Integrated System Approach for the Terrestrial Carbon Budget in Asia: Flux Measurement, Remote Sensing, Ecosystem and Land Use Models

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Research background

- Kyoto Protocol was ratified in 2005 and the rules for implementation was decided at COP/MOP1
- International negotiation commenced on post 2013 (Beyond Kyoto) framework
- We need to consider about the long-term atmospheric GHG stabilization target setting
- Scientific knowledge to support carbon management policy is needed regarding terrestrial carbon sink function and its variability

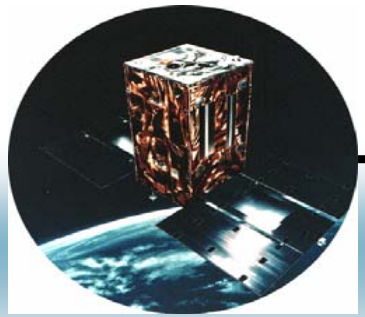
Structure of the System Approach

Carbon budgets

Flux tower observation

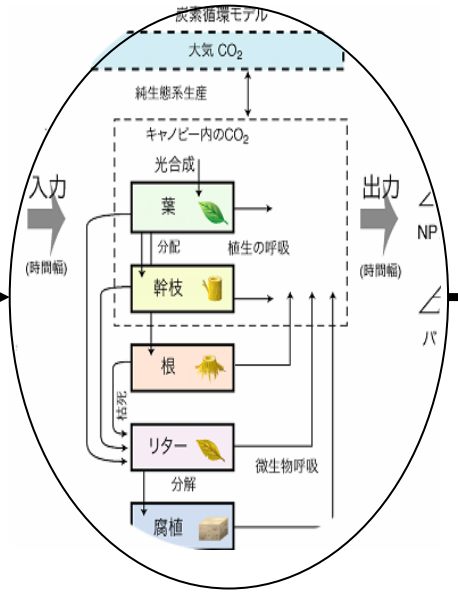
Ecosystem Processes

Ecosystem measurement



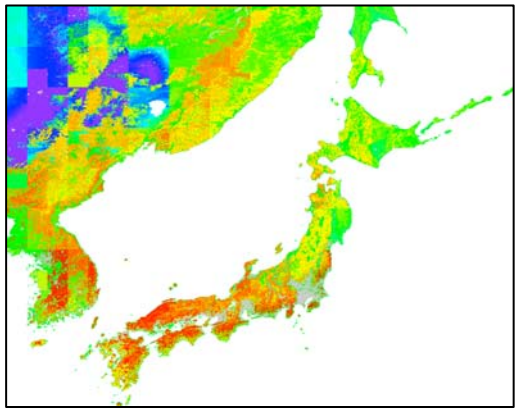
Land cover PAR, etc

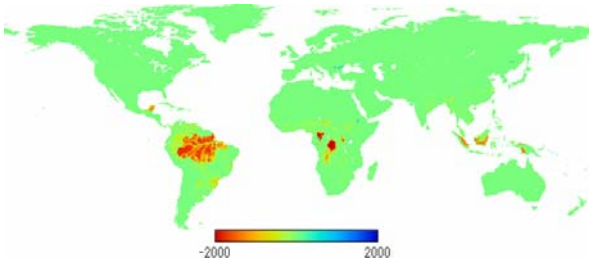
Remote Sensing



Ecosystem Model

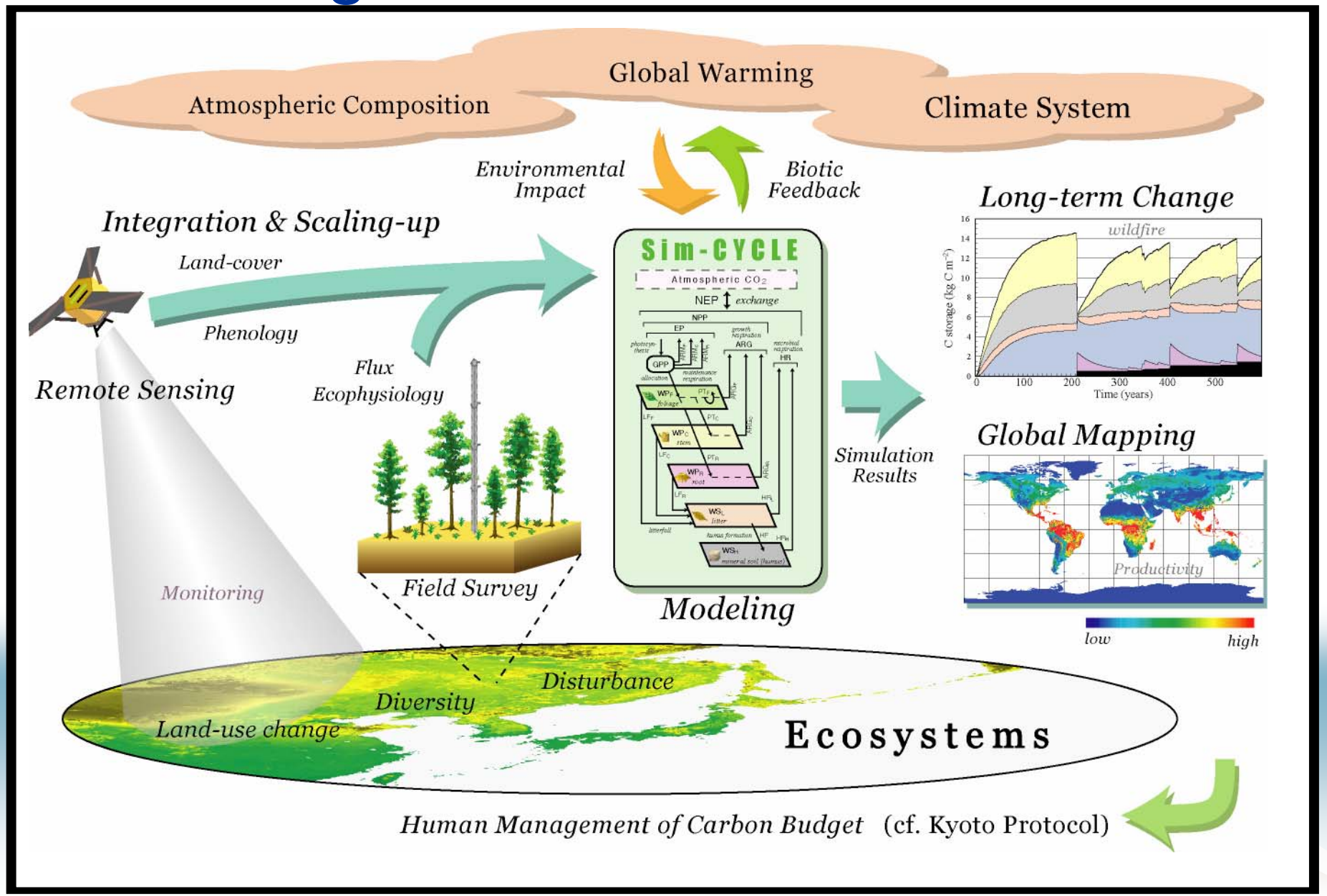
Carbon Dynamics



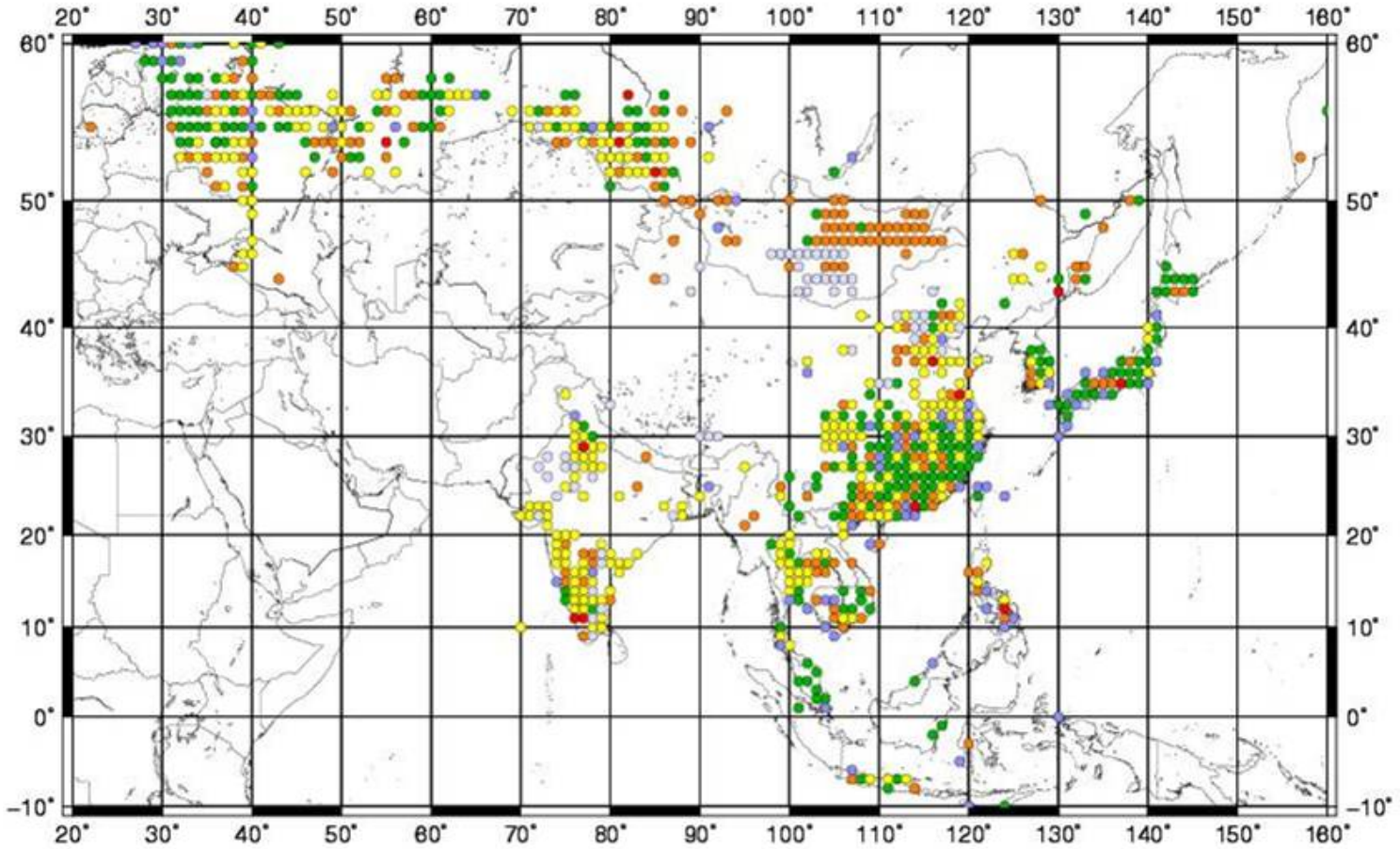


Land Use Model

Integration of Information

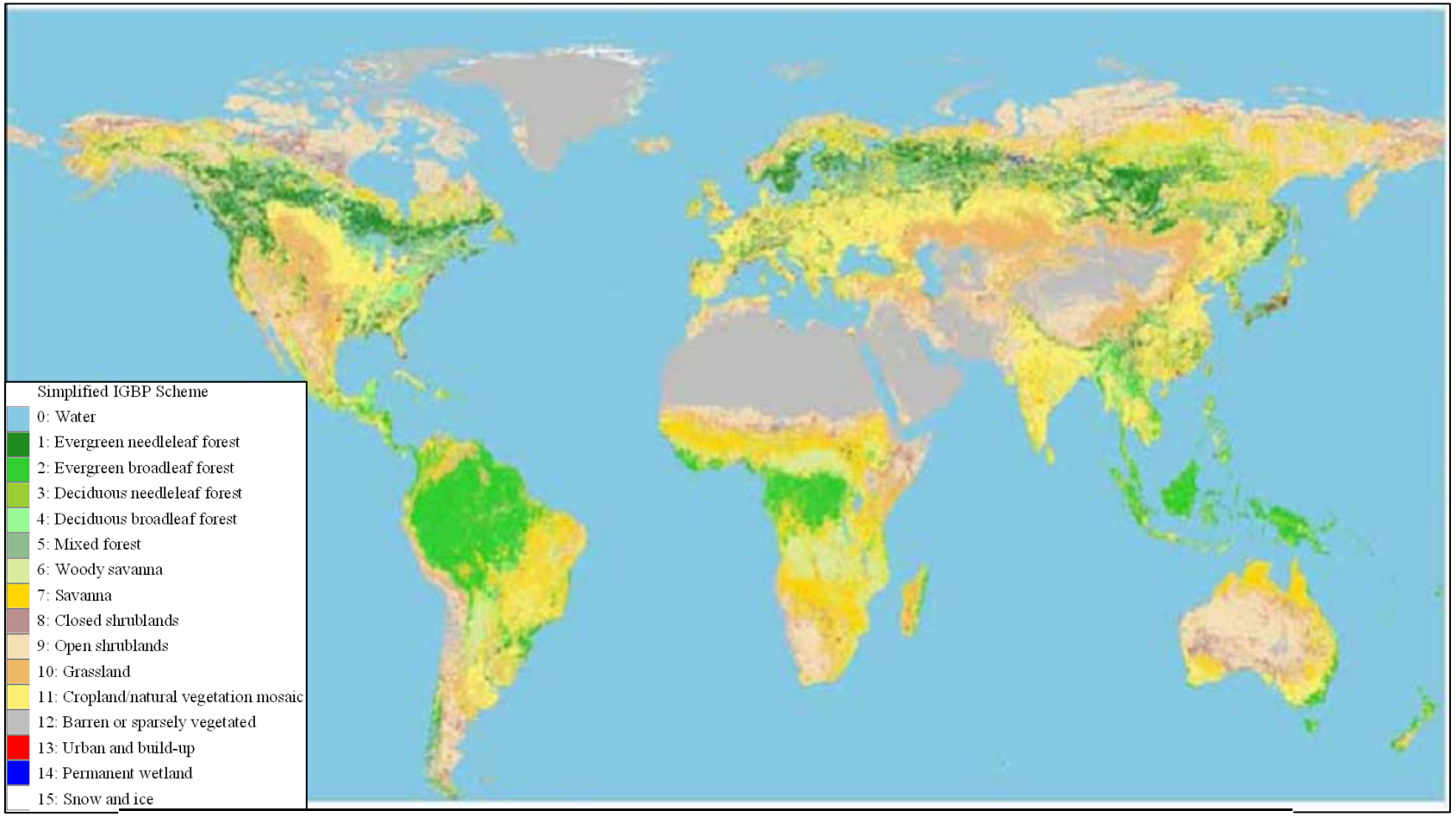


Development of Land Cover Validation DB (ground truth for every 1 x 1° area in a grid)



Iwao, K., Nishida, K., Kinoshita, T., and Yamagata, Y. (2006): Validating land cover maps with degree confluence project information. Geophysical Research Letters, (in printing)

Development of New Land Cover Map
(using Remote Sensing data)



Land Cover Map

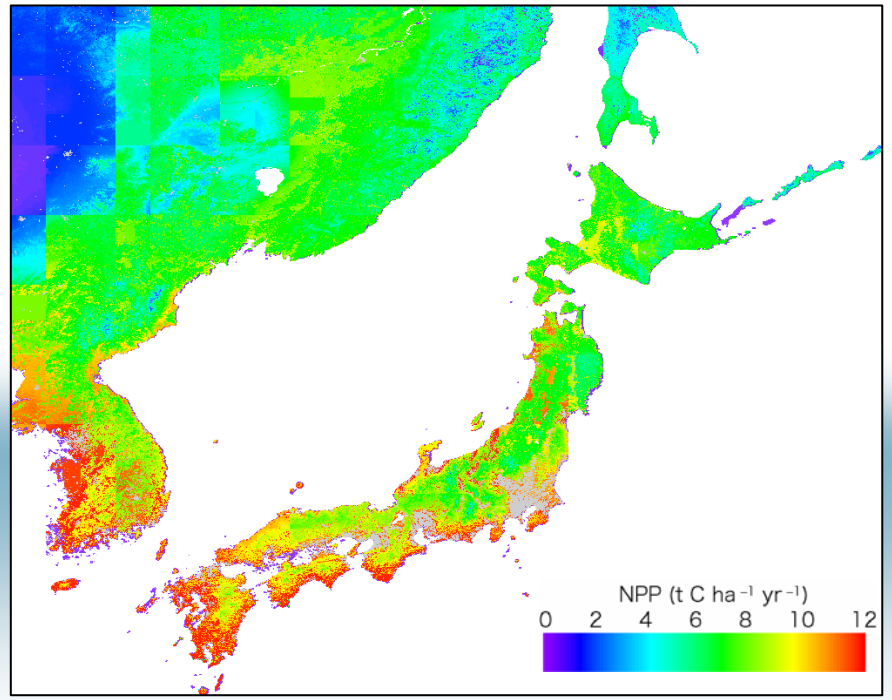
Organization		Original NIES/IWAO	MOD12 Boston Univ	GLC2000 JRC	GLCC V.2 USGS
*Accuracy	（%）	60	58	55.1	50.5

*For Eurasia Region

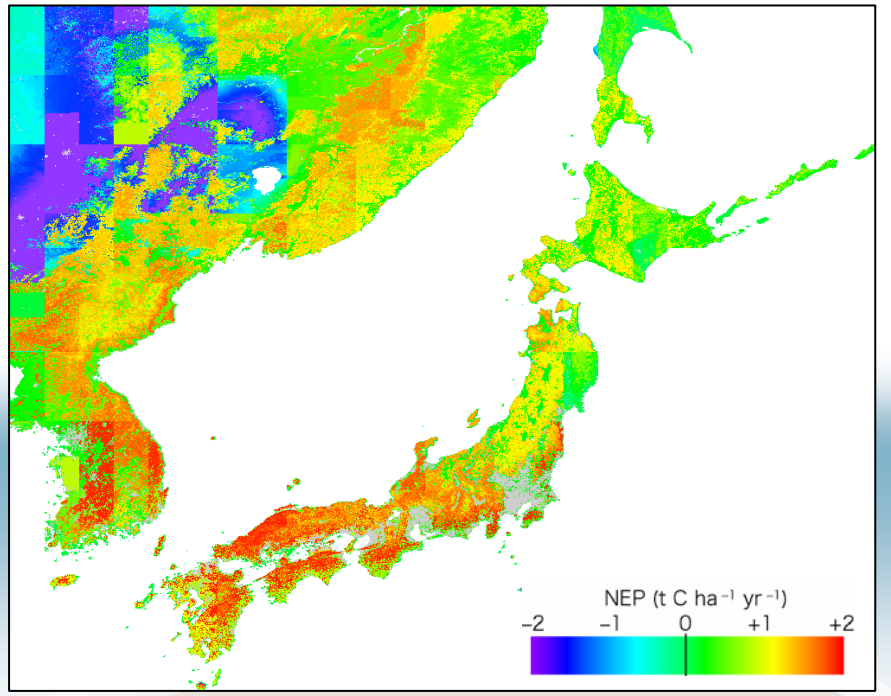
Estimated Carbon Budgets (NPP, NEP)

- Period: 2000–2005
- Climate data: WorldClim + NCEP/NCAR
- Land cover: New Land Cover Map (NIES)
- Soil: IGBP-DIS soil collection dataset

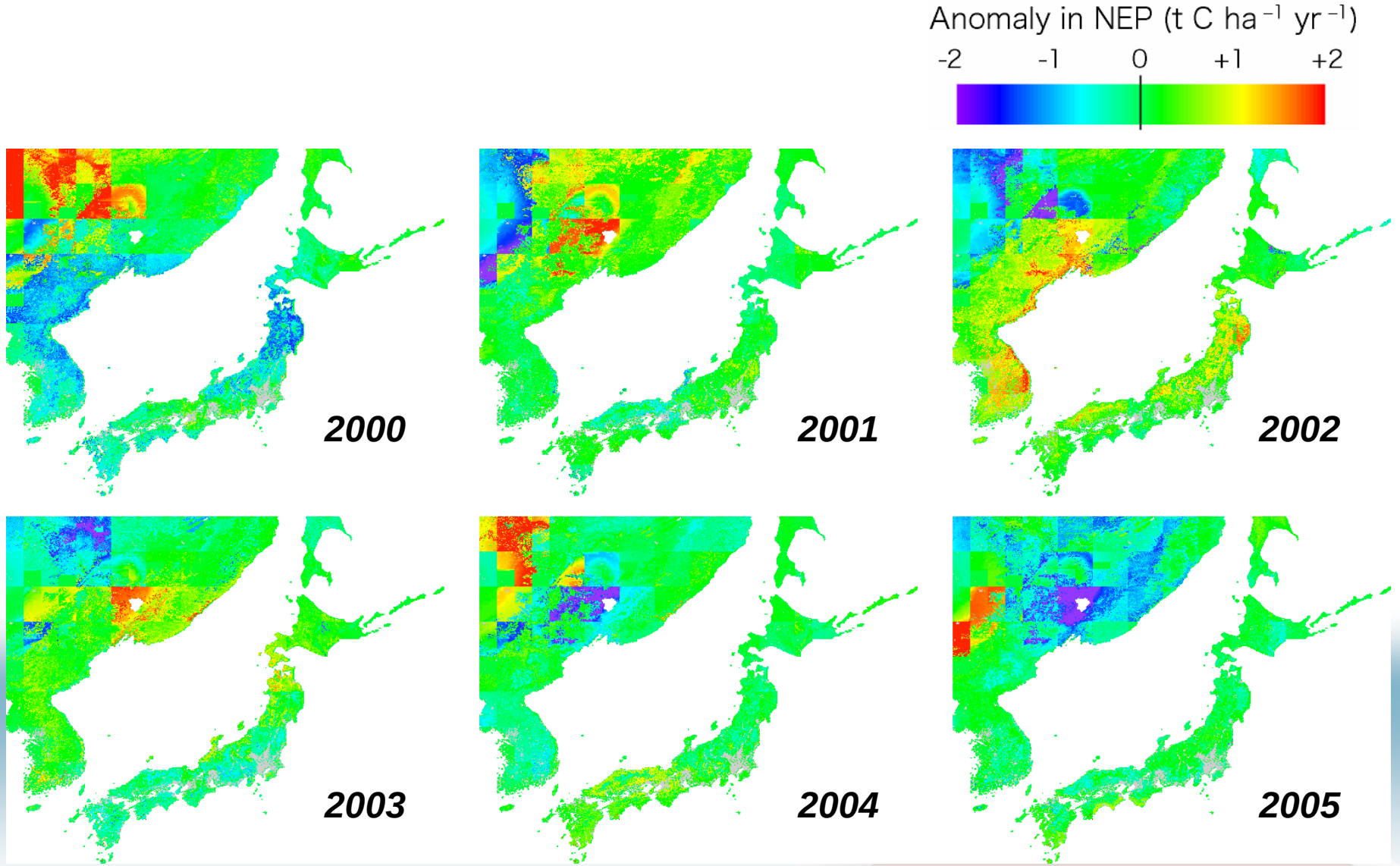
Mean NPP



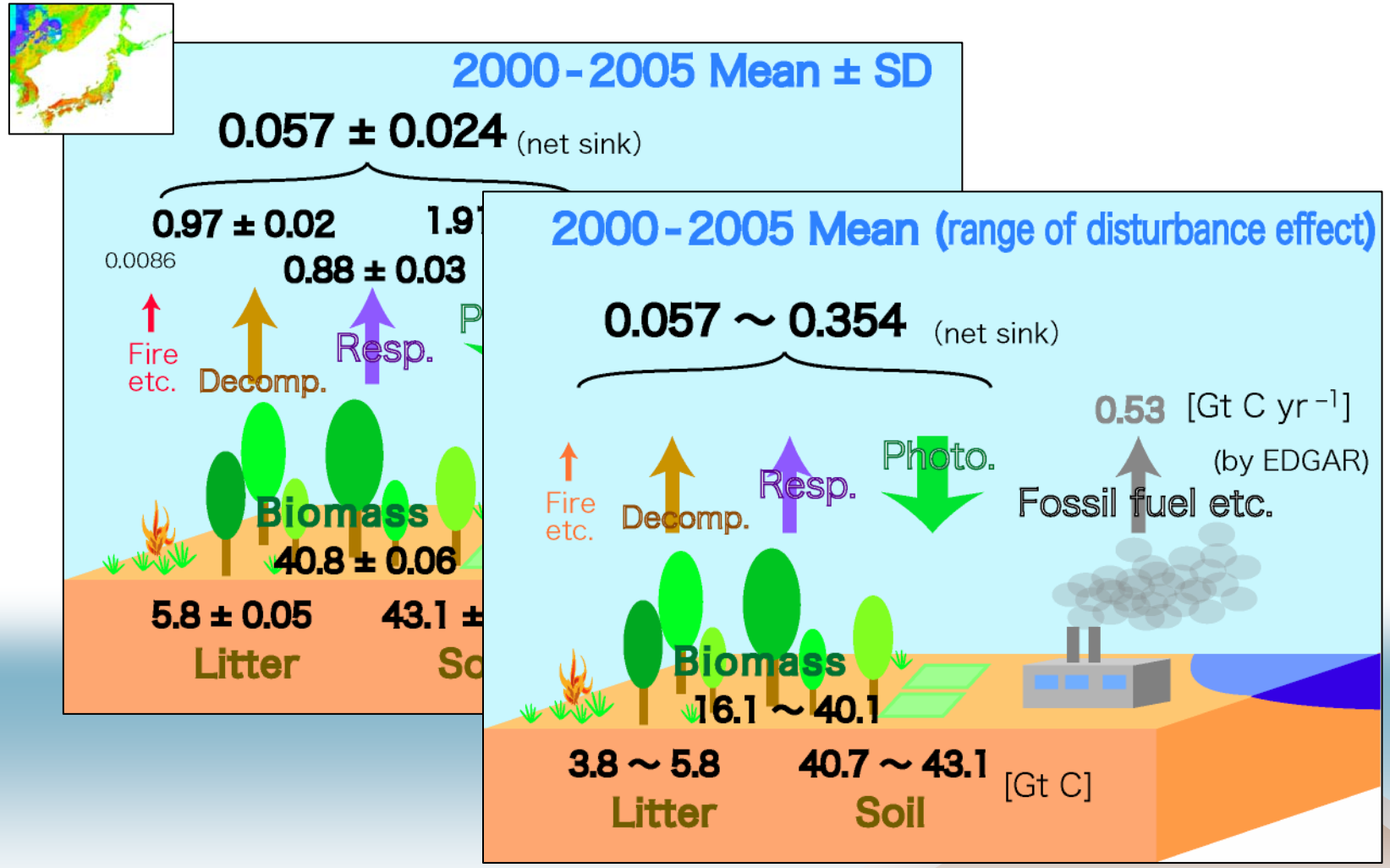
Mean NEP



Carbon Dynamics (NEP 2000-2005)



Estimated Carbon Dynamics (NEP 2000-2005)



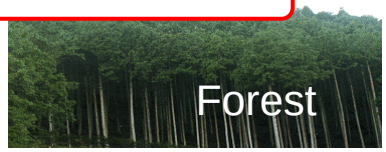
Land Use Model and Links to Ecosystem Model and Remote Sensing

Socio economic scenarios

GDP
Population
Transportation
Trade etc.

Land-use model

Forestry product
Bioenergy



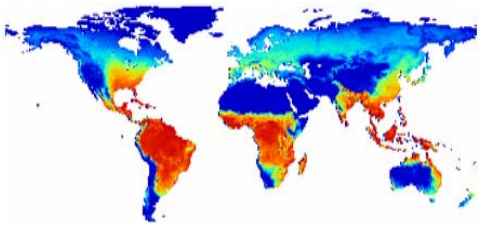
Land-use change by economic competition

Crop
Bioenergy

Productivity
Land cover

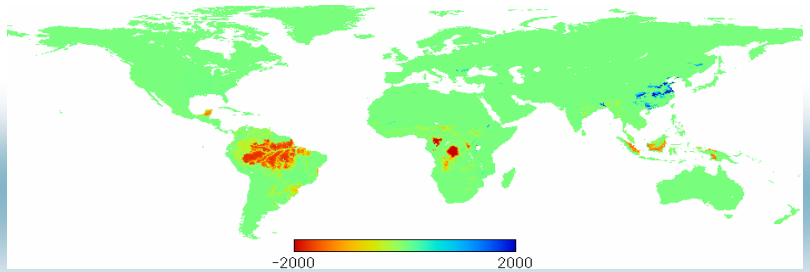
Terrestrial ecosystem model

GPP, NPP, NEP
etc



PAR, Land cover etc

Remote sensing data



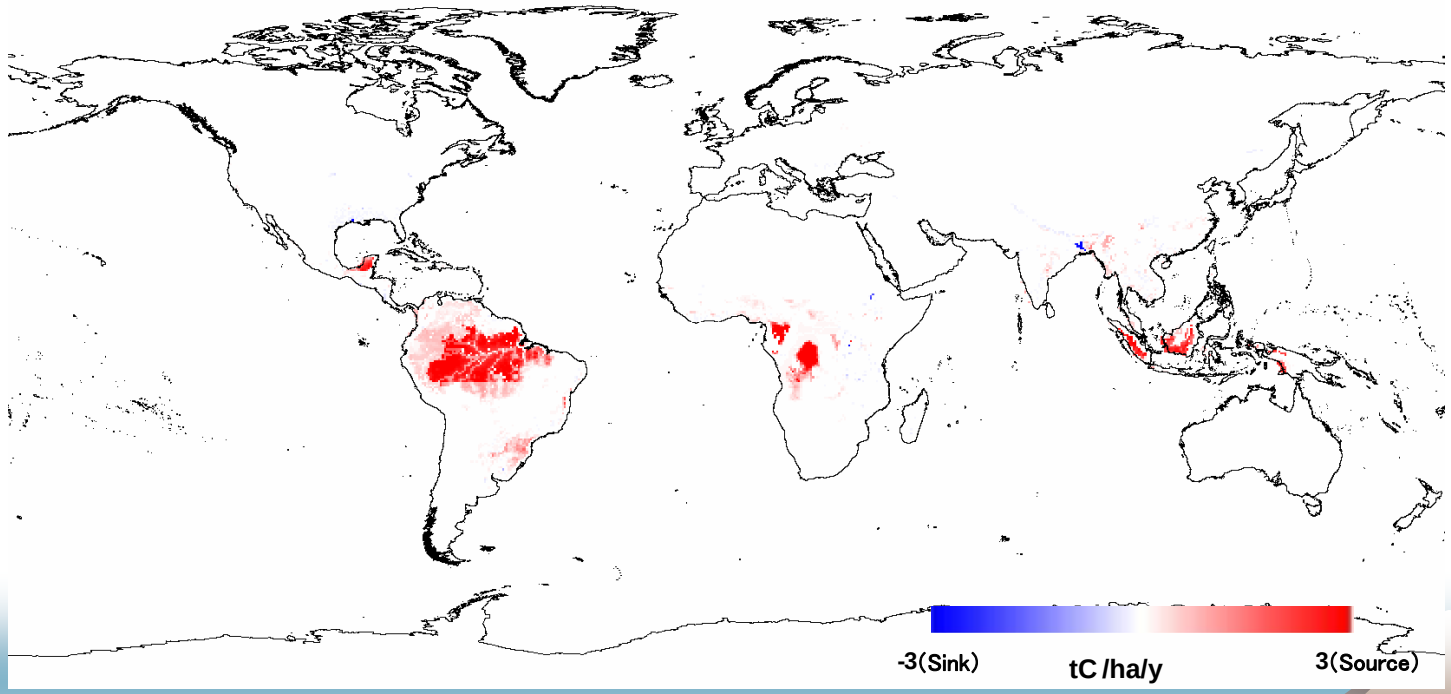
Land-use change
（2030）

Carbon Dynamics Estimate using New Land Use Model

Period	: 2000-2030
Scenario	: A2
Discount rate	: 2%
agricultural productivity increase	: 1%

Estimated carbon emission induced by land-use change

Biomass	1.6 GtC/y
Soil	0.5 GtC/y



More details are available
at our poster presentations

Needs for using ALOS data

Improvement of Remote Sensing techniques

- PAR
- fPAR, LAI, Biomass (NPP)
- Photosynthesis (GPP)
- Land Use (Cover)
- Disturbances (Fire and Harvest)
- Soil type
- Urban distribution