

# GOFC-GOLD

Global Observation of Forest and Land Cover Dynamics



## Land Cover Project Office



# Annual Report 2005

January 2006



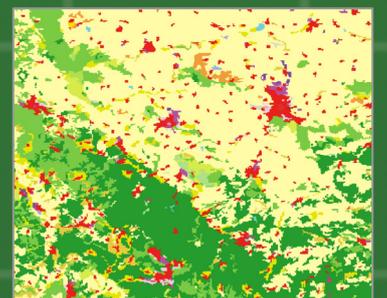
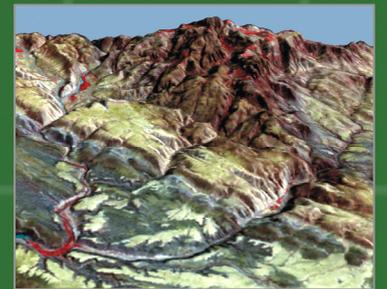
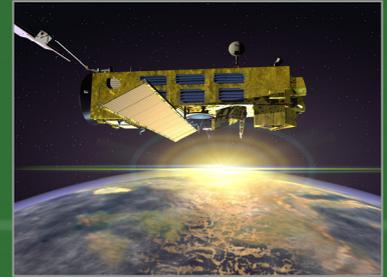
## Overview

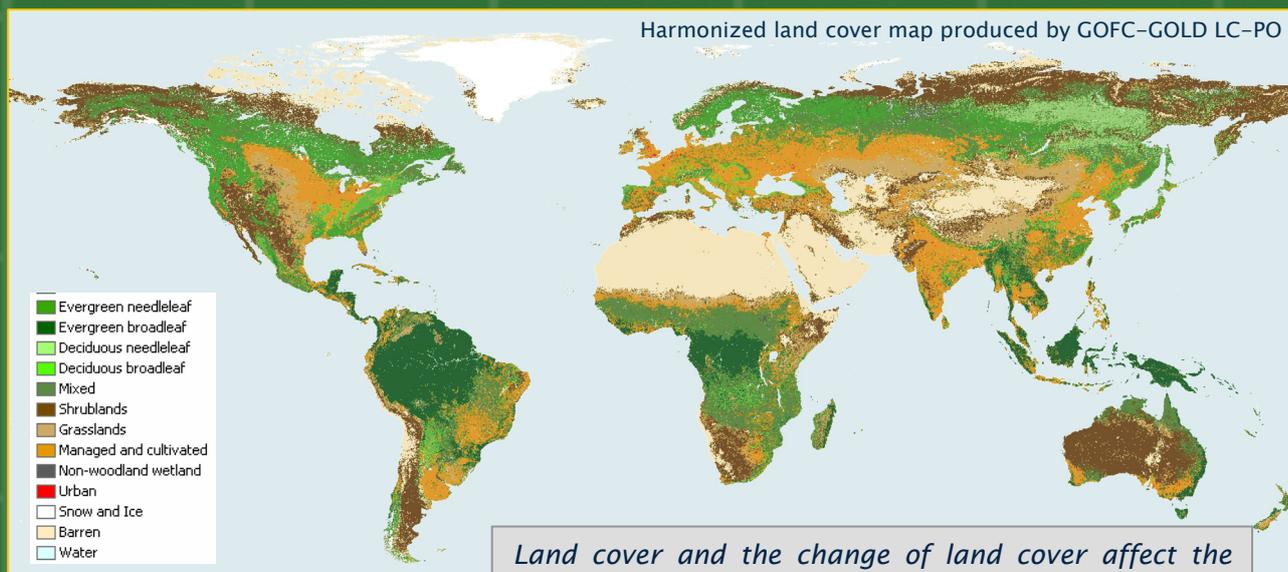
During its second year of operation, the GOFC-GOLD land cover project office (LC-PO) has continued to work towards operational terrestrial earth observations. Such reliable environmental observations are of crucial importance to understanding climate change and its impacts, to sustainable development, natural resources management, conservation, biodiversity and understanding of ecosystems and biogeochemical cycling. There is a strong push from international conventions, treaties, and implementation guidelines like the UN's Conference on Environment and Development (UNCED) Agenda 21, the Kyoto Protocol, the Group of Earth Observations (GEO), the Global Monitoring for Environment and Security (GMES) initiative, and the UN Global Observing Systems implementation activities (GCOS, GTOS, GLCN) for sustained, harmonized, and validated land observation products. With the support of the GOFC-GOLD land cover project office at the FSU Jena, the European Space Agency has taken an action to participate in the strategic development and implementation activities to provide high quality data of the Earth's land surfaces and ongoing change processes.

GOFC-GOLD (Global Observation of Forest Cover - Global Observation of Land Dynamics) as technical panel of the Global Terrestrial Observing System (GTOS) provides the platform for international communication and cooperation for actors involved in global Earth Observation including data producers (e.g. space agencies, land cover facilities), the scientific community, and data users (FAO, UNEP, global modeling community etc.). These activities improve the value of current and future land cover datasets for a multitude of applications and contribute to the overall goal of operational observations of the land surface.

In 2005, most prominent achievements were made through contributions in the following international initiatives:

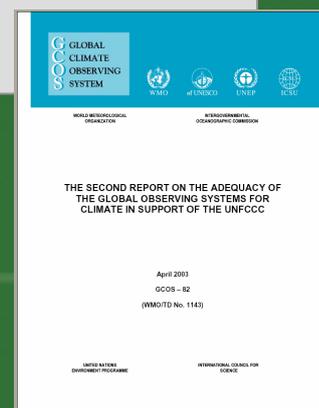
- Group on Earth Observation (GEO),
- Integrated Global Observations for Land (IGOL),
- UN Conventions, in particular concerning the GCOS implementation plan,
- CEOS with the group on calibration and validation
- ESA GLOBCOVER project





*Land cover and the change of land cover affect the services provided to human society (e.g., provision of food, fibre, recreational opportunities, etc.), force climate by modifying water and energy exchanges with the atmosphere, and change greenhouse gas and aerosol sources and sinks.*

(GCOS Implementation Plan, 2004)



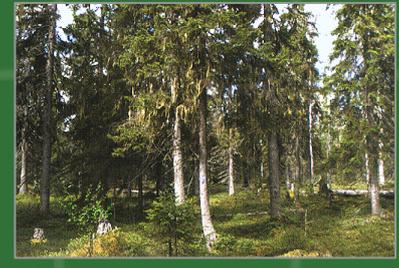
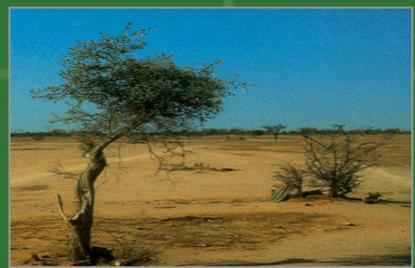
**The primary GOFC-GOLD objective is to provide continuity and consistency of space-based and in-situ observations of land surfaces:**

- for sustainable management of terrestrial resources
- to obtain an accurate, reliable, quantitative understanding of the terrestrial carbon budget

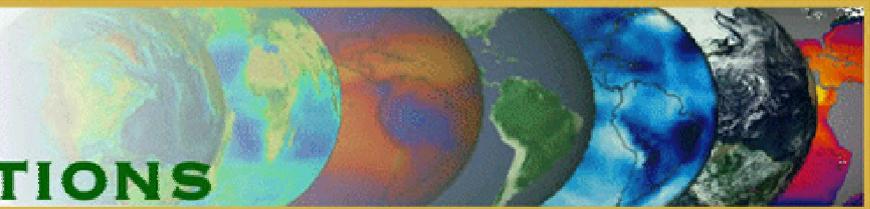
**Functions of GOFC-GOLD land cover team: priorities:**

- Continuity of Observations (satellite, in-situ)
- Harmonization, Interoperability, and Synergy
- Validation
- Adequacy and Advocacy of Mapping Products
- Regional Networks and Capacity Building
- Share Data, Information and Knowledge
- Land Change Assessment

(as defined by the 3<sup>rd</sup> Science and Technical Board, 2005)

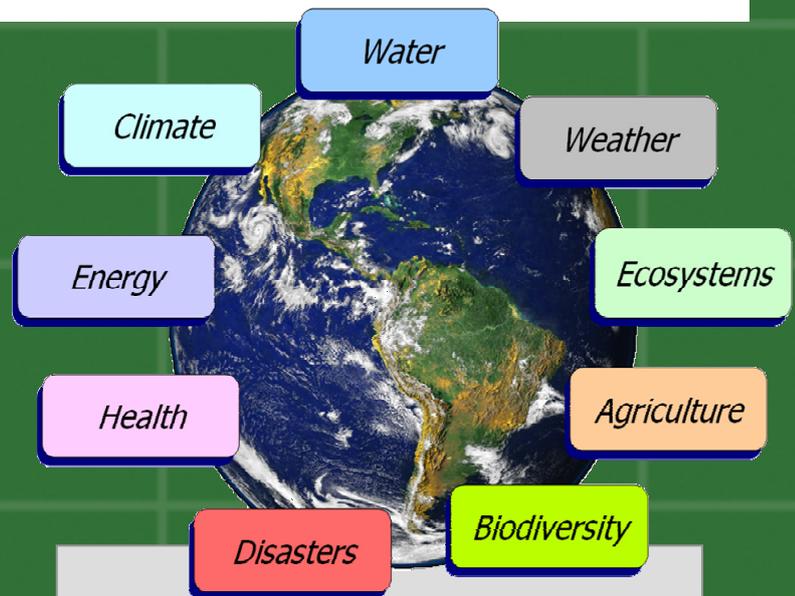


# GROUP ON EARTH OBSERVATIONS



## Taking on the challenges posed by GEO:

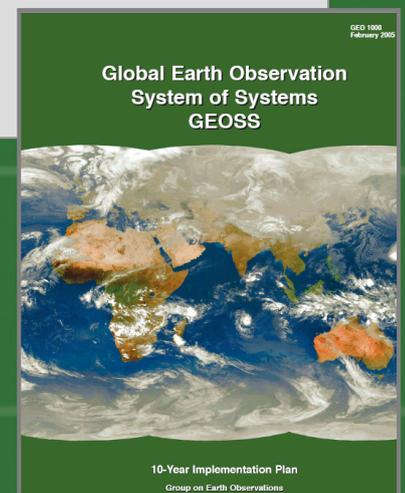
- GOFC-GOLD provides an operational framework for land observations within GTOS.
- The land domain is least advanced compare to other fields of observation (ocean, atmosphere).
- The GEOSS reference plan especially mentions GOFC-GOLD and its detailed observation plans and network for land cover, global fire mapping products, cultivated area, and forest area.
- GOFC-GOLD provides a communication and cooperation platform between data producers, data users, and the science community to cooperatively improve observation, data products definition, assimilation, and dissemination.
- Implementation builds upon and enhances established partnerships and observing systems, and stable funding and staffing are essential for a comprehensive GEOSS implementation.
- GOFC-GOLD has been involved in the development and evaluation of internationally agreed standards for harmonization, standardized land mapping and validation,
- Potential of international capacity building (linkage to GOFC-GOLD).

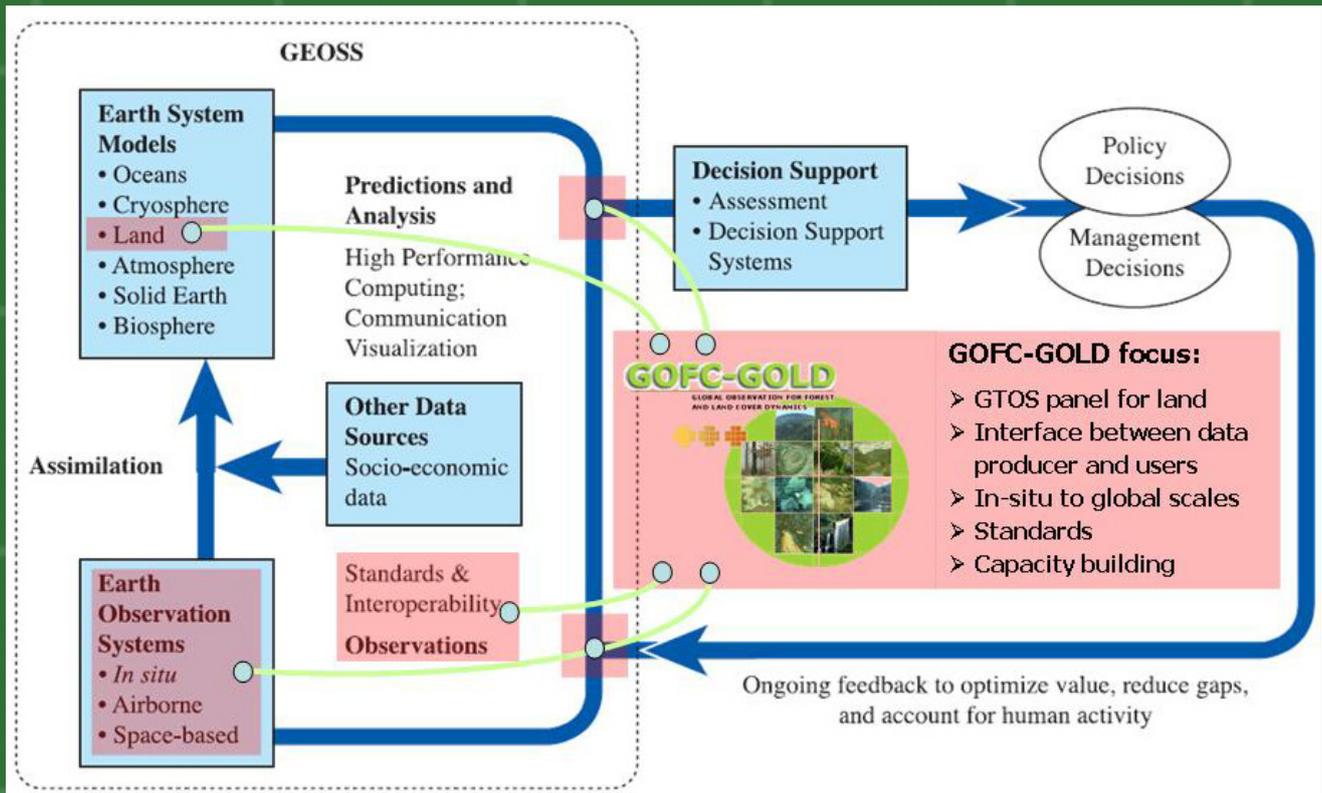


*GEO aims to achieve advances in nine specific areas of socio-economic benefit (see above).*

*There are several commonly required and used products among the nine societal benefit areas (Disasters, Health, Energy, Climate, Water, Weather, Ecosystems, Agriculture and Biodiversity). All areas require **land cover** products.*

*(GEO Implementation Plan, 2005)*

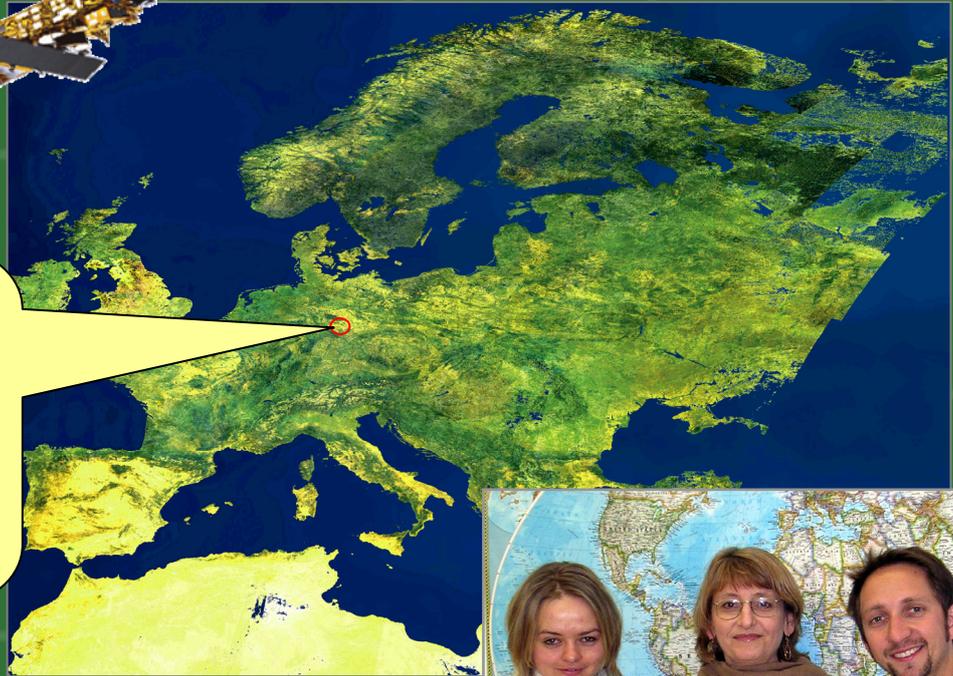
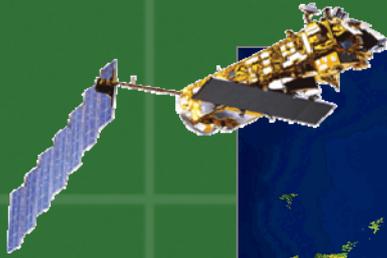




**GOFC-GOLD and some related tasks in the GEO 2006 work plan:**

- ECOSYSTEMS-06-03: Initiate the harmonization of observing-methods and create synergies between ecosystem observing activities and those of other existing groups and mechanisms for terrestrial, freshwater and marine systems.
- ECOSYSTEMS -06-07: Build upon existing initiatives (e.g. ANTARES in South America for oceans and GOFC-GOLD regional networks for terrestrial domains) to develop a global network of organization-networks for ecosystems, and coordinate workshops to strengthen observing capacity in developing countries.
- AGRICULTURE-06-03: Utilizing global and regional high-resolution land-cover datasets (e.g. GLOBCOVER) and earlier 1-km resolution land cover data sets (e.g. Global Land Cover 2000), implement production of a high-resolution global land-cover change dataset and report. Propose mechanisms for regular analysis and reporting on land cover change building on current efforts and promulgate the use of these products, especially in developing countries.
- AGRICULTURE -06-04: Initiate an international assessment effort on forests and forest changes utilizing ongoing land cover mapping projects (e.g. GLOBCOVER). Ensure application of standardized classifications and harmonization of existing datasets.
- USERS-06-02: Initiate pilot communities of practice to identify and further refine users' needs, in particular on cross-cutting areas, building upon the initial experience of community of practice and on information provided by national, regional and project-level surveys.
- BIODIVERSITY-06-02: Building on the framework adopted for monitoring biodiversity trends in the UN Convention on Biological Diversity, conduct a series of workshops and meetings to (i) define the needs and requirements of the biodiversity information users sector, (ii) delineate available methodologies and (iii) identify the adequacy of current and past observational strategies.

## European Space Agency Sponsorship



Location of the ESA GOFC-GOLD land cover office at the FSU Jena. The office is led by Prof. Christiane C. Schmullius, the Co-chair of the GOFC-GOLD Land Cover Implementation Team, and coordinated by Dr. Martin Herold.



*ESA PO team: Kathleen Neumann, Chris Schmullius and Martin Herold (from left).*

With the establishment of a GOFC-GOLD land cover project office at the Friedrich Schiller University Jena, Germany, the European Space Agency has taken responsibility to participate and contribute to the international cooperation and communication to coordinate and improve global observations of land. The Land Cover Project Office (PO) helps to strengthen the GOFC-GOLD framework, to coordinate, promote and fulfil the GOFC-GOLD Land Cover implementation plan, and to support the European Space Agency and related projects and services. ESA has invested €240 K over a 3 year (2004-2006) to support the LC-PO. In conjunction with the extensive ENVISAT data acquisitions and several regional and global mapping activities (e.g. GLOBCOVER), ESA has strengthened his position in coordination of land observations and extended their activities for an improved match between data products and user needs.

The ESA LC-PO office is led by Prof. Christiane Schmullius, the Co-chair of the GOFC-GOLD Land Cover Implementation Team (LC-IT) jointly with David Skole from the Michigan State University. The Project Office is located at the Department of Geoinformatics of the Friedrich Schiller University in Jena, Germany. The management, coordination and execution of the GOFC-GOLD activities close cooperation with the GOFC-GOLD-chairs John Townshend and Alan Belward, as well as, the GOFC-GOLD executive office in Edmonton, Canada led by Michael Brady.

Despite fostering the implementation of GOFC-GOLD objectives, a major objective of the PO is to support ESA in the coordination of land cover harmonization and validation activities focused on the development of a user information service for the reporting and exchange of validation results and information relating to the operational activities of satellite platforms and data delivery (GLOBCARBON and GLOBCOVER projects).

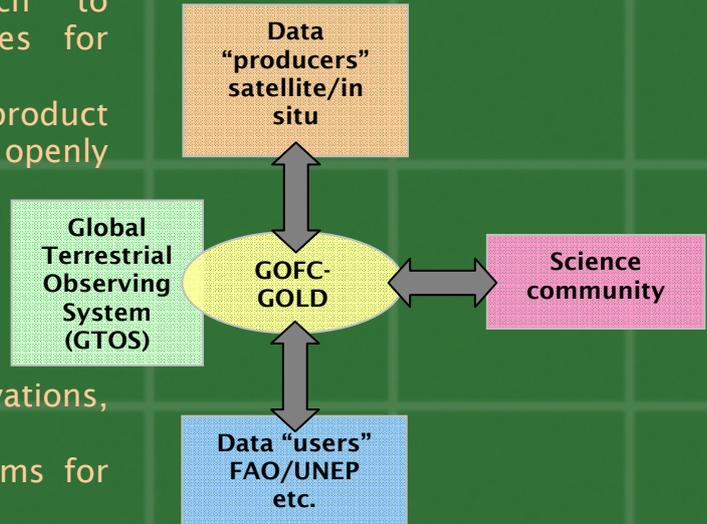
# Key activities and achievements

- **State of the art in global land cover assessment**
    - Collect and summarize published materials and datasets
    - Documentation on land cover algorithms, change routines, data products, in situ facilities
  - **Strategies for land cover harmonization and dataset interoperability**
    - Review of previous land cover harmonization approaches including advocating the UN Land Cover Classification System as common ground for land characterization
    - Translation, comparison and semantic similarity assessment of several land cover legends using the UN Land Cover Classification System, i.e. IGBP, GLC2000, CORINE, MODIS Land Cover, USGS Anderson, Continuous Fields Products and others
    - Development of strategic documents for harmonization of existing land cover datasets and guidelines for standardized development of land cover legends for future mapping
  - **Global land cover validation strategies**
    - Strong cooperation with CEOS Cal-Val group on development of validation standards
    - Participation in ongoing validation activities (GLC2000, GLOBCOVER) and comparative accuracy assessment of existing global datasets using existing reference information
    - Outline implementation plan for an operational validation strategy to assess the accuracy of existing and future global land cover products and foster their interoperability/synergy
  - **Land cover map product applications**
    - Develop advanced and refined global land cover maps for global process modeling
    - Dataset synergy for coarse scale land change analysis and long term trends
  - **Support development of GLOBCOVER**
    - Comparative assessment of GLC2000 and CORINE for flexible development of GLOBCOVER
    - Contribution to GLOBCOVER legend development
  - **Participation in GEO process**
    - LC-PO acts as point of contact for GOFC-GOLD participation in GEO activities
    - Outline GEO 2006 work plan tasks for GEO to benefit from GOFC-GOLD implementation
    - Coordination and presentation of GEO user Community of Practice for forest observations
  - **Earth observation to support UN conventions**
    - Active contribution for land cover tasks described in the GCOS implementation plan
    - Participation in delegations to UNFCCC-COP11 and UNCBD SBSTA
    - Coordination of GOFC-GOLD working group to evolve internationally agreed technical protocols for using Earth observation in monitoring avoided tropical deforestation
  - **GOFC-GOLD science meetings and capacity building**
    - Active participation and preparation for GOFC-GOLD science and technical board meeting
    - Organization and co-hosting of the GOFC-GOLD capacity building on LCCS and evolving standards in land characterization in St. Petersburg, Russia, organization and co-hosting of the GOFC-GOLD VCF validation expert workshop, organization of several small harmonization and LCCS-capacity building events
  - **Participation in key events to foster international cooperation**
    - Contacts and communications with GOFC-GOLD regional networks
    - Participation in meetings and workshops on: GLOBCOVER meetings, GTOS, IGOS-IGOL, GLC2000 validation, UN Global Land Cover Network (GLCN), GEOLAND, DLR
    - Participation and GOFC-GOLD representation in scientific conferences symposia
  - **Documentation, publication, and outreach:**
    - 23 deliverables submitted to ESA
    - Maintenance of webpage and regular updates
    - Development and distribution of four GOFC-GOLD newsletters
    - Contribution to GOFC-GOLD report series
    - Scientific publications (4 peer-reviewed papers submitted, 2 accepted and published 2006)
    - Assistance and review of key documents: GTOS-Coastal implementation plan, GLOBCARBON product validation plan, CEOS Cal-Val 'best practice' document on validation of global land cover datasets, Integrated Global Observations of Land (IGOL) documents, GEO 2006 work plan, LCCS resources
-

# How to make land observations operational and useful to multifaceted applications?

## The Challenge:

- Growing need for detailed and accurate information about land cover and land cover change on all geographic scales
- Need to move from research to operational monitoring capabilities for land cover
- Need for operational data and product suites, better defined, flexible, and openly available



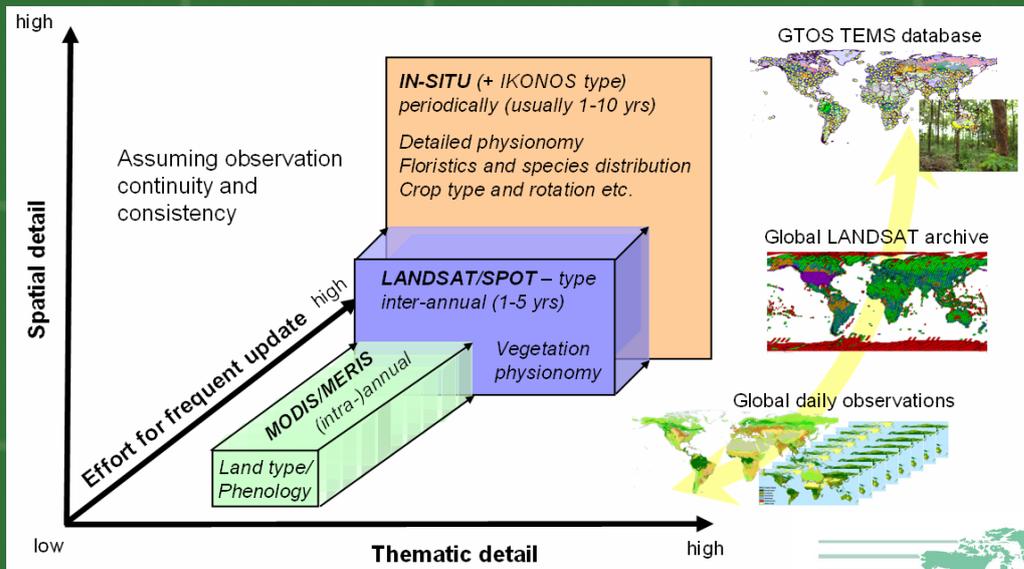
## The GOFC-GOLD Approach:

- Improved match between observations, data products and user needs
- Support of coordination mechanisms for land surface observations
- Establish international standards and protocols especially with respect to harmonization and validation
- Improve adequacy and advocacy of land cover products based on user requirements
- Maintain GOFC-GOLD regional networks
- Work towards continuity and consistency of land cover observations
- Implement coordinated research, demonstration and operational projects
- Support to share data, information and knowledge

**GOFC-GOLD –  
A platform for an  
international  
partnership of data  
producers, the science  
community, and users**

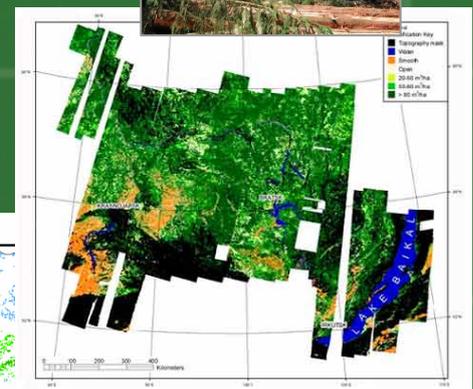


# Integrated and operational land observations

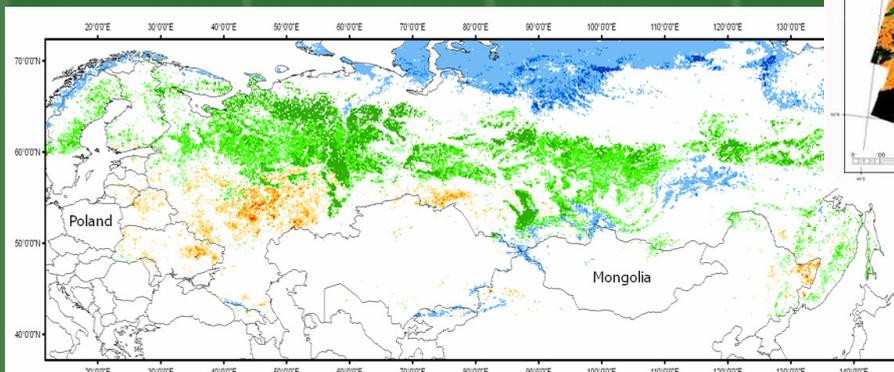


## Improved forest monitoring from integrated satellite and in-situ observation:

- Tree cover
- Vegetation type and physiognomy
- Density (canopy closure)
- LAI, FPAR
- Biophysical processes (NPP, fire)
- Biomass and carbon pools
- Species
- Disturbance, natural/anthropogenic
- Fragmentation and biodiversity
- Inundation
- Regeneration
- Stand structure
- Basal area/volume
- Age class
- Tree measurements (age, DBH, ht, etc)
- Forest floor and belowground biomass



Forest biomass map of Siberia using ESA ERS Tandem data ([www.siberia1.uni-jena.de](http://www.siberia1.uni-jena.de))



FOREST Spring NDVI		CROPLAND Summer NDVI		TUNDRA Spring NDVI	
0	-0.0026	0	-0.0011	0	-0.0011
0.0026 - 0.0041		0.0011 - 0.0017		-0.0012 - -0.0019	
0.0041 - 0.0109		0.0017 - 0.0038		-0.0019 - -0.0090	

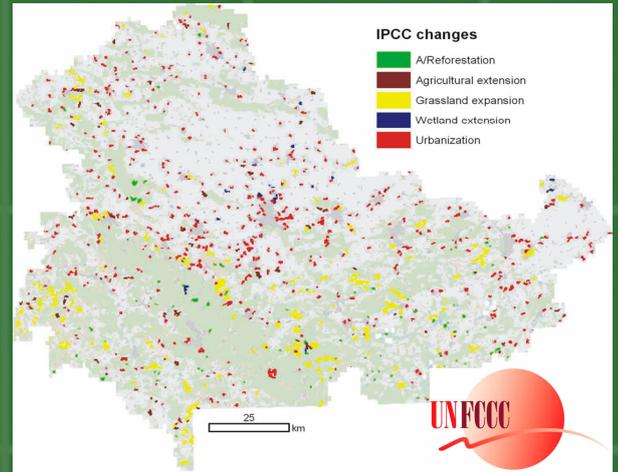
Significant inter-annual NDVI trends 1998-2005 for three main Northern Eurasia land cover types from SPOT-VGT 1km data

# Activities to support UN Conventions

GOFC-GOLD activities are guided and outlined in several international agreements and UN conventions. In the UNFCCC-GCOS implementation plan, GOFC-GOLD is called on to support implementation actions with respect to land cover observations:

- Establish international *standards and specifications for the production of land-cover characterization maps*
- Produce reliable accepted methods for *land-cover map accuracy assessment*
- Develop an *in situ reference network and apply CEOS WGCV validation protocols for land cover.*
- Generate annual products documenting *global land-cover characteristics at resolutions between 250m and 1km, according to internationally-agreed standards and accompanied by statistical descriptions of the maps accuracies.*

The GOFC-GOLD PO has participated in the ESA delegation to the Montreal 2005 climate convention summit and contributed to reporting obligations of GTOS to the UN Climate Convention.



**Observed land change according to IPCC best practice guidelines (LULUCF) using satellite information**



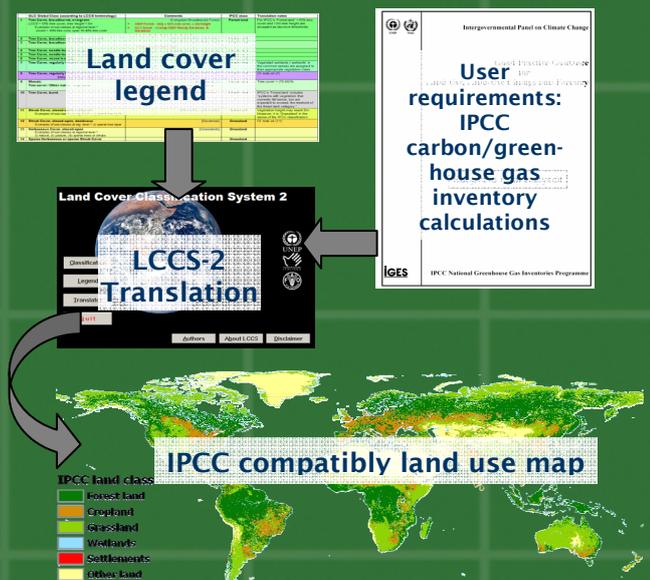
**GOFC-GOLD supports ESA delegation at UN Climate Convention, Montreal 2005**



**Advocacy role for GTOS/GOFC-GOLD at UN Convention on Biodiversity SBSTA meeting, Montreal 2005**

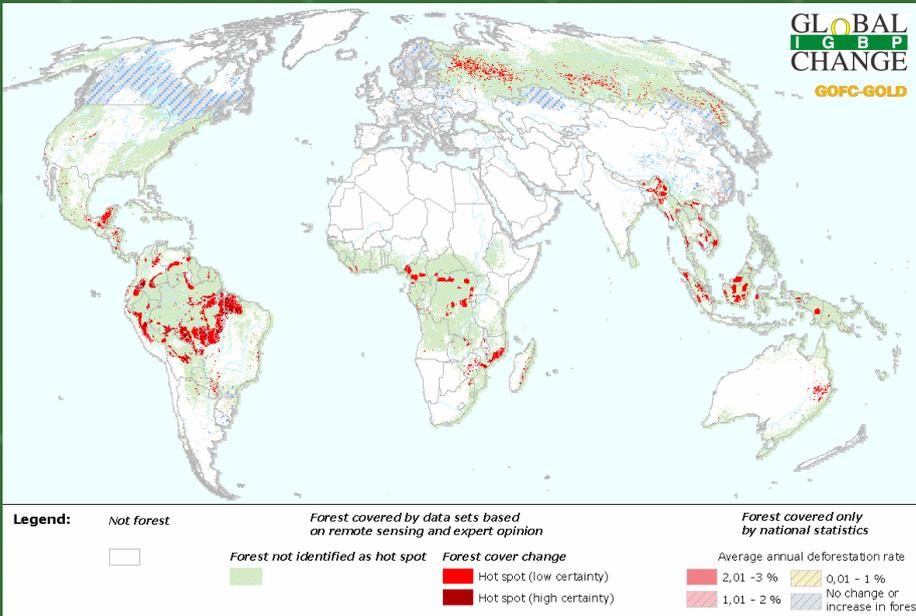
**UN Convention on Biodiversity 2010 goals with benefits from Earth Observation:**

- Goal 1: Promote the conservation of the biological diversity of ecosystems, habitats and biomes
- Goal 5: Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced.
- Goal 7: Address challenges to biodiversity from climate change and pollution



**Translating existing land cover datasets into UNFCCC-IPCC required land use categories**

# Monitoring avoided tropical deforestation



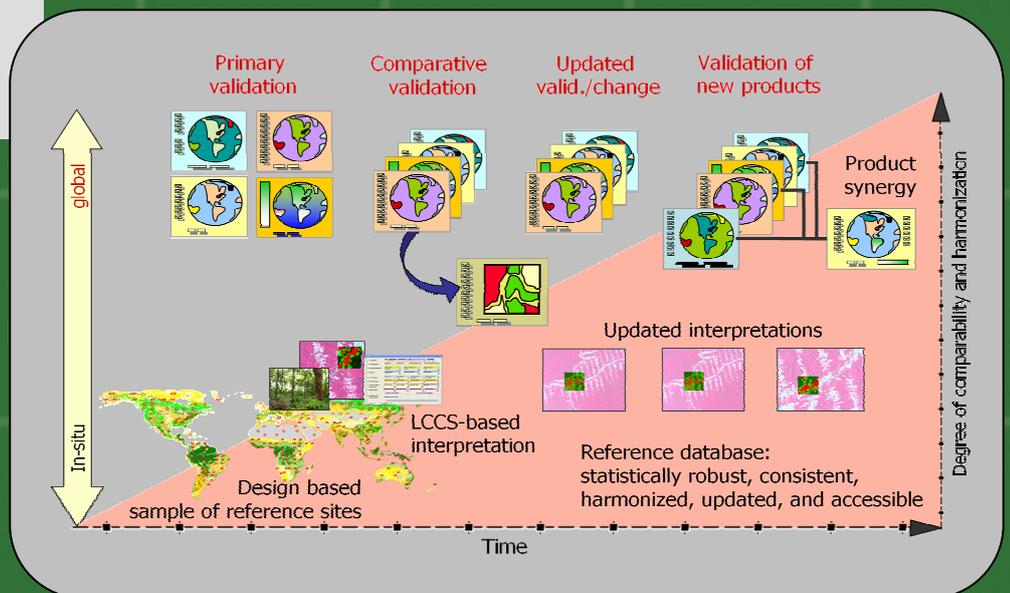
Discussions are underway within the UNFCCC on the feasibility of compensating tropical countries to reduce deforestation. A key issue is the technical feasibility of determining historical baselines and monitoring future tropical deforestation that would enable tropical countries to obtain carbon credits for reducing deforestation. This discussion is whether a capability exists to monitor deforestation at a national-scale to implement compensated reductions. GOFC-GOLD has established an international working group to provide technical guidance on current and future capabilities for monitoring tropical deforestation within the context of these discussions.

## Hot spots of deforestation derived from synergy of different datasets

Source: Lepers, E., E.F. Lambin, A.C. Janetos, R. DeFries, F. Achard, N. Ramankutty and R.J. Scholes (2005). A synthesis of information on rapid land-cover change for the period 1981–2000. *BioScience*, 55 (2), 115–124

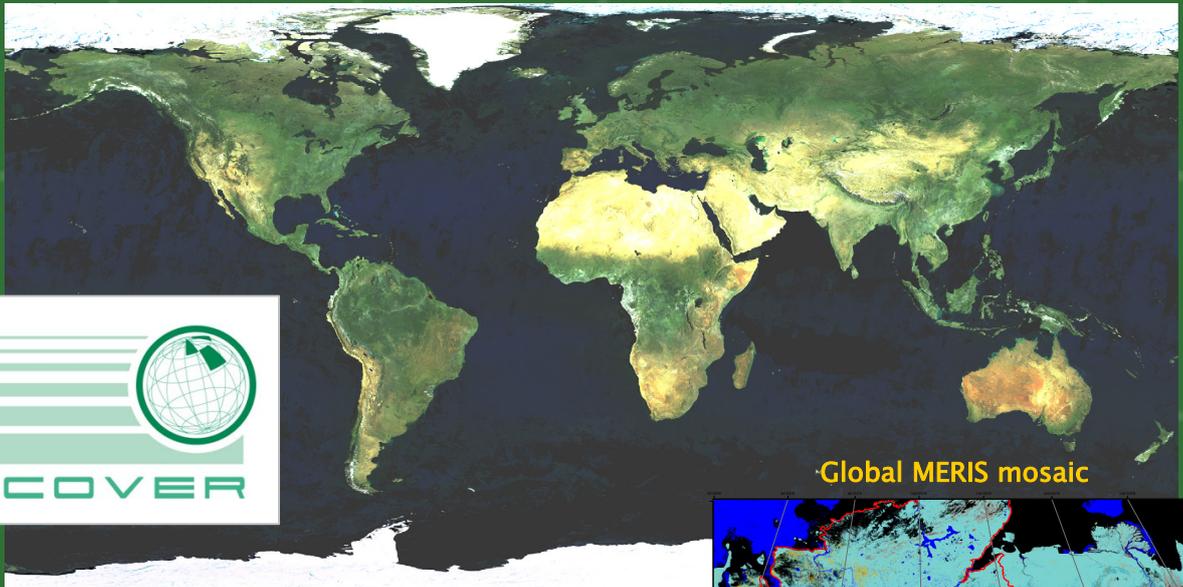
# Harmonization and Validation

**GCOS Implementation Plan 2004:**  
 ... full benefit should be taken of existing initiatives, e.g., the FAO's Land Cover Classification System for legend harmonization and translation and the legends published by the IGBP and GTOS GOFC-GOLD.



Lack of harmonization and validation hinders the flexibility and usability of land cover datasets; in particular considering the large number users and applications including the analysis of land changes. The GOFC-GOLD PO has fostered the harmonization and standardized development of land cover datasets including the use of the UN Land Cover Classification System (LCCS), legend translations, and dataset harmonization. GOFC-GOLD has contributed to the development and dissemination of standard validation protocols and frameworks for their operational implementation.

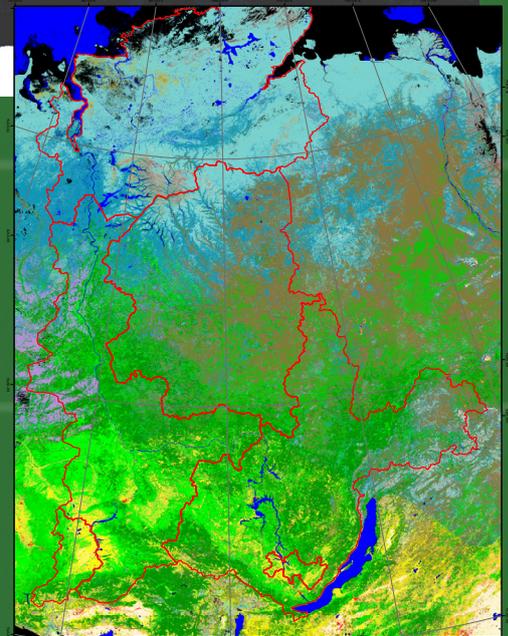
# Supporting ESA land cover initiatives



Global MERIS mosaic

The GLOBCOVER project was launched 2004 as an initiative of ESA which is led by an international network of partners, in particular ESA, FAO, UNEP, JRC, IGBP and GOFC-GOLD. The objective of GLOBCOVER is to produce a global land-cover map for the year 2005, using fine resolution (300 m) ENVISAT-MERIS data to be acquired over the full year 2005. This new product is intended to update and to complement other existing comparable global products, such as the global land cover map for the year 2000 (GLC 2000) with a resolution of 1 km.

The GOFC-GOLD LC-PO will play an active role in the coordination and development of the GLOBCOVER products. GLOBCOVER provides an opportunity to implement the GOFC-GOLD objectives for harmonized and validated land cover mapping. The LC-PO will assist ESA for a standardized and flexible definition of the land cover legends and the accuracy assessment of the land cover products.



2004 land cover map of 3.2 Mill. sqkm of SIBERIA based on ENVISAT-MERIS data

**GLC2000**

**SIBERIA-II Modis 2004**

**SIBERIA-II Meris 2004**

**GLC2000 Legend**

- Unclassified
- Evergreen Needleleaf Forest
- Deciduous Broadleaf Forest
- Needleleaf / Broadleaf Forest
- Mixed Forest
- Broadleaf / Needleleaf Forest
- Deciduous Needleleaf Forest
- Broadleaf Deciduous Shrubs
- Needleleaf Evergreen Shrubs
- Humid Grasslands
- Steppe
- Bogs and Marsh
- Palsa Bogs
- Riparian vegetation
- Barren Tundra
- Prostrate Shrub Tundra
- Sedge Tundra
- Shrub tundra
- Recent Burns
- Croplands
- Forest / Natural Vegetation Complexes
- Forest / Cropland Complexes
- Cropland / Grassland Complexes
- Bare Soil and Rock
- Permanent Snow/ice
- Water bodies
- Urban
- Salt-March
- Burns of year 2000

**SIBERIA-II Legend**

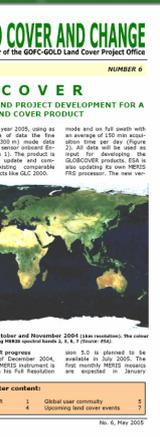
- Unclassified
- Water
- Barren Ground
- Urban
- Croplands
- Cropland/Forest Complex
- Evergreen Needleleaf
- Deciduous Broadleaf
- Needleleaf/Broadleaf Forest
- Mixed Forest
- Broadleaf/Needleleaf Forest
- Deciduous Needleleaf Forest
- Humid Grassland
- Wetland
- Steppe
- Tundra Lichen-Moss
- Tundra Heath

Legend	GLC2000	SIBERIA-II Modis 2004	SIBERIA-II Meris 2004
Unclassified	0.00	0.00	0.00
Water	0.00	0.00	0.00
Barren Ground	0.00	0.00	0.00
Urban	0.00	0.00	0.00
Croplands	0.00	0.00	0.00
Cropland/Forest Complex	0.00	0.00	0.00
Evergreen Needleleaf	0.00	0.00	0.00
Deciduous Broadleaf	0.00	0.00	0.00
Needleleaf/Broadleaf Forest	0.00	0.00	0.00
Mixed Forest	0.00	0.00	0.00
Broadleaf/Needleleaf Forest	0.00	0.00	0.00
Deciduous Needleleaf Forest	0.00	0.00	0.00
Humid Grassland	0.00	0.00	0.00
Wetland	0.00	0.00	0.00
Steppe	0.00	0.00	0.00
Tundra Lichen-Moss	0.00	0.00	0.00
Tundra Heath	0.00	0.00	0.00

Similarity assessment of different land cover datasets to support the development and flexibility of the GLOBCOVER legend

## Presentation, publications and outreach

The LC-PO produces and distributes to a variety of documentations and outreach materials. Several documentation materials, newsletters, and press releases have been produced, edited, and released. The quarterly newsletter is distributed to a comprehensive list of actors involved in global land cover assessment through GOFC-GOLD and GTOS. The GOFC-GOLD LC-PO webpage contains a variety of services to users including documentation on access to global and regional land cover map products and in-situ observations.



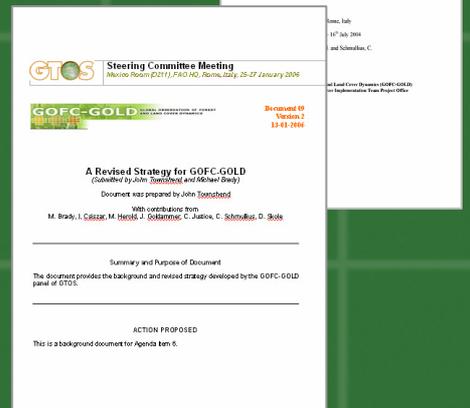
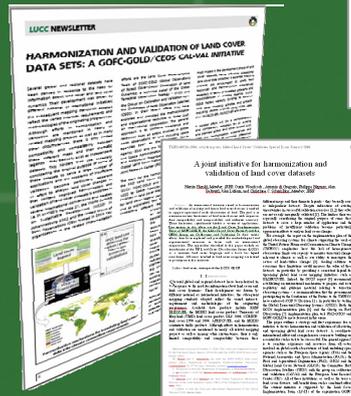
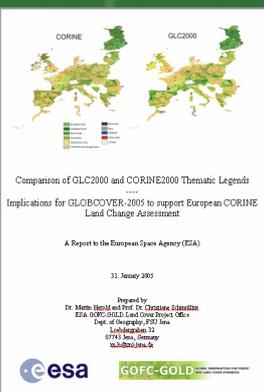
### Web Page

with data access documentation: [www.gofc-gold.uni-jena.de](http://www.gofc-gold.uni-jena.de)

Several reports and twenty-three deliverables have been submitted to ESA. They include status reports, documentation of implementation strategies for harmonization and validation, and results from prototype studies. The LC-PO has contributed to the GOFC-GOLD report series, in particular to the revised strategic document. Further input and documentation was provided to UNFCCC-COPI1, GEO and the 2006 work plan and for the development of IGOL. The LC-PO has completed several scientific publications in the peer-reviewed literature.

### Quarterly Newsletter

### GOFC-GOLD report series



### Reporting to ESA

### Scientific publications

## Workshops and travel

The LC-PO director and officer have organized, contributed and participated in several workshops and meetings to foster international cooperation and communication and for outreach and capacity building purposes. Most prominently, the LC-PO has helped to organize the GOFC-GOLD science and technical boards meeting, capacity building events, special sessions at scientific conferences, validation workshops, GLOBCOVER progress meetings and participated in the ESA delegation to the UNFCCC-COP11.

### GOFC-GOLD STB meeting Beijing



### Capacity building in St. Petersburg



Land cover validation workshop

### Missions completed by LC-PO

Date	Destination	Mission
Feb 05	Ispra, Italy	Coordination and cooperation meeting at JRC
Mar 05	Phoenix, USA	Host of special session at URS conference
Apr 05	Beijing, China	GOFC-GOLD Science and Technical Board Meeting
Apr 05	Frascati, Italy	GLOBCOVER pre-processing kick-off meeting
Apr 05	Vienna, Austria	Representation of GOFC-GOLD at the EGU Conference
Apr 05	Ispra, Italy	GEOLAND meeting at JRC
June 05	St.Petersburg Russia	Capacity building at NERIN GOFC-GOLD Regional Network
Sept 05	Rostock, Germany	GOFC-GOLD representation at DGPF Conference
Sept 05	Frascati, Italy	Participation in MERIS user workshop at ESRIN
Sept 05	Berlin, Germany	GOFC-GOLD representation at DLR-GMES conference
Oct 05	Sioux Falls, USA	Organisation and contribution to VCF validation workshop
Oct 05	Frascati, Italy	GLOBCOVER consortium update meeting
Nov 05	Bonn, Germany	GOFC-GOLD representation at INSPIRE/RISE workshop
Nov 05	Friedrichshf. Germany	Project meeting at INFOTERRA
Dec 05	Montreal, Canada	Participation at UNFCCC/ COP11 and UNCBD/SBSTA
Dec 05	Warsaw, Poland	GOFC-GOLD representation at DLR-GMES conference
Dec 05	Krakow, Poland	GOFC-GOLD representation at GCOS ECV conference
Dec 05	Geneva Switzerland	Participation in GEO II plenary

## Financial summary 2005

<b>Incoming:</b>	<b>K€</b>
ESA sponsorship	80.0
Additional funding	7.8
Carry over of 2004	16.0
<b>TOTAL</b>	<b>103.8</b>
<b>Outgoing:</b>	<b>K€</b>
<b>Salaries (including overheads)</b>	
➢ PO executive officer/staff	61.5
➢ Student support staff	6.0
<b>Travel and subsistence</b>	
➢ PO director and officer	16.5
<b>Consumables</b>	
➢ Printing/communication cost	3.5
➢ Publications/Brochures/other	3.8
<b>TOTAL</b>	<b>91.3</b>
Carry over for 2006*	12.5

\*PO budget was estimated for three years overall support of 240K€. Carry over contains travel support for additional inter-continental missions of PO director in 2006, and increasing amounts of publications, printing, outreach, and capacity building costs for full implementation of strategies in the third year of operation.

## Financial overview

The GOFC-GOLD LC-PO is operated through ESA's Technical Officer Olivier Arino under ESA ESRIN contract: 17970/04/I IW. All invoices to ESA were issued and paid according to that contract. All expenses have been documented in Quarterly Status Reports submitted to the ESA technical officer. The operation of the PO started in Feb. 2004. The first annual progress report summarized all expenses for the period Fe. 2004 – Jan. 2005. The financial summary to the left contains cost statements from Feb - Dec 2005 and estimates for Jan 2006.

## Activities and objectives for 2006

In 2006, the LC-PO will continue to work on the implementation of the GOFC-GOLD objectives. Main issue for 2006 is the active participation in ongoing initiatives like GEO, UN conventions and IGOL. Key objectives are:

1. The establishment of a GEO user Community of Practice for forest observations. The GEO II plenary in December 2005 has asked GOFC-GOLD and its partners to move forward in this arena.
2. Finalize documentation and strategies for the land cover tasks in the GCOS implementation plan.
3. Coordinate the development of robust technical protocols for Earth Observation based implementation of compensated reductions for avoided tropical deforestation. The Montreal summit has emphasized the needs for this development and GOFC-GOLD will provide the platform to assess best practices and development international agreement.
4. Support the ongoing development of IGOL and related documentation.

Detailed studies on harmonization, the standardized acquisition of in situ and satellite land cover data, and exploration of synergies between existing global and regional land cover products All activities will be in accordance and in joint activities with ongoing international developments on the strategic level including cooperation with GTOS, other GOFC-GOLD implementation activities, the GCOS implementation plan, and the UN Global Land Cover Network and user requirements.

The LC-PO will contribute to several ongoing land cover mapping projects (e.g. using ENVISAT MERIS data). Most prominently, the LC-PO will further assist ESA in the development of the GLOBCOVER products with focus on standardized and flexible land cover legend development and validation activities. Funding strategies will be elaborated under consultancy of ESA. A main component of the activities is communication with users and evaluation of user requirements with respect to land cover. Established cooperation and communication with user agencies like FAO, UNEP, the European Environmental Agency (EEA), Canadian Forest Service and considering requirements posed by international conventions and treaties will be strengthened to improve adequacy and advocacy of land cover data sets. Building capacities and confidence will be pursued within GOFC-GOLD (regional networks), the scientific community and with different user organizations. The objective is to provide the user community with comprehensive and flexible land cover information based on the current status of map products. More specifically, the following workshops and missions will be organized and attended from LC-PO members:

Time	Destination	Purpose and objective
Feb 2006	Rome, Italy	Land use harmonization workshop at FAO/Rome
Feb 2006	Beijing, China	3rd IGOL land theme development workshop
March 2006	Jena, Germany	GOFC-GOLD land cover symposium organized and hosted by the LC-PO with workshops on: 1) Earth observation and avoided tropical deforestation 2) Boreal forest monitoring for UN conventions 3) Land Cover IT meeting 4) GOFC-GOLD regional network meeting
May 2006	Enschede, Netherlands	Special session: "Towards operational global and regional land observations: Status - challenges - strategies" at ISPRS Commission VII Mid-term Symposium
June 2006	Ulaanbaatar, Mongolia	Capacity building workshop at 2nd International Conference on land cover/land use study using Remote Sensing and GIS
Sept 2006	Bonn, Germany	Workshop and tutorial on: "LCCS and evolving standards in land characterization" at EARSeL Land Cover Special Interest Group Workshop
Nov 2006	Beijing, China	Special session: "Global Land Cover Observations: International Strategies and Implementation" at Earth System Science Partnership (ESSP) Science Conference

All progress and developments will be documented and communicated through presentations and reports to ESA, GOFC-GOLD and the public through the LC-PO Newsletter, reports to be published on the GOFC-GOLD LC-PO webpage, and in the scientific literature.

## More information and contact

More information and documentation about GOFC-GOLD, GTOS, and the LC-PO activities can be found on the following web pages:

**ESA:**

<http://www.esa.int/>

**GTOS:**

<http://www.fao.org/gtos/>

**GOFC-GOLD:**

<http://www.fao.org/gtos/gofc-gold/>

**GOFC-GOLD land cover project office:**

<http://www.gofc-gold.uni-jena.de/>

**GOFC-GOLD report series:**

<http://www.fao.org/gtos/gofc-gold/series.html>

**Land cover implementation team newsletter (sign up and information):**

<http://www.gofc-gold.uni-jena.de/sites/letter.html>

**IGOS-P:**

<http://ioc.unesco.org/igospartners>

**CEOS group on calibration and validation for land:**

<http://landval.gsfc.nasa.gov/LPVS/>

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