

The Kyoto & Carbon Initiative - a brief overview

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The Kyoto & Carbon Initiative

The K&C Initiative forms the continuation and **extension of the GRFM/GBFM activities** into the era of the next generation of NASDA satellites: **ALOS** (June, 2004) and **ADEOS-II** (Dec., 2002).

- **Aims to support information needs posed by:**
 - The **terrestrial carbon cycle** science community;
 - Multinational Environmental Conventions and Declarations:
 - UNFCCC **Kyoto Protocol** (CO₂ & CH₄ sources and sinks);
 - **Ramsar Treaty on Wetlands** (wetland inventory);
 - **UN Millenium Declaration & WSSD** (water supply and water management);
 - International conventions on Biodiversity (CBD) and Desertification (UNCCD).

Areas of potential support to the Kyoto Protocol* and Terrestrial Carbon Cycle Science**

Data

- Development of **systematic observation systems** and data archives;

Derived information

- Annual **changes in forest- and land cover** (detection and spatial quantification);
- Incremental changes in [regenerating] **above-ground biomass** (R/D);
- Monitoring of certain **sources of CH₄**:
 - Active acreage & crop cycle timing of **irrigated rice**
 - spatio-temporal dynamics of **wetland inundation**.

* *Remote Sensing and the Kyoto Protocol: A Review of Available and Future Technology for Monitoring Treaty Compliance*, ISPRS Report, 2000

** *IGOS-P carbon cycle observations theme: terrestrial and atmospheric components. A report to IGOS-P, TCO Theme Team, 2001*



(1) Systematic data observations and consistent data archives

The Kyoto Protocol:

All Parties shall "co-operate in scientific and technical research and promote the maintenance and the development of **systematic observation systems** and development of **data archives** to reduce uncertainties related to the climate system, [and] the adverse impacts of climate change...". [*Kyoto Protocol, Art. 10d*]

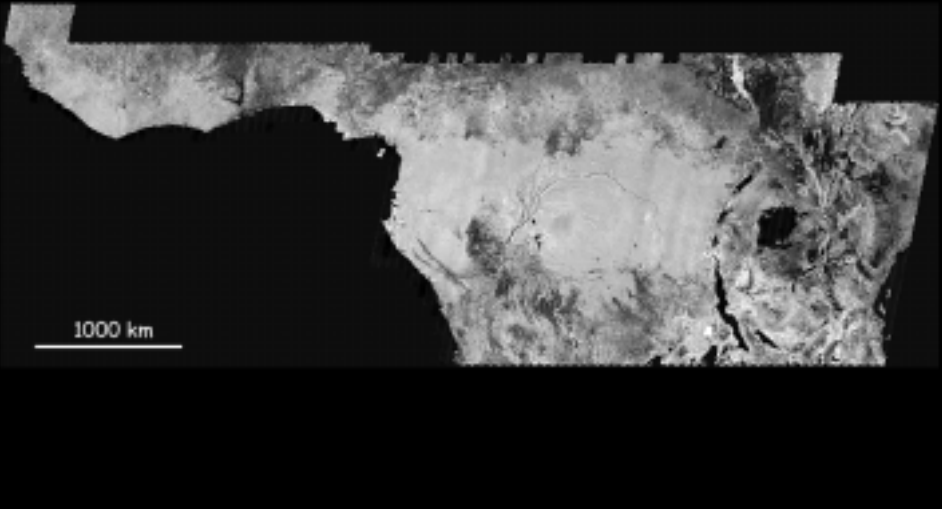
Terrestrial Carbon Science:

"The vision for a carbon cycle observing system is to contribute to the integrated understanding and human management of the carbon cycle, through **systematic, long-term monitoring** of the exchanges of GHGs, and the associated changes in carbon stocks".

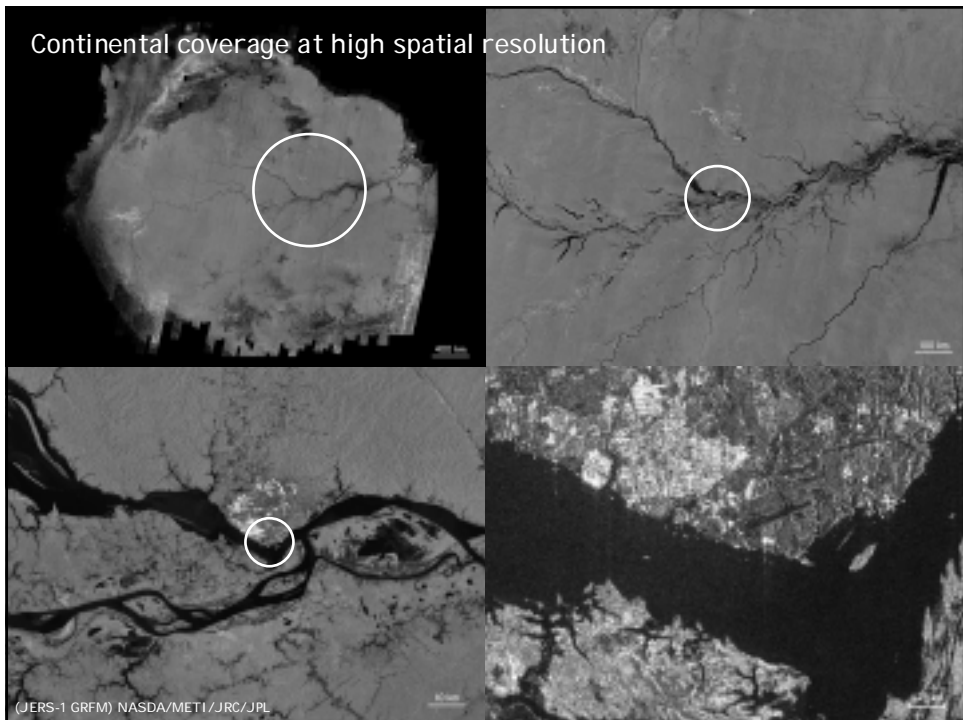
[*IGOS-P Carbon Cycle Observation Theme: Terrestrial and Atmospheric Components, Feb., 2001*]

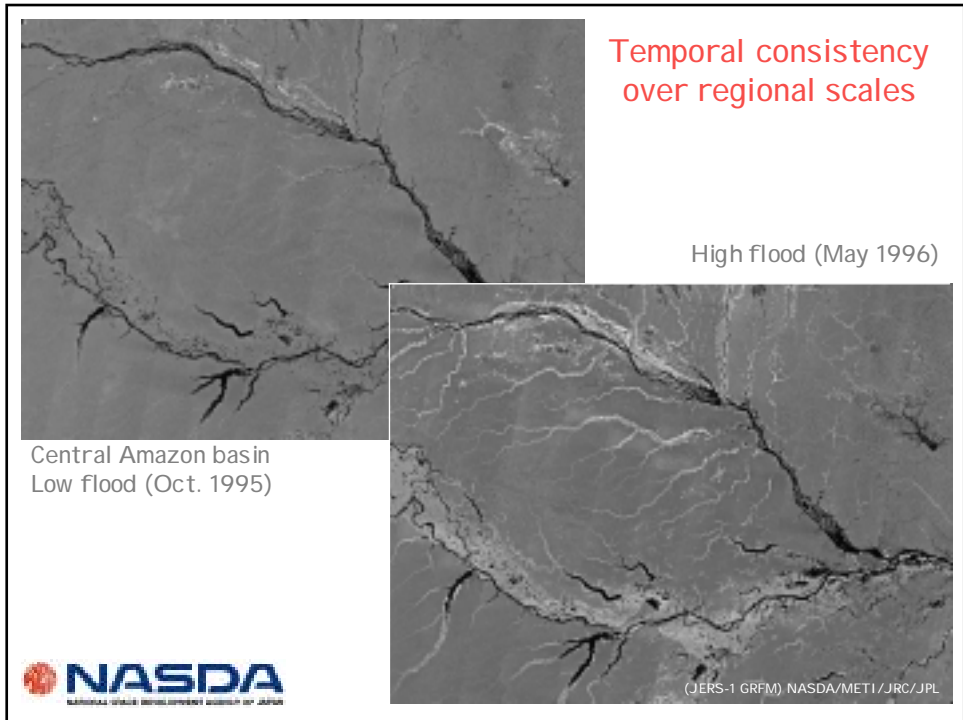


Spatial consistency over continental scales



Continental coverage at high spatial resolution





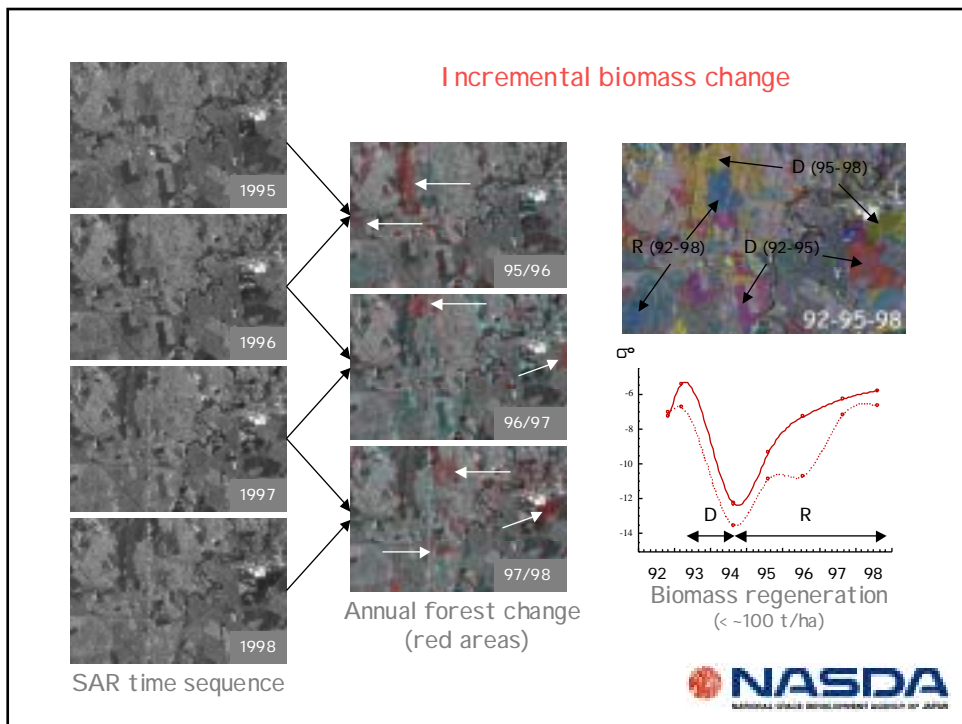
(2) Detection and quantification of changes in land cover and biomass stocks.

The Kyoto Protocol:

"The net changes in greenhouse gas emissions ... resulting from direct human-induced **land-use change and forestry** activities, limited to afforestation, reforestation and deforestation (ARD) since 1990, measured as verifiable **changes in carbon stocks**, shall be used [during the first commitment period]..." [Art. 3:3].

Terrestrial Carbon Cycle:

"Estimates of above- and below-ground biomass provide fundamental information on the size and changes of the terrestrial carbon pool".
"There will be a need for **repeated measures of biomass/carbon density** with a high degree of accuracy for small land parcels." [IGOS-P, 2001]



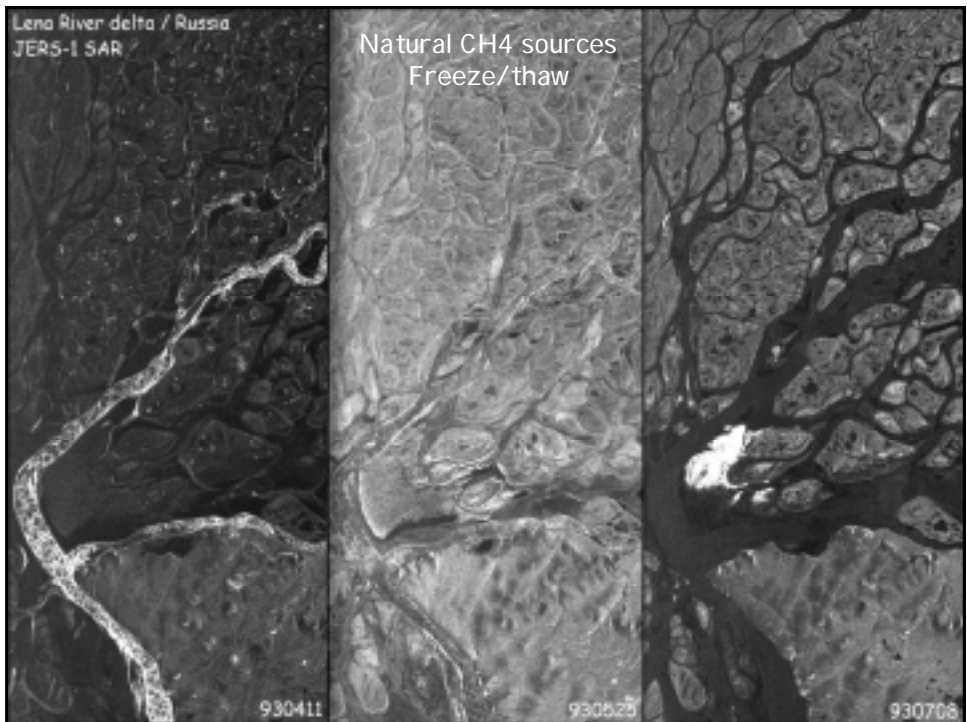
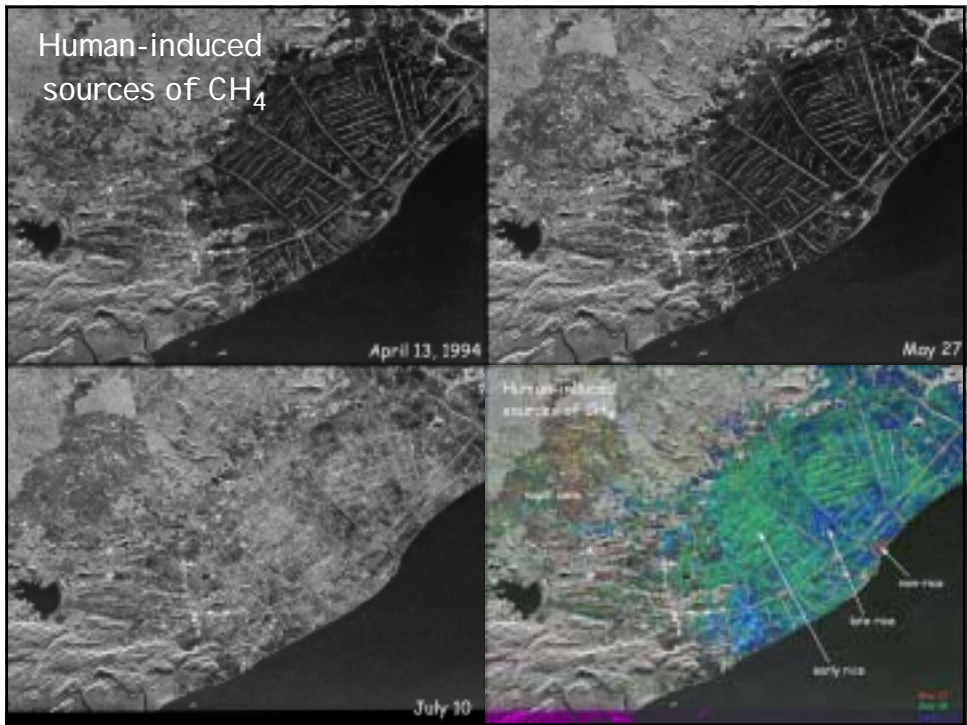
(3) Mapping and monitoring of certain sources of methane (CH₄)

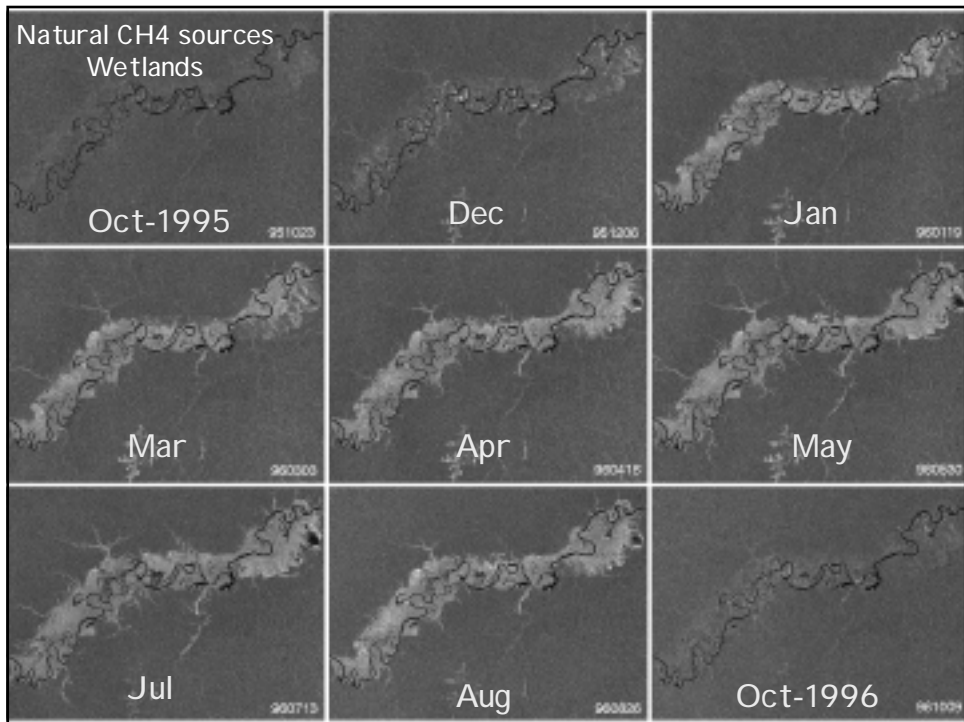
The Kyoto Protocol:

After CO₂, methane is the second most important greenhouse gas covered by the Kyoto Protocol. Human-induced sources of CH₄ include e.g. cultivation of irrigated rice, aquaculture and hydroelectric reservoirs.

Terrestrial Carbon Cycle:

Wetland areas constitute major sources of natural CH₄. "Satellite observation techniques and modeling tools should be developed to estimate CH₄ fluxes from wetlands." [IGOS-P, 2001]





Synergy with the Ramsar Convention on Wetlands

Information requirements

- Spatial and temporal characteristics of **flooding patterns** in Ramsar designated (and other) wetland areas
 - Spatial extent;
 - Temporal cycle (seasonal/annual/decadal...);
- Identification of natural- and human-induced **disturbances** in wetlands;
- Global **inventory** of wetland environments (limited support).

* Personal communication: Ramsar Bureau and Wetlands International

Identification of wetland **disturbances**



Banjarmasin (Indonesia) August 1998

Identification of **disturbances** (mangrove)



New: K&C Water Supply Theme

Johannesburg World Summit on Sustainable Development:

"Launch a programme of actions, with financial and technical assistance, to achieve the millenium development goal on safe drinking water. In this respect we [sigantories] agree to **halfe, by the year 2015, the proportion of people who are unable to reach or afford safe drinking water** as outlined in the [UN] Millenium Declaration..." [WSSD Implementation Plan, IV:24]

"Mobilize international and domestic financial resources at all levels, transfer of technology, promote best practice and **support capacity-building for water and sanitation infrastructure...**". [IV:24:a]

"Adopt prevention and protection procedures to promote **sustainable water use** and to address water shortages." [IV:24:e]

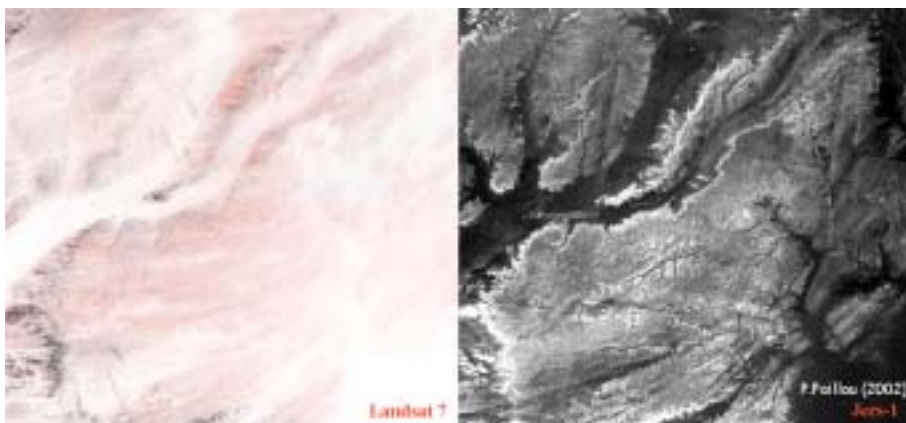
K&C support to WSSD:

Mapping of **sub-surface hydrology** in arid areas.



New: K&C Water Supply Theme

Mapping of **sub-surface hydrology** in arid areas.



The K&C back-bone: Systematic data acquisition strategy for ALOS PALSAR

The K&C Initiative is based on an extensive data acquisition strategy for ALOS PALSAR - aiming to provide:

- **spatially and temporally consistent** data sets
- at **high spatial resolution**,
- with **adequate temporal revisit frequency**,
- for **all land areas** on the Earth,
- during the **life-time** of the satellite.



Product generation

The *potential* of PALSAR (and GLI) to support the Carbon Science community and Environmental Conventions with important and unique information is thus obvious. **However - NASDA cannot do this alone!**

International collaborative network is required for the development and generation of viable output products



K&C Work Approach

Methodology development

- **Development of algorithms and methods** required to support the specific information requirements identified (e.g. annual biomass change, wetland flooding dynamics, etc.);

Regional demonstration

- **Operational demonstration** of the methodology to a “large” geographical region;

Global-scale extrapolation

- Implementation of a **Systematic Data Observation Strategy** to enable application of the methods developed to any other area on Earth.

NOTE:

Local scale research and technology demonstrations:

Not included within the Kyoto & Carbon Initiative.

(Covered within ALOS and ADEOS-II A.O. programmes)



Science Advisory Panel

The international Science Advisory Panel has been set up to

- Review the scientific relevance in the project design
 - Project objectives (1st K&C Panel)
 - Optimal acquisition modes (1st K&C Panel)
 - Data acquisition strategy (1st, 2nd & 3rd K&C Panel)
 - Assure alignment with significant international initiatives (e.g. GTOS/TCO, GOFC/GOLD) (1st, 2nd & 3rd K&C Panel)
- Advice on product definition and product generation (2nd & 3rd K&C Panels);
- Attract new collaborators.





• Global PALSAR mosaics @ 100m

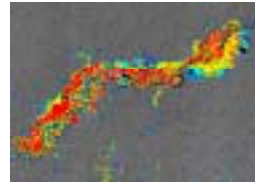


• Annual forest change

• Global GLI mosaics @ 250m



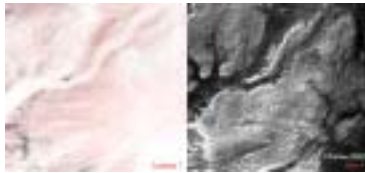
Anticipated products



• Flood duration



• 250m LCC



• Sub-surface hydrology



• Rice mapping