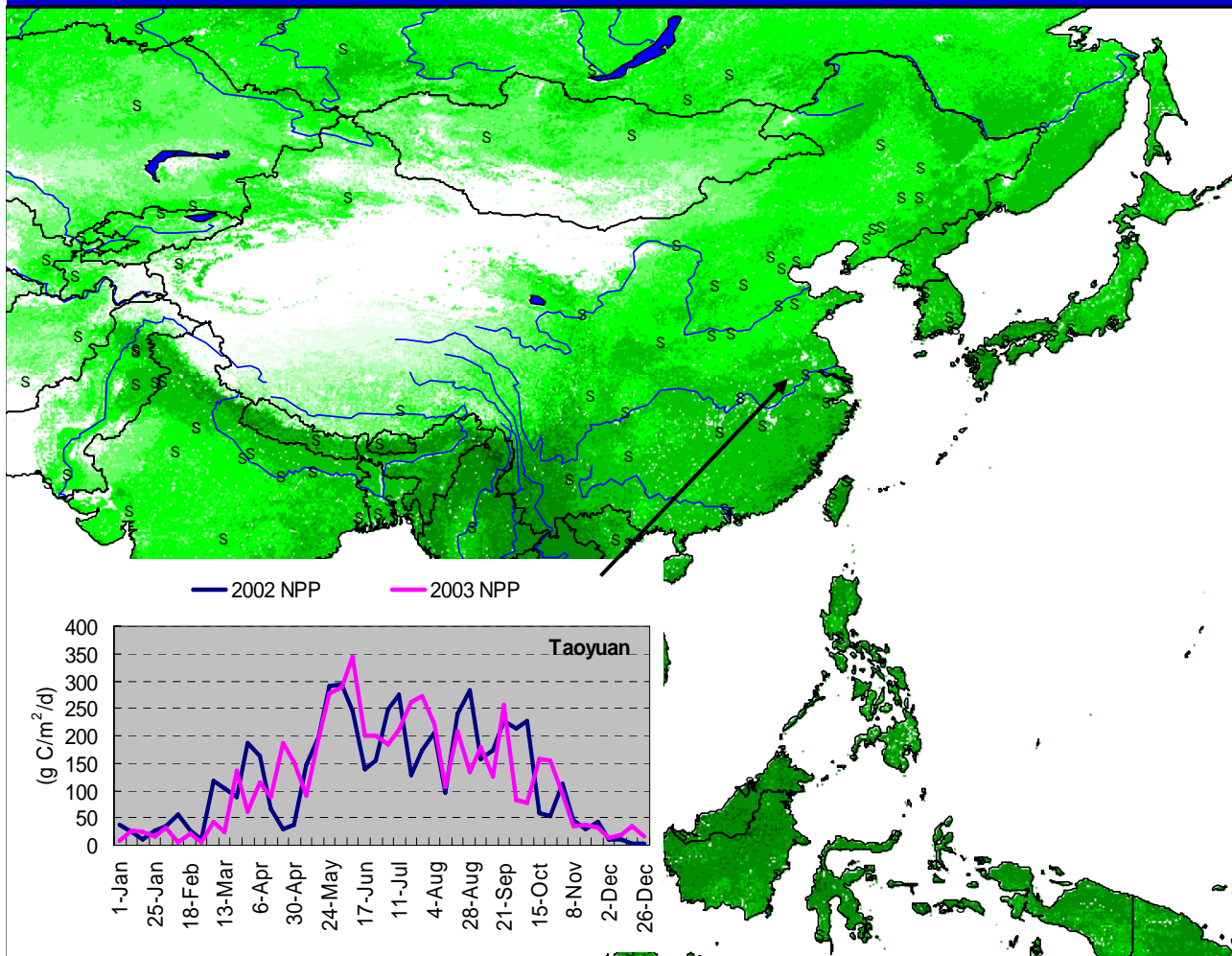
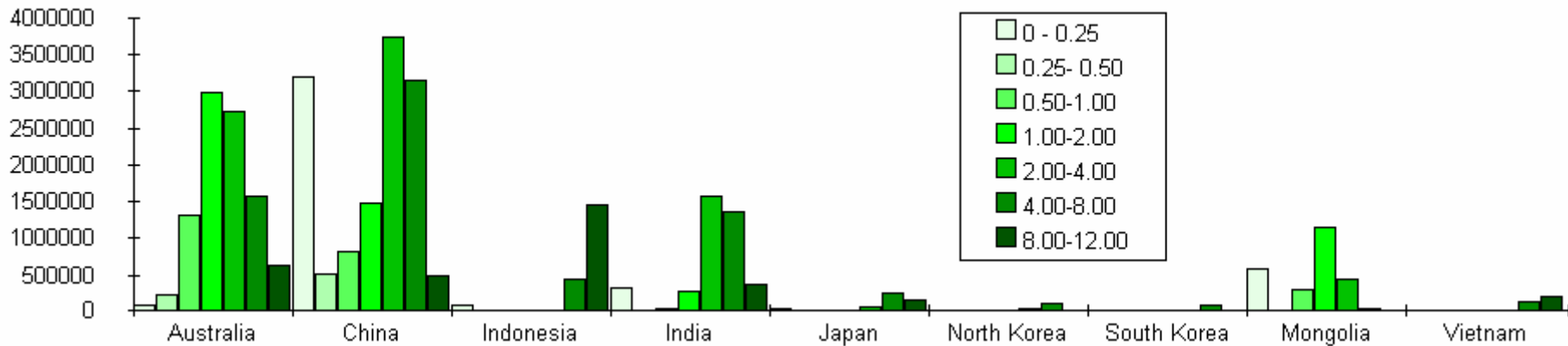
Simulation of CO2 Flux



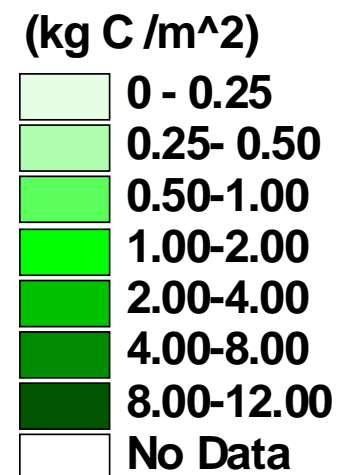
After improved

Scale-up





Carbon Fixation by Vegetation in Asia-Pacific Derived from MODIS Data



Cooperative International Network

(a) APEIS 3rd Integrated Environmental Monitoring (IEM) Workshop, 9 - 11 December 2004, Singapore

Joint Countries:

Australia, Singapore, China, Russia, India, Mongolia, Vietnam

Report Groups:

MODIS Network and its Applications

-10 reports

FLUX Network Research Activities

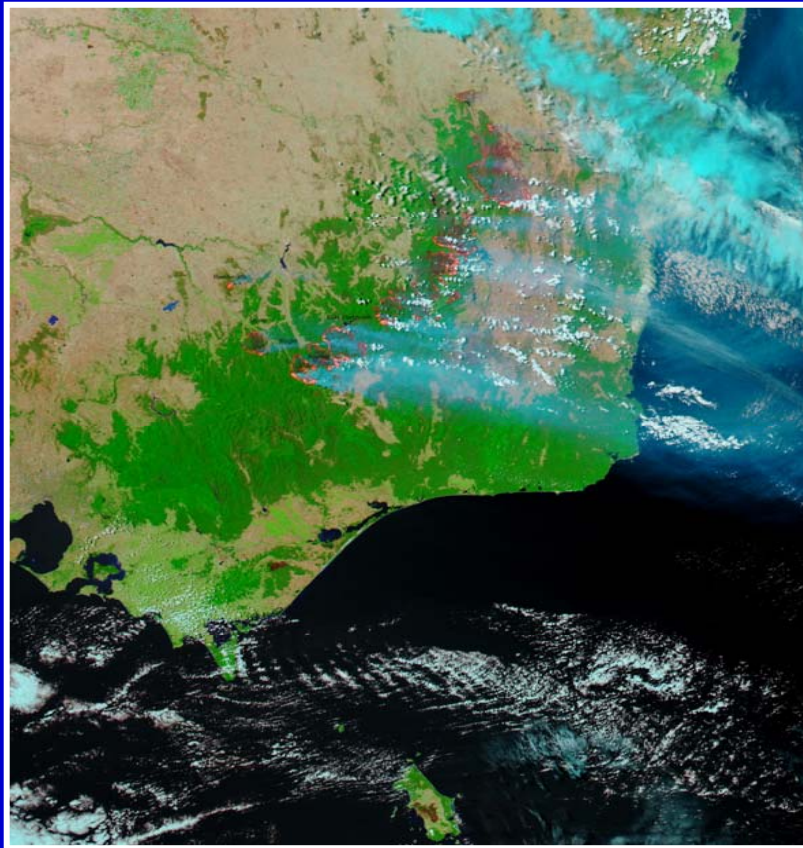
-6 reports

Integration of Satellite-based and Ground-based Systems

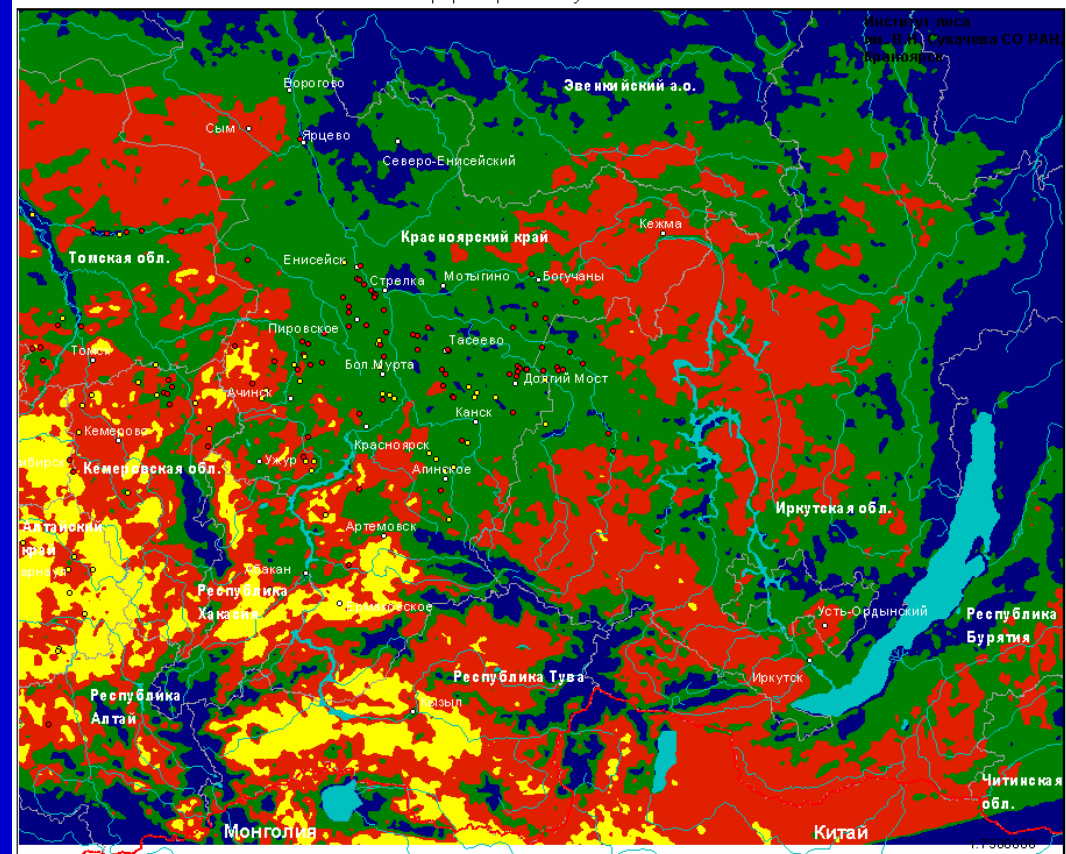
-8 reports



(b) Forest Fire in Australia and Russia

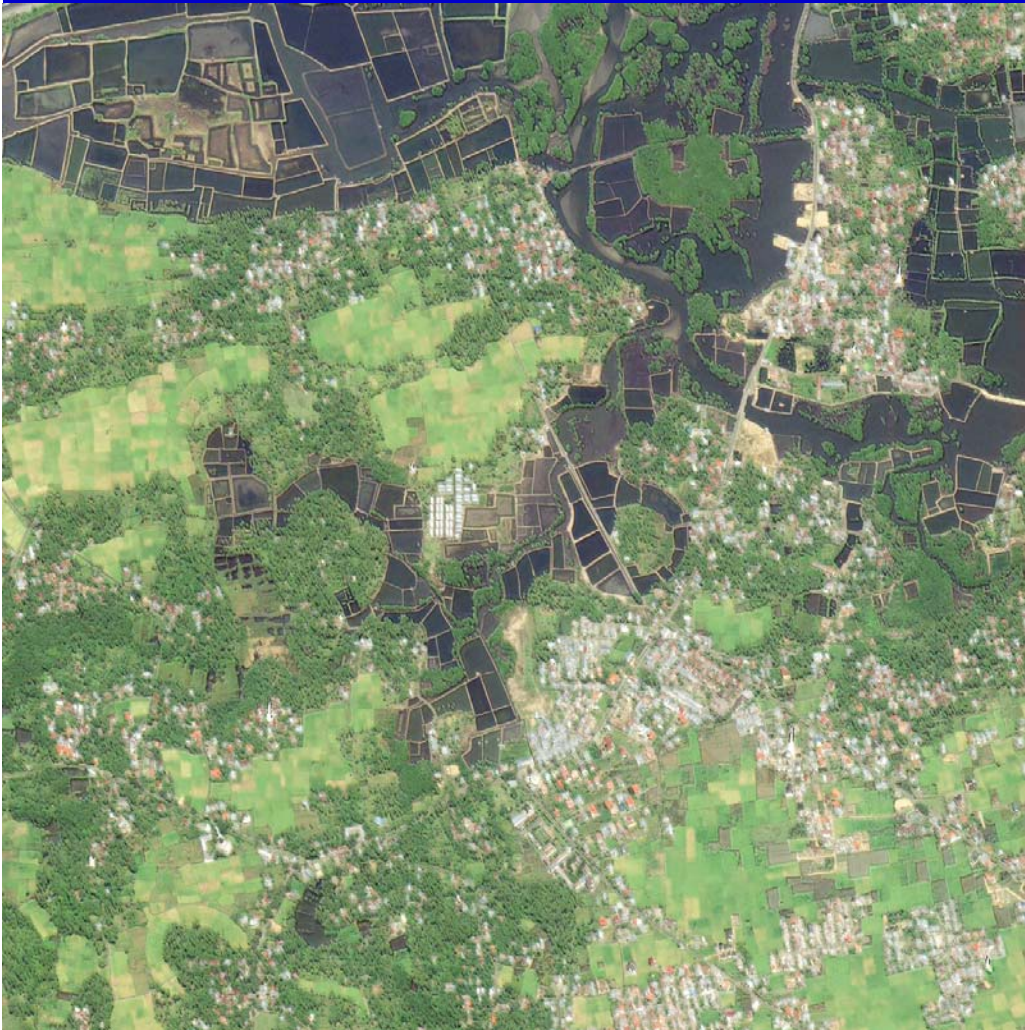


*Forest fire in Australia
(Provided by CSIRO Earth
Observation Centre)*



*Typical Fire Danger Map based on MODIS
information on May 28, 2004, in which yellow
shows the most dangerous areas (Provided by
Russian Academy of Sciences, V.N. Sukachev
Institute of Forest, Krasnoyarsk, Russia)*

(c) Tsunami Disaster - Aceh, Sumatra, Indonesia



Imaging date : 13 Jan 2003



Imaging date : 29 Dec 2004

(Provided by CRISP, Singapore National University)

(c) Tsunami Disaster - Aceh, Sumatra, Indonesia



Imaging date : 13 Jan 2003



Imaging date : 29 Dec 2004

(Provided by CRISP, Singapore National University)

Future Plan

- Expanding IEM network
- Sharing common model for detection of environmental change
- Updating and Sharing database and common methodology for assessment of ecosystem services
- Contribution to GEO (Group on Earth Observation)
 - 10 Year Implementation Plan for the “Global Earth Observation System of Systems (GEOSS)”
 - 9 Societal Benefit: Disasters, Health, Energy, Climate, Water, Weather, Ecosystems, Agriculture, Biodiversity

<http://www-basin.nies.go.jp/project/iem/index.html>