

# Forest Carbon Tracking

A New GEO sub-Task in WP 2009-2011

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CEOS

FAO

GTOS (GOFC-GOLD)

Sub-task Number: CL-09-03b

Overarching GEO Task: Global Carbon Observation  
and Analysis System

GEO Area: CLIMATE

Related GEO Communities of Practice: Carbon Cycle  
(former IGCO) and Forest

**Note: This presentation is a DRAFT,  
- in preparation for Asia-Pacific GEOSS Symposium (Kyoto, Feb. 2009)**

# International Context

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- Initiative supports political requirements related to the UNFCCC negotiations in relation to reduction of emissions from deforestation and degradation (REDD)
- Window of opportunity for political attention towards COP-15 in Copenhagen end 2009
- Unique opportunity for GEO, CEOS and the forest community to demonstrate capability to develop a consistent, long-term forest carbon monitoring system

# Typical forest change & routine monitoring requirements



Type of clearing	Characteristic size	Characteristic temporal cycle
Selective logging	Gaps < 30 x 30 m	30-80 yrs
Clear-cut logging	> several ha	80 yrs
Shifting cultivation	Small fields, < 6 ha	5-10 yrs
Small-holder agriculture	Small fields, < 6 ha	Permanent until abandoned
Intensive mechanized agriculture	> 100 ha	Permanent until abandoned
Urban growth, or other uses	Ranging from small settlements to urban expansion	Permanent until abandoned

Source GOF-C-GOLD

# GEO Task Objectives

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Ultimate Goal: Establishment of a network of national systems and associated regional demonstration/reference test-sites, using similar input satellite data and agreed methodologies, to demonstrate forest-change monitoring capability, in support of climate policy needs

To support this goal, the task objectives are:

- Consolidation of observational requirements and associated products, ultimately leading to an annual, mid-resolution global forest-change monitoring program.
- Coordination of observations, including securing their continuity
- Coordinated assessment of tools and methodologies
- Coordination of the production of reference datasets
- Improvement of access to observations, datasets, tools and expertise and associated capacity building activities.

## Step 1: Establishment of Test Sites (1)

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- This GEO Task will establish a number of reference test-sites to demonstrate and develop approaches and methods for using current remote sensing capabilities for long-term, operational forest-cover change and carbon monitoring.
- Test-sites need to have key characteristics to qualify (see below), and to be endorsed in support of this task

Once the initial sites are identified, we will ask CEOS members work with space agencies to secure the necessary Earth observation datasets and possible additional support from agencies for some of the data processing.

## Proposed Guidelines for Establishment of Test Sites and Recognition by GEO Task (2)

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- Sites should be located in countries with own stated intent to develop national forest carbon monitoring systems, and requiring capacity building support
- *The original UN-REDD pilot countries are Papua New Guinea, Indonesia, Vietnam, Zambia, Tanzania, Democratic Republic of Congo, Panama, Bolivia and Paraguay*
- Donor countries and/or donor NGO's clearly identified
- Countries with proposed test-sites and their government institutions having commitment for capability to support ground observations
- Relevant national forest management authorities in host countries being involved
- Clear management and governance arrangements being outlined
- Resources for the acquisition and analysis of the data clearly identified
- Timely and specified reporting on progress and deliverables, including specific data products, for each site

## Proposed Guidelines for Establishment of Test Sites and Recognition by GEO Task (3)

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- Initial focus will be on cloud-affected areas with active deforestation – afforestation activities
- Large areas (to demonstrate repetitive, wall-to-wall, accurate wide-area forest mapping capabilities - e.g. Borneo, Amazon)
- Sites to include representative scientific projects on forest change, with appropriate in-situ observations
- Availability of archived SAR and optical data to demonstrate changes is preferred

Initial preference will be given to large-extent tropical sites, and/or sites with cloud-cover constraints and with active land cover change

# Nominated Initial Test-sites

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- Amazon region in Brazil
- Borneo, with focus on the Indonesian part
- Tanzania, with focus on mountain forest
- Tasmania (Australia)
- Additional sites to be defined by UN REDD (FAO)
- Utilise synergy with CEOS LSI Constellation regional areas

Note: Final area and coverage of each regional test-site is being finalised in conjunction with key countries and governments.



# Initial Focus Areas (1)

## - Africa -

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# Initial Focus Areas (2)

## - SE Asia -

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# Initial Focus Areas (3) - South America -

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# Australian Methodology Development Focus Area: Tasmania

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# Opportunities for Optical + SAR fusion.

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## SAR Missions in Operation

- ALOS L-band; continuation approved
- ERS and ENVISAT C-band; continuation approved
- RADARSAT-1 and-2 C-band; continuation approved
- TerraSAR-X X-band; continuation approved
- COSMO-SkyMed X-band; constellation of 4 satellites

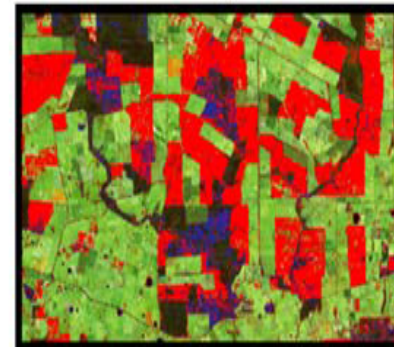
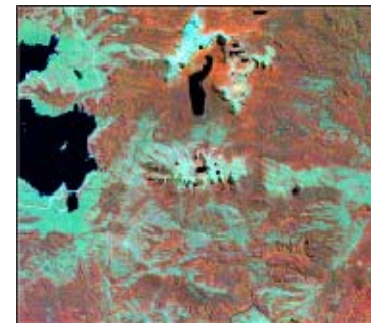
# Task Outputs/Deliverables

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1. Regional reference test-sites established in consultation with national governments, NGO's and expert teams.
2. Optical + SAR data acquisition strategies agreed and established via CEOS agencies
3. Optical + SAR datasets routinely provided by space agencies, initially over reference sites
4. Satellite data processing, accuracy assessment and correction methods widely agreed and documented through a mid-term task report
5. Provision of in-country access to observations, datasets, tools and expertise and associated capacity building activities.
6. Establish guidelines for annual, mid-resolution global forest-change monitoring program
7. Forest change data products agreed and being routinely produced, by national/regional programs, together with associated accuracy metrics.

## Key Deliverable 1: Development of Methods for production of repeatable Land-Cover Products for Ingestion into Carbon Models

- Needed: Agreed Methods of pre-processing into annual, orthorectified, terrain illumination-corrected mosaics (optical & SAR).
- Needed: Methods for production of Information Products (Annually @ 25 m resolution)
  - Priority 1: Forest, Non-Forest
  - Priority 2: Forest Degradation
  - Priority 3: Land-use (e.g. agriculture, plantations, native forest )
    - Forest class: Softwood, hardwood, native
    - Plantation type mapping pre- and post-1990
  - Priority 4: Sparse woody perennial extent



## Possible Short-term K&C Actions

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1. Provide a short document on optimal SAR data modes and products for annual, medium resolution forest-cover change monitoring (include some key examples if appropriate) – late January 2009 (for discussion at GEO Asia-Pacific Symposium, Kyoto 3-4 February)
2. Write a short paper on SAR acquisition strategies (including synergistic sensors/platforms) ready for execution by relevant space agencies in CEOS – end of February 2009 (for presentation at CEOS SIT – March 3!!)
3. Establish and document the methodology for generation of annual, ortho-rectified, terrain illumination-corrected mosaics – April 2009
4. Report on agreed and robust forest-change & trend monitoring methodology, that is interchangeable with current optical (eg PRODES, NCAS) methods – late April 2009 (for presentation at ISRSE – GEO Forest 7 Carbon Workshop – Stresa, May 3-9, 2009)
5. Documented accuracy assessment of mid-resolution, wall-to-wall, annual forest change mapping methods by August 2009 (in collaboration with GOFC-GOLD)
6. Over selected test-sites, demonstrate near-real time annual monitoring capability of SAR deforestation and forest degradation – early November 2009 (K&C + others) (for showcasing at COP-15 possible side-event – Copenhagen 2009)