3rd GEOSS-AP Symposium February 4-6, 2009, Kyoto, Japan **Ecosystem Modeling for Global Carbon Monitoring**



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Observation and modeling



Observation and modeling

JAXA & JAMSTEC



Importance of database

Database is more than an assemble of individual data (i.e. synergy effect)



Modeling and earth observation



Terrestrial ecosystem models

Vegetation Integrated SImulator for Trace gases

(Developed in NIES & FRCGC-JAMSTEC)

Objectives

(Sim-CYCLE-based)

- Atmosphere-ecosystem biogeochemical interactions
- Especially, major greenhouse gases (CO₂, CH₄, and N₂O) budget
- Assessment of climatic impacts and biotic feedbacks



Point-global, daily-monthly

- CO₂: photosynthesis & respiration
- CH₄: production & oxidation
- N₂O: nitrification & denitrification
- LUC emission: cropland conversion
- Fire emission: CO₂, CO, BC, etc.
- BVOC emission: isoprene etc.
- Others: N₂, NO, NH₃, erosion

Global Modeling

Land by VISIT (revised Sim-CYCLE: Ito & Oikawa); Ocean by VGPM (Falkowski; K.Sasaoka [FRCGC])



Global mapping by VISIT



Problems

1. There remain large uncertainties in model estimation

- <= model intercomparison (MIP)
- <= uncertainty in CC feedback and GW prediction (cf. IPCC AR4)
- => model development
- => advanced data use: validation and assimilation
- => more intimate linkage with observation (ex. GEOSS)

2. Little contribution to policy-relevant issues

- => from science to society
- => e.g., forest carbon sink in the Kyoto Protocol
- => GEO new task: Forest Carbon Tracking
- => MoE, Japan: Forest Carbon Monitoring System
- => ACTS: Asian Carbon Tracking for Society (by J.Kim)

Forest Carbon Tracking (GEO 2009-2011 Work Plan : AG-09-01 b))

Task main activities (in brackets potential contributors)

- a. Consolidation of observational requirements and associated products *(NIES, JRC, WHRC)*
- b. Coordinated assessment of tools and methodologies (GOFC-GOLD, JRC, WHRC)
- c. Coordination of observations, including securing their continuity (JAXA, Norway, CSIRO-Australia, CEOS?)
- d. Coordination of the production of reference datasets (FAO, GTOS, JRC)
- e. Demonstration or pilot initiatives to show capabilities (Australia, Norway, FAO, ESA, Brazil, Niger)
- f. Improvement of access to observations, datasets, tools and expertise and associated Capacity Building activities. *(Australia, Norway, Rep. of Korea, FAO .)*

Forest Carbon Monitoring Approach



Simulated carbon budget (potential)



Ito (2003) using the carbon cycle component

Disturbance (land-use change)



Stand age (yr)

Source (Chapin et al. 2002)

Modeling of disturbance impact

Test case at the Pasoh forest (mature rainforest)



Forest Carbon Modeling System, 2008-2010



🗿 PlotNet Forest I	Database – Microsoft Internet Explorer
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Database

The PlotNet Forest Database is designed to facilitate storage of, and access to existing forest plot data. You are encouraged to use and provide data. Please read Guideline for details

Mailing List

- Search

- Update

Links

Activities

Guidlines

- Download

- Registration

Please send empty file to plotnet-ml-subscribe@hosho.ees.hokudai.ac.jp for subscribing to plotnet ML



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PlotNet Forest Database

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Concluding remarks

• Terrestrial ecosystem (carbon cycle) model is an effective and necessary tool for 'data-mining' of different observational evidences.

• The models have been used for scientific research, but will be more used for policy-relevant issues and decision making in carbon management.

• Intimate collaboration between observational (GEOSS, FLUXNET, LTER, etc.) and modeling side should be stimulated.

=> to reduce uncertainty and make reliable prediction

Thank you



Validation using observational data

