GOFC-GOLD GLOBAL OBSERVATION OF FOREST AND LAND COVER DYNAMICS

esa

LAND COVER AND CHANGE

Newsletter of the GOFC-GOLD Land Cover Project Office

FEBRUARY 2006 **NUMBER 9**

EARTH OBSERVATION AND AVOIDING TROPICAL DEFORESTATION

GOFC-GOLD WORKING GROUP AIMS TO DEVELOP TECHNICAL PROTOCOLS FOR MONITORING TROPICAL DEFORESTATION FOR COMPENSTATED REDUCTIONS USING SATELLITE OBSERVATION

Discussions are underway within the United Framework Convention on Climate Change (UNFCCC) on the feasibility of compensation for tropical countries to reduce deforestation following the first commitment period. This concept of avoided tropical deforestation has been taken on by the conference of the parties during the at the Montreal summit in December 2005. Following the Montreal summit, the parties and accredited observers were invited to submit to the UNFCCC secretariat their views on issues relating to reducing emissions from deforestation in developing countries, focusing on relevant scientific, technical and methodological issues, and the exchange of relevant information and experiences, including policy approaches and positive incentives.

Newsletter content:

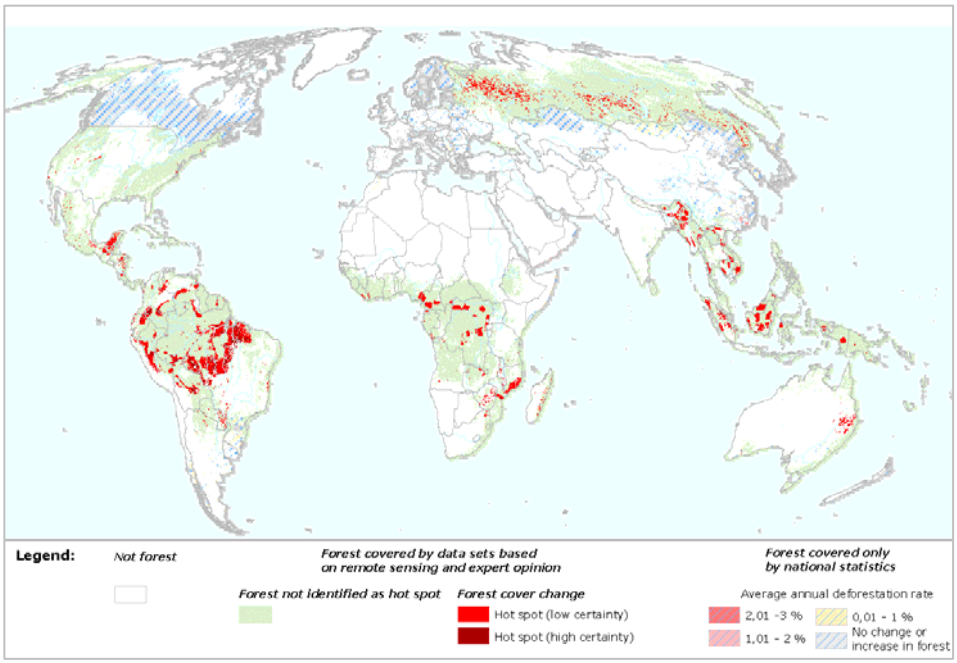

Figure 1: Hot spots of deforestation derived from synergy of different datasets
Source: Lepers, E., E.F. Lambin, A.C. Janetos, R. DeFries, F. Achard, N. Ramankutty and R.J. Scholes (2005). A synthesis of information on rapid land-cover change for the period 1981-2000. BioScience, 55 (2), 115-124

Earth observation has been emphasized as key source of information for implementing the UNFCCC and the Kyoto protocol. Examples were advocated for the use of Earth Observation to support national reporting on greenhouse gas inventories and for Clean Development Mechanisms. Although observed land change (from satellite) is not easily translated into net carbon emissions, satellite observations have played a dominant role in observing and assessing tropical deforestation (Figure 1). Thus, it is obvious that satellite based information can make a key contribution in assessing avoided tropical deforestation. The operational con-

Figure 2: Tropical deforestation pattern in Rondonia / Brazil seen from ESA's ERS-2 / ATSR instrument.

text of the UNFCCC raises the question of technical feasibility in determining historical baselines and monitoring future tropical deforestation that would enable tropical countries to obtain carbon credits for reducing deforestation. Several major issues emerged from a workshop held at the Carnegie Institution, Washington in July 2005 (DeFries et al., 2005):

1. Access to data from multiple satellite sensors is crucial
2. National-level institutional capabilities and regional partnerships to monitor tropical deforestation need to be developed
3. Techniques for monitoring tropical deforestation are available as a basis for developing best available practices and standards
4. Transition from the research domain for monitoring deforestation to operational systems requires a commitment from international institutions.

The role of the GOFC-GOLD and the established ad hoc group on this issue is to provide technical guidance on current and future capabilities for monitoring tropical deforestation within the context of these discussions (see box below). There is a strong need for such a neutral advisory group to foster the implementation of these activities. The work of the group aims to develop and demonstrate internationally-agreed protocols, and accepted technical guidelines and protocols for EO-based monitoring of tropical deforestation for compensated reductions. The group will build a communication platform with actors involved to ensure consensus and general acceptance and implementation. Such protocols are already worked on at different levels (nationally and internationally) and this will be considered. Furthermore, the group will foster GOFC-GOLD activities to overcome known challenges for implementation (i.e. consistency and continuity of satellite and in-situ observations) and promote the open sharing of the international satellite data needed to generate the deforestation products and the open sharing output products and results of analysis.

As the next step, a expert workshop on this issue will be organized and hosted by GOFC-GOLD land cover office during the symposium on "Land cover and Forest observations" in March 2006 in Jena, Germany (see contribution in this newsletter).

Reference:
DeFries, R., G. Asner, F. Achard, C. Justice, N. Laporte, K. Price, C. Small, J. Townshend 2005. Monitoring tropical deforestation for emerging carbon markets, in Paulo Moutinho & Stephan Schwartzman: Tropical Deforestation and Climate Change, pp. 35-46.

Activities of the GOFC-GOLD working group:

- Outline needs and requirements to understand what is suggested by UNFCCC and Kyoto protocol and IPCC GPG.
- Assess standard practices for monitoring tropical deforestation. This includes the review of national level deforestation observing systems with respect to UNFCCC, and an outline of activities by other organizations for developing such guidelines and to define the role and need for Earth Observation (requirements versus capability and efficiency).
- Develop guidelines for best practices in monitoring tropical deforestation at a national scale considering a range of tropical forest types and land uses, different forest change processes and most suitable methods for their analysis, and related data requirements.
- Recommend key requirements and current limitations in implementing monitoring in tropical countries. This includes the definition of baselines, minimum requirements (transparency, interoperability, validation), foreseen data shortcomings and known uncertainties, and avenues for implementation and capacity building.

GOFC-GOLD LAND COVER OFFICE IN 2005

Summary of activities and achievements

Supporting the GOFC-GOLD Land Cover Project Office (LC-PO) at the Friedrich Schiller University Jena, Germany, the European Space Agency participates and contributes to the international cooperation and communication to coordinate and improve global observations of land. During its second year of operation, the GOFC-GOLD Land Cover Project Office (LC-PO) has continued to work towards operational terrestrial earth observations. The list of activities and achievements is shown to the right.

Progress was made through contributions in the following international initiatives including the 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 and in implementation of evolving standards in land characterization and validation.

For 2006, the Land Cover Office priorities are in the establishment of a GEO User Community of Practice for forest observations, to finalize documentation and strategies for the land cover tasks in the GCOS implementation plan, to coordinate the development of robust technical protocols for Earth Observation based implementation of compensated reductions for avoided tropical deforestation. The office in Jena will remain a focal point for land cover Earth Observations, evolving standards in land characterization and for participation in ongoing mapping projects, and capacity building.

Progress and achievements in 2005:

- **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, , 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**
  - 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/ 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 GLOBCOVER development
  - Contribution to GLOBCOVER legend development
- **Participation in GEO process**
  - LC-PO acts as point of contact for GOFC-GOLD participation in GEO activities
  - Outline 2006 work plan tasks for GEO to benefit from GOFC-GOLD implementation
  - Coordinate/initiate of GEO user Community of Practice for forest observations
- **Earth observation to support UN conventions**
  - Active contribution for land cover tasks described in 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 in 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, 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
  - 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

THE GLOBCARBON INITIATIVE:

MULTI-SENSOR ESTIMATION OF GLOBAL BIOPHYSICAL PRODUCTS FOR GLOBAL TERRESTRIAL CARBON STUDIES

Background

Understanding the spatial and temporal variation in carbon fluxes is essential to constrain models that predict climate change. However, our current knowledge of spatial and temporal patterns is uncertain, particularly over land. The ESA GLOBCARBON project aims to generate fully calibrated estimates of at-land products quasi-independent of the original Earth Observation source for use in Dynamic Global Vegetation Models, a central component of the IGBP-IHDP-WCRP Global Carbon Cycle Joint Project. The service will feature global estimates of: burned area, fAPAR, LAI and vegetation growth cycle.

Products

The service is focused on the generation of various global estimates of aspects of terrestrial vegetation: the number, location and area of fire-affected land, known as Burnt Area Estimates (BAE), the area of green leaf exposed to incoming sunlight for photosynthesis, known as Leaf Area Index (LAI), the sunlight actually absorbed for photosynthesis, known as the Fraction of Absorbed Photosynthetically Active Radiation (fAPAR) and the Vegetation Growth Cycle (VGC).

Figure 3: Forest fires pump large amounts of carbon into the atmosphere and require better characterisation within carbon cycle models *(Source ESA).*

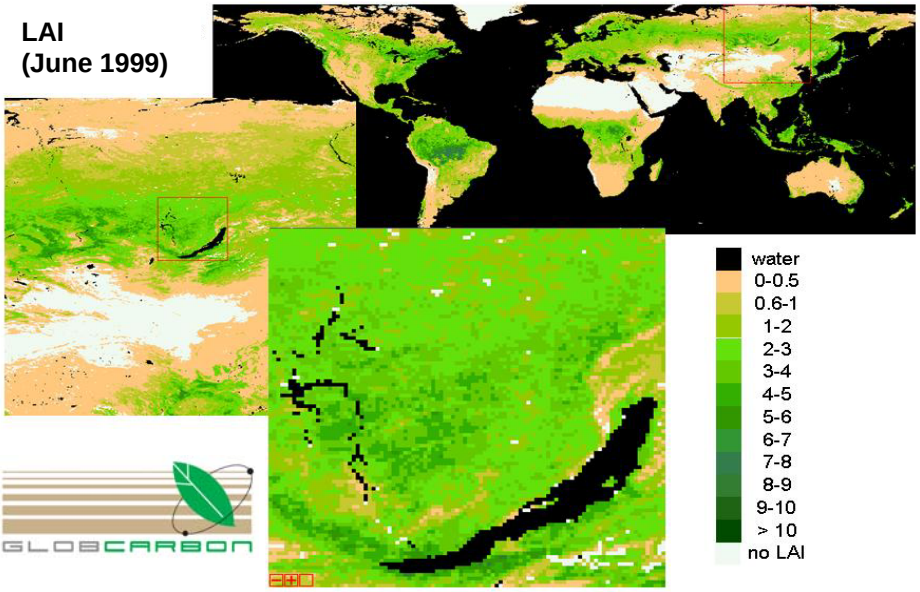

Figure 4: Leaf area index at 10km for June 1999 showing the estimation to be in expected range for the region around Lake Baikal, Siberia *(Source: ESA)*

Methodology

To obtain these products, GLOBCARBON blends data from a total of five European satellite sensors: the VEGETATION instruments on SPOT-4 and SPOT-5, the Along Track Scanning Radiometer-2 (ATSR-2) on ERS-2, plus the Advanced Along Track Radiometer (AATSR) and Medium Resolution Imaging Spectrometer (MERIS) on Envisat.

The processing algorithms used to render raw satellite data into final products have come from a number of authoritative sources: the International Geosphere-Biosphere Programme (IGBP); the European Commission's Joint Research Centre (EC-JRC); the University of Toronto, the Centre d'Etudes Spatiales de la Biosphère (CESBIO) as well as ESA's ESRIN centre in Frascati, Italy. GLOBCARBON beta users comprise the UK Centre for Terrestrial Carbon Dynamics (CTCD); the Laboratoire des Sciences du Climat et l'Environnement (LSCE); the Global Carbon Project (GCP); the Potsdam Institute for Climate Impact Research (PIK); the Max Planck Institute for Meteorology (MPI-M); University of Toronto and the Geoland project. During the January 17th GLOBCARBON progress meeting at ESA/ESRIN, project partners and end-users were informed that products for six complete years are now available, covering the whole of 1998 to 2003. A follow-on phase is planned to cover up to the end of 2007.

GLOBCARBON is being supported through the ESA's Data User Element of the Earth Observation Envelope Programme-2 (EOEP-2), and is one of a family of projects developing satellite-based products and services that support investigations of global and climate change within different elements of the Earth system.

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T E R R A N O R T E

A NEW BOREAL ECOSYSTEMS MONITORING DATA ACCESS FACILITY

Russian Academy of Sciences' Space Research Institute has developed new information system. "TerraNorte" offers information on the status and dynamic of terrestrial ecosystems to a wide Earth Science community interested in the boreal region, with particular, but not exclusive focus at Northern Eurasia.

TerraNorte contains a number of advanced datasets and products derived from Earth Observation techniques, regarding land cover dynamics, natural and human induced ecosystem disturbances and agricultural activity, which grow on both thematic domains and geographical coverage. The TerraNorte's harmonised and unique database provides an important input for studying the interconnected processes of terrestrial ecosystems dynamics and global climate change, modelling of biogeochemical and water cycles, along with information support of international conventions on climate and environment, and natural resources management.

A wide range of thematic products available at TerraNorte, derived with use of Earth Observation instruments from high (Landsat-TM/ETM+, Meteor-3M/MSU-E and etc) to moderate (SPOT-Vegetation, Terra/Aqua-MODIS, Envisat-MERIS) spatial resolution, gives an opportunity to study the boreal ecosystem dynamics on different scales, from local to global. The continuously updated multi-annual time-series of the data products (burnt area, arable land dynamics etc) provide an essential contribution to research studies focused at global change issues.

The TerraNorte web site (http://terranorte.iki.rssi.ru)

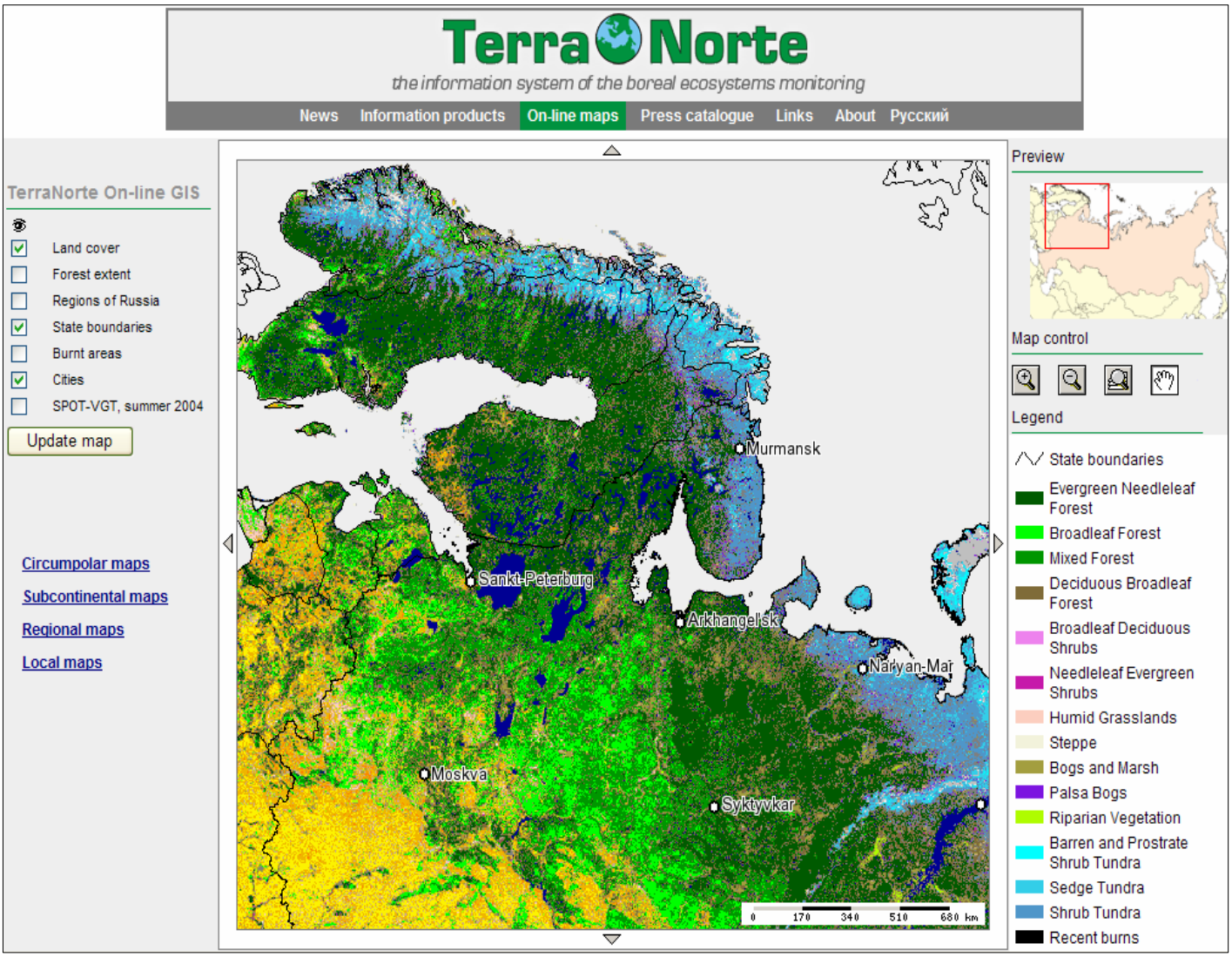
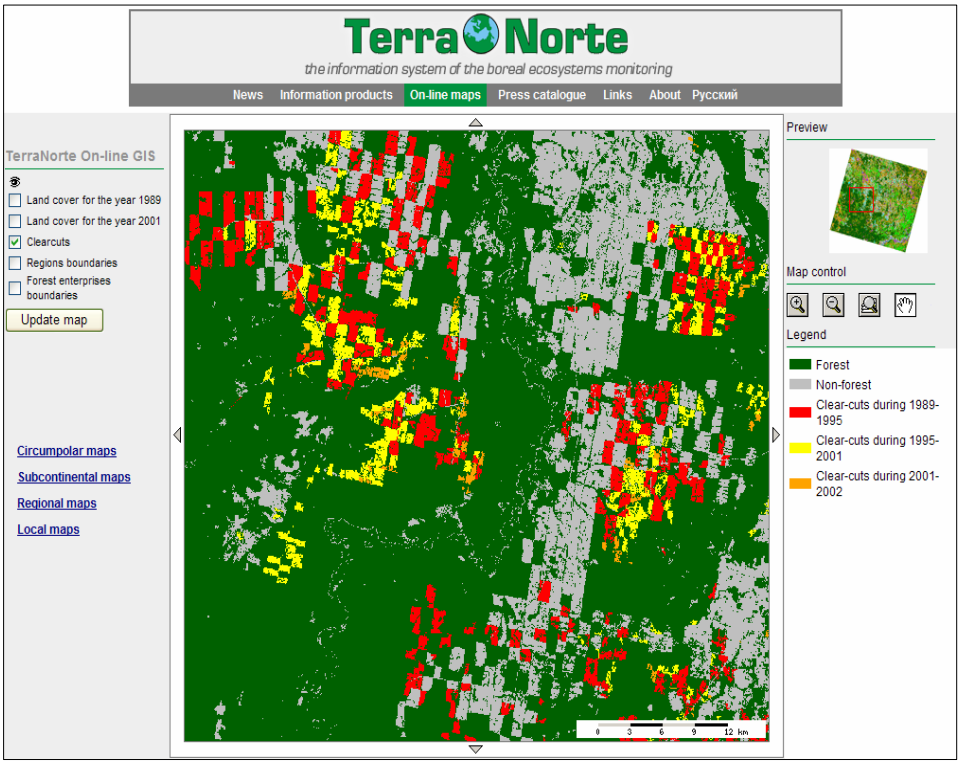


Figure 4: TerraNorte User Interface, online maps.



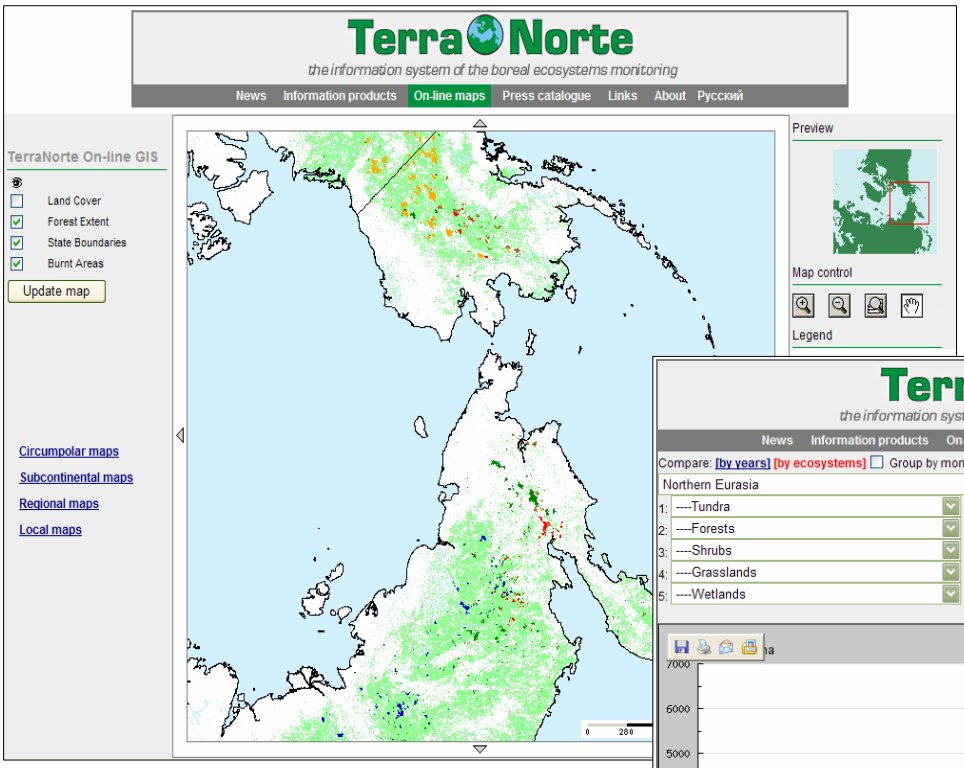


Figure 6: Example for online GIS applications to show clear-cuts between 1998 and 2002 (top) and extent of forest and burnt areas (below).

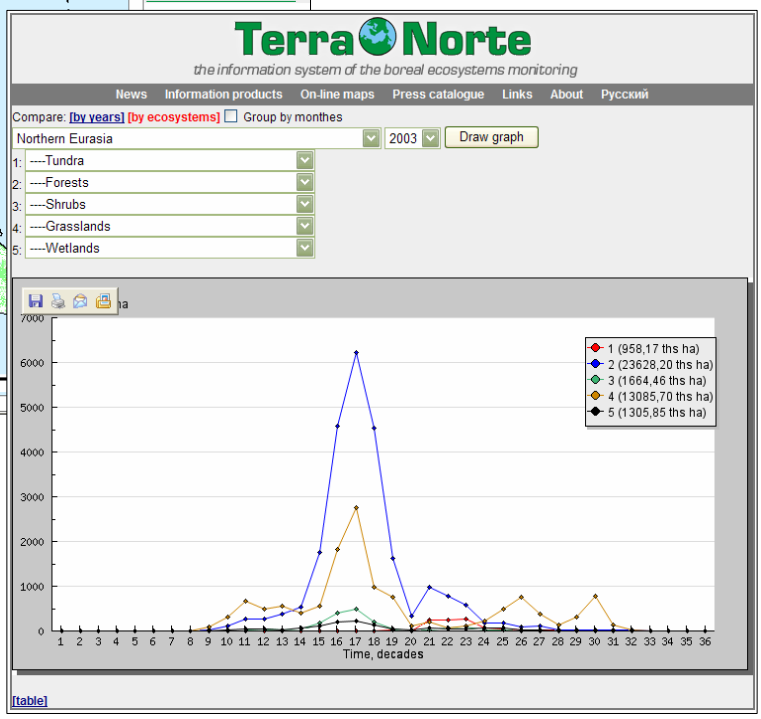


Figure 7: Statistic tool in TerraNorte.

provides an interactive access for users to the data and derived products, as well as to set of flexible tools for on-line visualization of available spatial data and for statistical data retrieval as tables or graphs in various aspects of land cover and ecosystem dynamics. Circumpolar, subcontinental, regional and local levels of databases and web interface have been built upon actual geographical coverage and spatial resolution of available datasets.

The TerraNorte system has been developed with financial support from Russian Foundation for Basic Research (grant #04-07-90263-в).

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SYMPOSIUM ON FOREST AND LAND COVER OBSERVATIONS

21-25 MARCH IN JENA, GERMANY

Organized and hosted by the GOFC-GOLD land cover project office, an international symposium on "Forest and Land Cover Observations" will be held 21-25th March 2006 in Jena, Germany. The symposium is driven by the recent revisions of the overall GOFC-GOLD strategy at the 3rd Scientific and Technical Board meeting in Beijing (2005), and the challenges posed by international activities on strategic and implementation level. Prominent efforts include those of the Group on Observation (GEO), UN conventions including the United Framework Convention on Climate Change (UNFCCC) and the related implementation plan of the Global Climate Observing system (GCOS), the development of the IGOS-P theme for Integrated Global Observations for Land (IGOL), and activities of GTOS, the GOFC-GOLD regional networks, and the UN Global Land Cover Network. The meeting is jointly organized by the GOFC-GOLD Land Cover Project Office Jena and the GOFC-GOLD Project Office Edmonton, Canada.

The meeting will be organized in a number of individual workshops reflecting different GOFC-GOLD activities with different objectives and involving additional international experts and participants in each of the areas of interest. The symposium includes the following four events (see figure 8):

1. Workshop of the GOFC-GOLD working group on monitoring tropical deforestation for compensated reductions;
2. Workshop on monitoring boreal forest ecosystems for international conventions;
3. Fourth GOFC-GOLD Land Cover Implementation Team meeting; and
4. GOFC-GOLD Regional Network meeting.

	Tuesday, March 21st		Wednesday, March 22nd		Thursday, March 23rd	Friday, March 24th	Saturday, March 25th
Day	Workshop of GOFC-GOLD ad hoc working group on Monitoring Tropical Deforestation for Compensated Reductions (Day 1)	Workshop on Monitoring Boreal Forest Ecosystems and Carbon accounting (Day 1)	Workshop of GOFC-GOLD ad hoc working group on Monitoring Tropical Deforestation for Compensated Reductions (Day 2)	Workshop on Monitoring Boreal Forest Ecosystems and Carbon accounting (Day 2)	GOFC-GOLD Land Cover Implementation Team Meeting (Day 1)	GOFC-GOLD Land Cover Implementation Team Meeting (Day 2)	GOFC-GOLD Regional Network Meeting
Evening	*Joint Icebreaker and dinner in Jena Botanical Garden*		*Icebreaker &Dinner at SCALA Jena-tower*		*Conference Dinner*	*Dinner*	*Adjourn*

Figure 8: Overview of GOFC-GOLD Symposium events.

During the symposium, progress will be reported and discussed on the use and refinement of land cover data and information products for resource managers, policy makers, and scientists studying the global carbon cycle and biodiversity loss.

Symposium participants will include the GOFC-GOLD Executive, Land Cover Implementation Team members and regional network representatives, plus invited international specialists in tropical and boreal forest monitoring to help connect and coordinate the LC-IT activities with the larger programmatic and research framework.

More information on the symposium:
Christiane Schmullius: c.schmullius@uni-jena.de or
Michael Brady: MBrady@NRCan.gc.ca.

GOFC-GOLD
Global Observation of Forest and Land Cover Dynamics

Figure 9: View of Jena.

ENSURING THE QUALITY AND RELIABILITY OF LAND AND ATMOSPHERE ESSENTIAL CLIMATE VARIABLES DATA: THE EU-25 CONTRIBUTION

SCIENTIFIC WORKSHOP IN KRAKÓW, 15-16 DECEMBER 2005

The workshop 'Ensuring the Quality and Reliability of Land and Atmosphere Essential Climate Variables: The EU-25 Contribution' was held December 2005, 15-16 in Krakow, Poland. The workshop was organized by the Global Vegetation Monitoring (GVM) unit (recently renamed Global Environment Monitoring or GEM unit) of the Institute for Environment and Sustainability (IES) of the EC Joint Research Centre (JRC).

Background

At its 10th session in Buenos Aires, the Conference of the Parties (COP) of the UNFCCC adopted the Implementation Plan proposed by the Global Climate Observing System (GCOS) to put in place, within a decade, an Earth Observing System suitable to deliver the observations required by climate models. This Plan identified a number of Essential Climate Variables (ECVs) that are deemed critical to understand and predict the dynamics of climate change, to guide policy making and sound resource exploitation, as well as to evaluate the effectiveness of the measures adopted to mitigate or adapt to climate changes. The products and the underlying models must thus be accurate and reliable. The international community launched the Global Earth Observation System of Systems (GEOSS) initiative and Europe itself has invested in the Global Monitoring for Environment and Security (GMES), both of which contribute to the overall goal.

Objectives

The purpose of this workshop was to:

- Review the state of the art in benchmarking the models and tools used to generate ECVs identified in the GCOS Implementation Plan,
- Assess the accuracy and reliability of the products currently available or proposed in this context,
- Quality control these products through a variety of methods, including ensuring the internal consistency of the approaches, the compatibility of products generated from different sensors, and comparisons with independent estimates by other methods, including direct field (in situ) measurements.

Conclusions

The workshop showcased existing projects and achievements in this domain and seeks the involvement of scientists from EU New Member States. The meeting fulfilled its main scientific objective, which included the presentation of a wide and comprehensive overview of benchmark programmes and validation procedures to ascertain the relevance and accuracy of several of the Essential Climate Variables (ECVs) identified in the GCOS Implementation Plan.

In addition to its intrinsic scientific interest, the meeting accomplished two further notable achievements:

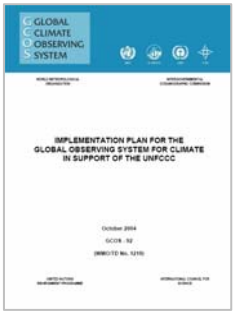
- Bringing together specialists from the EU-15 on one side
- and from the New Member States and neighbouring countries on the other; allowing many of them to have, for the first time, an opportunity to meet and learn about each other's work, and
- Initiating a constructive dialogue on possible future scientific collaborations in support of GMES, especially on issues concerning the terrestrial and atmospheric components of the climate system.

This workshop was attended by representatives from several EU-15 countries as well as many participants from EU-10, Candidate Countries and neighbouring countries, including Russia and Ukraine.

GOFC-GOLD activities and contributions to foster the GCOS implementation plan for improved global land cover observations were represented with a poster.

More information: http://www-gvm.jrc.it/stars/workshops.htm

GCOS Implementation plan: http://www.wmo.ch/web/gcos/Implementation_Plan_(GCOS).pdf



UPCOMING LAND COVER EVENTS

EVENTS / CONFERENCES / WORKSHOPS

March 2006

IGOL Agriculture meeting - Global Agricultural Monitoring in the Framework of GEOSS
Venue: FAO, Rome, Italy
Date: 8-10 March
Info: http://www.fao.org/gtos/meetIGOL1.html

GOFC-GOLD Symposium on Forest and Land Cover Observations
Venue: Friedrich-Schiller-University Jena, Germany
Date: 21-25 March
Info: For further information contact Prof. Christiane Schmullius (c.schmullius@uni-jena.de)

May 2006

ISPRS Commission VII Mid-term Symposium "Remote Sensing: From Pixels to Processes"
Venue: ITC, Enschede, The Netherlands
Date: 8-11 May
Info: http://www.itc.nl/isprsc7/symposium2006

GOFC-GOLD will organize and host a special session during this event.

Reducing Emissions from Deforestation in Developing Countries
Venue: Bad Blumau, Austria
Date: 10-12 May
Info: http://www.joanneum.at/REDD/

GI2006-SYMPOSIUM - GeoINSPIRE'd EU-X-border-GI&SDI in Europe of Regions
Venue: Dresden, Germany
Date: 11-12 May

26th EARSeL Symposium 'New Developments & Challenges in Remote Sensing', Workshop on Geohazards
Venue: Warsaw, Poland
Date: 29 May- 02 June
Info: http://www.earsel.org/

June 2006

2nd International Conference on Land cover /Land use study using Remote Sensing and Geographic Information System
Venue: Ulaanbaatar, Mongolia
Date: 8-9 June
Info: For further information contact Dr. Renchin Tsolmon (tsolmon@num.edu.mn)

For this conference, GTOS and GOFC-GOLD will organize a capacity building event on evolving standards in land characterization.

EVENTS / CONFERENCES / WORKSHOPS

July 2006

2006 IEEE International Geoscience and Remote Sensing Symposium
Venue: Colorado, USA
Date: 31 July – 04 August
Info: http://www.igarss06.org/

GOFC-GOLD will be represented with a booth

September 2006

2nd Workshop of the EARSeL Special Interest Group on Land Use
Venue: Universitätsclub Bonn, Germany
Date: 28 - 30 September
Info: http://www.zfl.uni-bonn.de/earsel/earsel.html (Submission of abstracts by 15 May 2006)

During this meeting GOFC-GOLD will organize a tutorial on evolving standards in land characterization. Issues to be discussed:

- UN LCCS as common land cover language and legend translator
- Guidance for mapping projects in land cover harmonization and legend development/translation
- Harmonization and validation: acquisition of in-situ and land cover reference data and CEOS Cal-Val validation standards.

October2006

2nd Göttingen GIS&RS Days "Global Change Issues in Developing and Emerging Countries"
Venue: Göttingen, Germany
Date: 4–6 October
Info: http://www.ggrs.uni-goettingen.de/

THE ESA GOFC GOLD LAND COVER PROJECT OFFICE NEWSLETTER:

The Newsletter is distributed free of charge to all members listed in the ESA Land Cover Project Office database. To update your information, to subscribe or to be removed from our database, please contact us or visit the newsletter website:

http://www.gofc-gold.uni-ena.de/sites/letter.html

If you have any suggestions or recommendations for future contributions in this Newsletter please feel free to contact us.

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