



Progress Report on I G O L

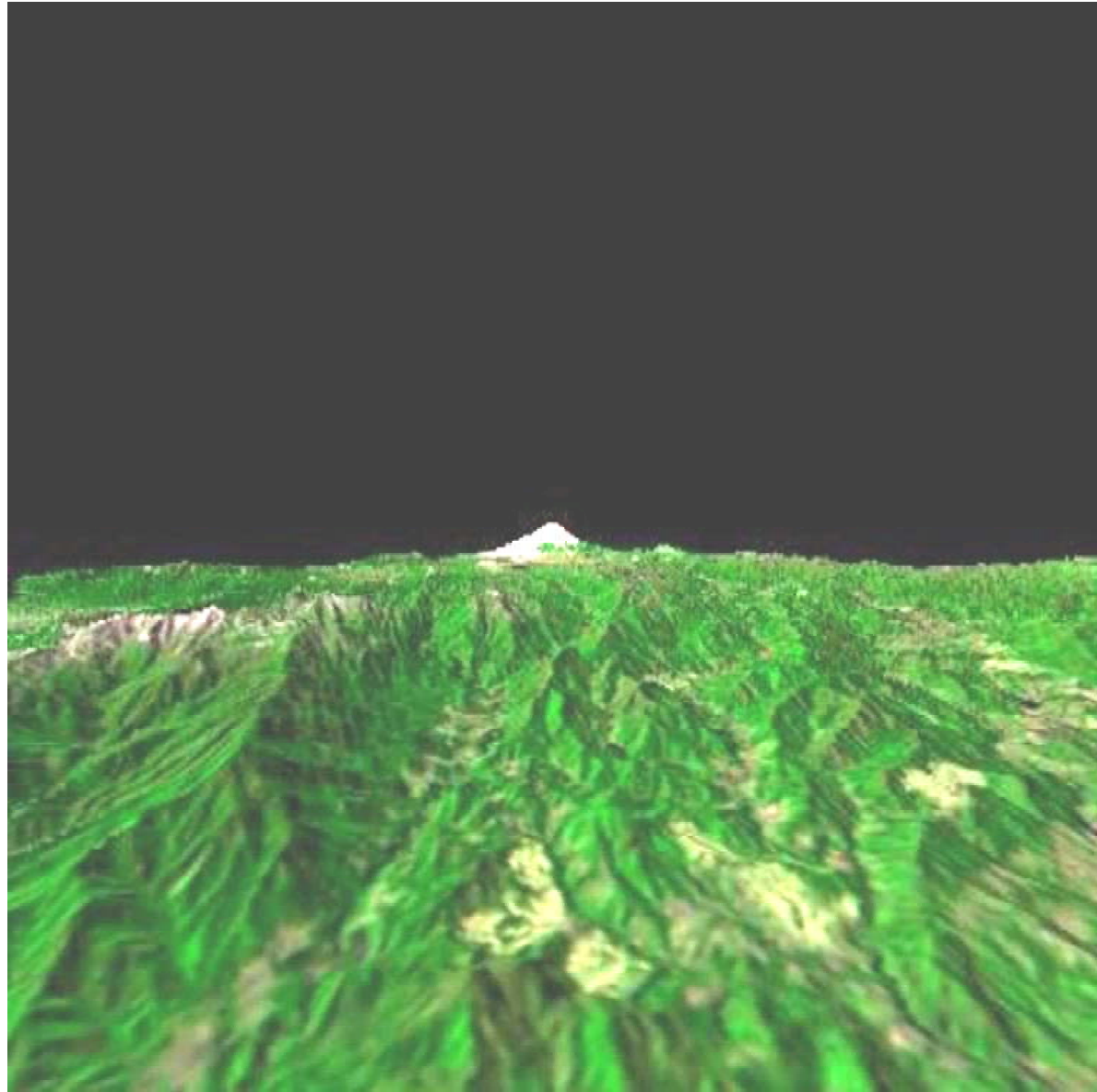
Integrated Global Observations of the Land

The need for a Land Theme

- IGOS-P had not considered the observational needs relating to many aspects of the land
 - Sustainable economic development,
 - Natural resources management,
 - Conservation and biodiversity
 - Ecosystems
 - Functioning
 - Services
 - Multilateral environmental agreements.
 - development, implementation mandatory reporting and monitoring.
- The World Summit on Sustainable Development pointed to the need to *"Promote the development and wider use of earth observation technologies, including satellite remote sensing, global mapping and geographic information systems, to collect quality data on environmental impacts, land use and land -use changes."*

The main components of a Land theme

- Land Cover and Land Use
- Human settlement and population
- Managed ecosystems
 - Agriculture, pastoralism, forestry
- Conservation,
 - biodiversity, sustainable use.
- Soils
- Elevation



IGOL

- IGOL Theme adopted formally at IGOS-P 11 in Rome, May 27, 2004
- Team Organization
 - Planned team organization, activities and budget
 - Formed a team from interested partners and internationally recognized experts
- 1st IGOL Team Meeting- Sept 13-15, 2004 at FAO:
 - Defined the scope of IGOL theme and built consensus among team members on theme topics
 - Agreed on work organization and timeline

IGOL Partners

Co-chairs



Technical inputs (includes)



Sponsors



IGOL Team members

Co-chairs

- John Townshend (GOFC-GOLD)
- John Latham (GTOS)

- Olivier Arino (ESA)
- Roberta B. Miller (CIESEN)
- Alan Belward (GCOS)
- Dennis Ojima (IGBP)
- Jay Feuquay (USGS)
- Ake Rosenqvist (JAXA)
- Tony Janetos (Heinz Center)
- Christiana Schmullius (GOFC/GOLD)
- Chris Justice (GOFC/GOLD)
- Ashbindu Singh (UNEP)
- Jiyuan Liu (CAS)
- Jeff Tschirley (FAO)

Deciding what to include and not to include

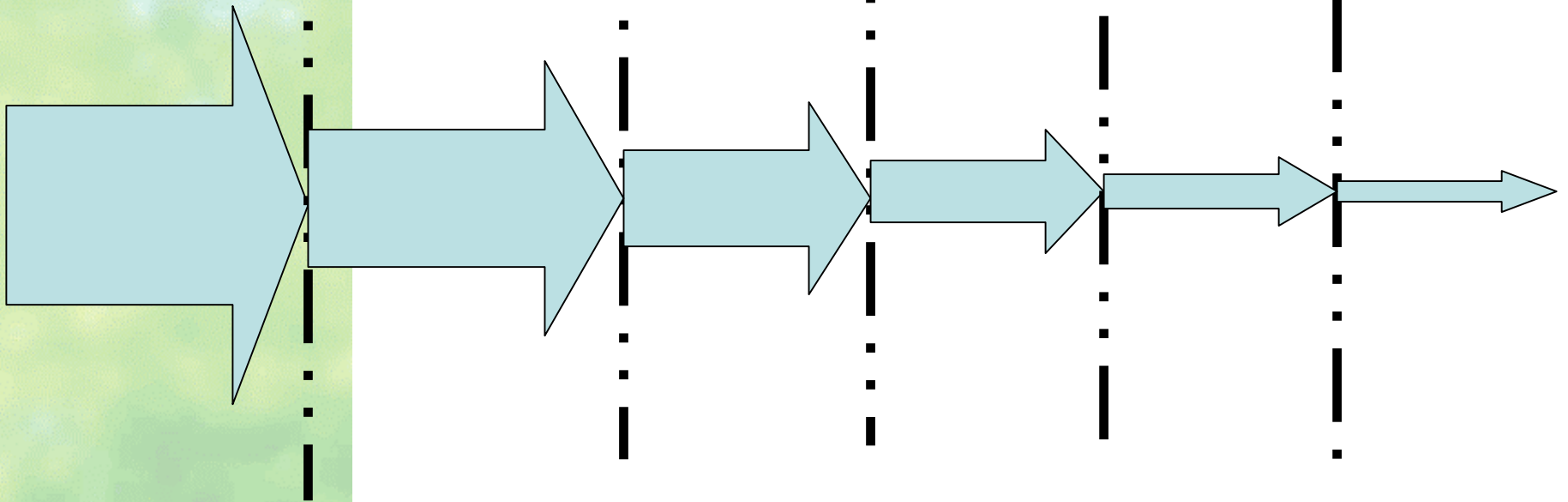
Global scale or
the local benefit
from global scale

Case has been
made in IGOS-P
documents

IGOS-P
can help

Spatially
disaggrega-
-ted

Realistic chance of
being implemented



STAKE-HOLDERS

- International Requirements
 - Environmental Assessment
 - Global, regional, sectoral
 - Early Warning
 - Food security
 - Sustainable agriculture, forestry and fisheries
- International Environmental Conventions
- Decision-makers at National Level
- Natural Resource Managers
- NGO's
- Evolving Scientific Requirements (IGBP, WCRP, IHDP).
 - Scientific focus on coupled human environmental systems

Requirements

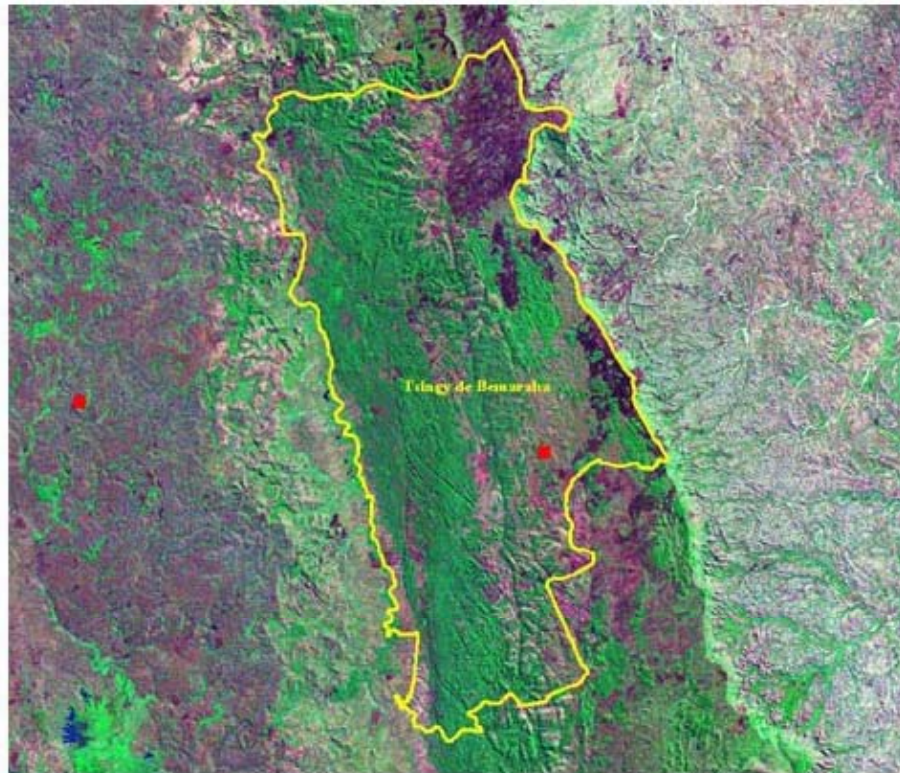
- Food Security And Sustainable Development
- Sustainable Forestry
- Early Warning Systems
- Biodiversity And Conservation
- Ecosystem Services
- Land Degradation
- Fire And Related Hazards (Including Air Quality)
- Climate
- Real Time Response Systems



CONSERVATION
INTERNATIONAL



E-mail based alert system for protected areas



Example of an e-mail alert attachment showing
fires in the Tsingy de Bemaraha Reserve,
Madagascar

MAIN TYPES OF MEASUREMENTS NEEDED

- Land Cover.
 - Much improved Global and Regional Products becoming available
- Land Use.
 - Socio Economic Inputs to Land – e.g. Tenure, Rotation, Fertilizers, Management Etc.
- Population Distribution.
 - Important Contribution of “City Lights” Products
- Soils.
- Topography.
 - Recent Major Improvements
- Plus many others from other Themes (e.g. Carbon, Water)

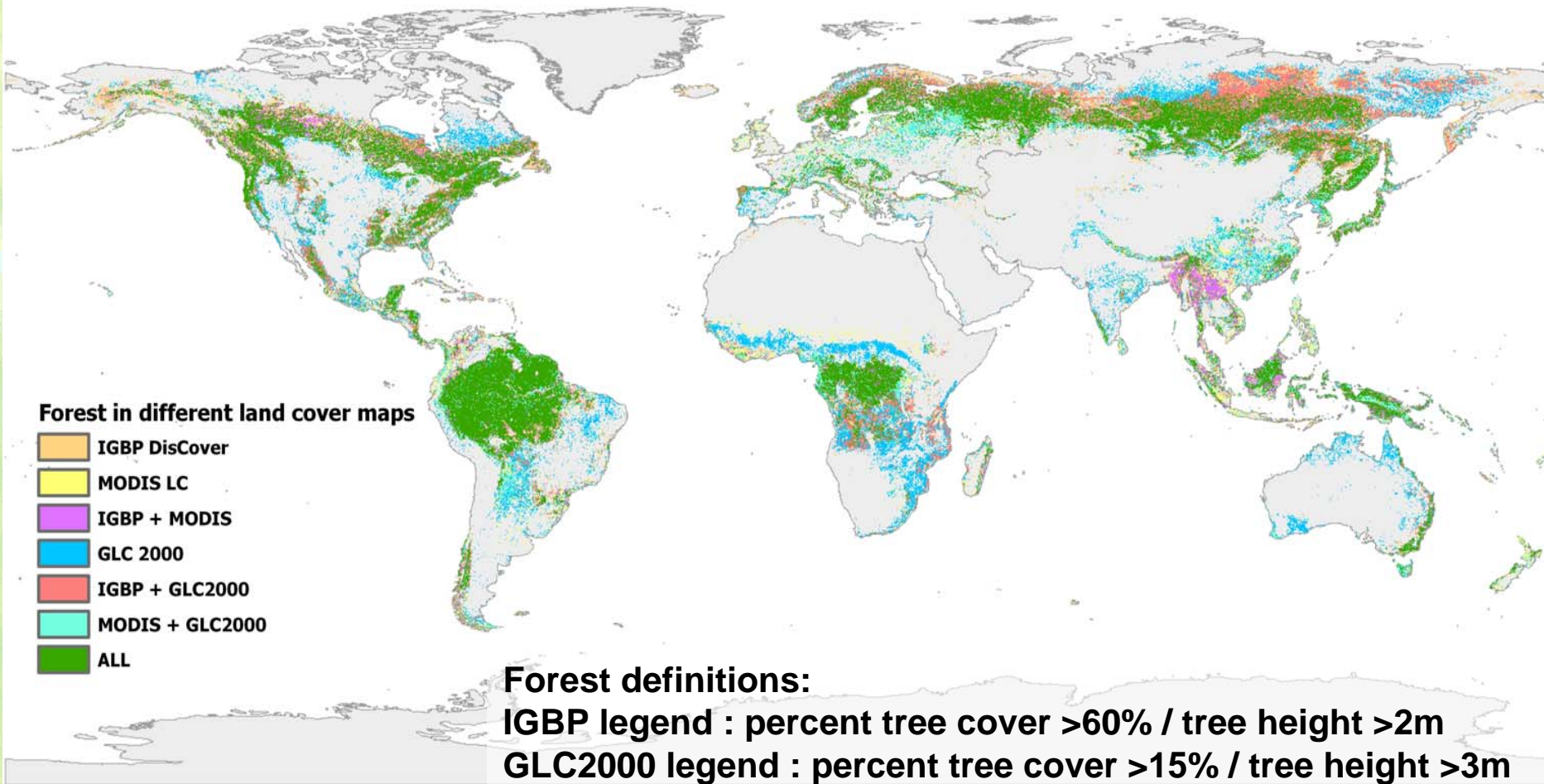
Water observations relevant to IGOL

- Soil moisture
- ET
- River discharge
- River networks
- Flood monitoring
- Wetlands
- Ground water resources
- Irrigation
- Problems of scale and resolution.
 - Uses of water observations include agricultural applications where the management unit is the farm or field

Remote Sensing – Key Needs

- Many necessary satellite systems exist or will do.
 - Moderate resolution optical – satisfactory to very good.
 - NPOESS/VIIRS and many other systems.
- Several significant deficits
 - Deficiencies in Landsat observations in short to medium term.
 - Operational Landsat capability to be placed on NPOESS
 - Need for use of international assets to substitute for Landsat for several years (Aster, CBERS, IRS-1, SPOT-HRV).
 - Very fine resolution systems for scaling and human infrastructure (non-commercial capability).
 - Radar systems with appropriate acquisition strategies.
 - Lidar systems for vegetation structure.
 - Lack of validation activities

Forest areas in global land cover maps



Framing harmonization

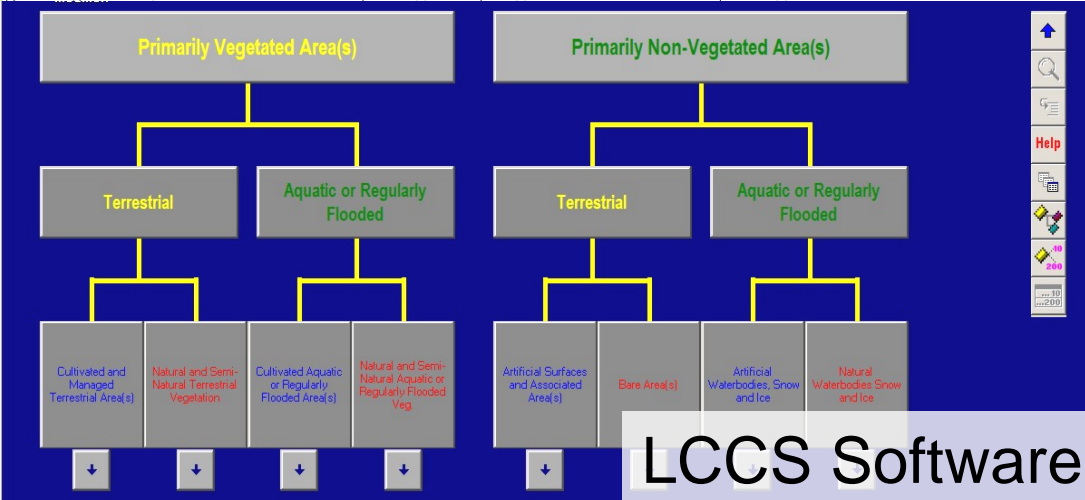
- Union of similarities in existing definitions
- “Bottom up process” - from an existing divergence to a state of comparability/compatibility
- Originally strong push for single lc/lu legend
- Too much standardization reduces application relevance
- Standardizing terminology rather than categories
- W/S: FAO/UNEP 1994, GOFC-GOLD 2004 (Jena/Rome)
- Problems in harmonizing land cover semantics:
 - Unclear thematic definitions (e.g. spectral classes)
 - Confusion between classification system and legend (e.g. mixed units)
 - Mix of land use/cover terms
 - Internal unbalance/inconsistency in legends

MODIS LC



Translations:
Legend/Legend
Legend/Application

Color	IGBP class	LCCCode	LCCLLevel	LCCLLabel
	Evergreen needleleaf forests	20092	A3A10B2XXD2E1	Needleleaved Evergreen Trees
	Evergreen broadleaf forests	20089	A3A10B2XXD1E1	Broadleaved Evergreen Trees
	Deciduous needleleaf forests	20093	A3A10B2XXD2E2	Needleleaved Deciduous Trees
	Deciduous broadleaf forests	20090	A3A10B2XXD1E2	Broadleaved Deciduous Trees
	Mixed forests	20006(1)[Z1]	A3A10B2Z1	Closed Trees
	Closed shrublands	20018-13476	A4A10B3-B9	Closed Medium High Shrubland (Thicket)
	Open shrublands	20022-13476	A4A11B3-B9	Open Medium High Shrubs (Shrubland)
	Woody savannas	20317-1	A3A11B2XXXXXXF2F4F7G4-A12	((70-60) - 40%) Woodland with Herbaceous Layer
	Savannas	20014-3012	A3A11B2-A13	Open (40 - (20-10)%) Trees (Woodland)
	Grasslands	21453	A2A20	Herbaceous Closed to Open Vegetation
	Permanent wetlands	0007	A24	Natural And Semi-Natural Aquatic or Regularly Flooded Vegetation
	Croplands	10025	A3	Herbaceous Crop(s)
	Urban and built up lands	5001	A1	Built Up Area(s)
	Cropland/natural vegetation mosaics	10025 / 0004	A3 / A12	Herbaceous Crop(s) / Natural And Semi-Natural Primarily Terrestrial Vegetation



LCCS Software



In situ Observations – Key needs

- Vast quantities of in situ data are collected
- Numerous problems
 - Lack of internationally agreed standards and protocols.
 - Lack of long term records for many variables
 - Sharing of data often restricted.
 - Many observations not collected operationally.

Product generation

- Key need for agreement on international standards for validation of most products.
- Need for systematic *implementation* of validation activities.
- For land cover and land use need for harmonization of approaches and resultant products.
- Much improved global soils information possible with modest additional resources.
- 30m spatial resolution topographic data from SRTM highly desirable.
 - Readily available only for the US

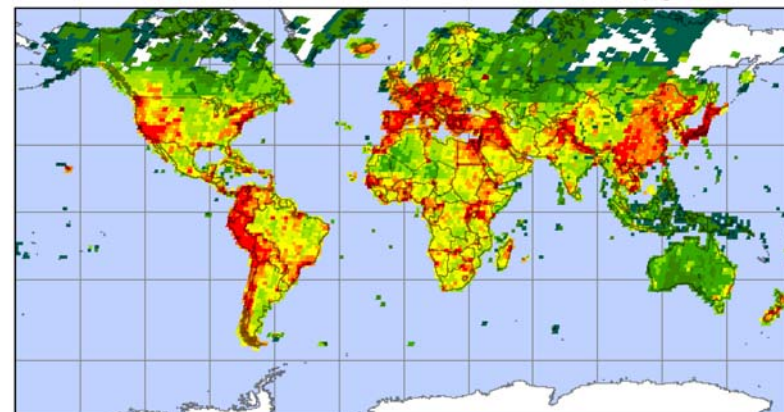
Data Delivery: Landsat Data from the Global Land Cover Facility

- Substantial increase in data use:
 - Data on-line
 - Data readily accessible
 - Appropriate format for users
 - Free
- 30,000 scenes downloaded per month
- (USGS max 16,000 scenes in a year)

Unique TM and ETM+ Landsat
Downloads At GLCF by WRS-2
27 Aug 2002 - 26 Apr 2004



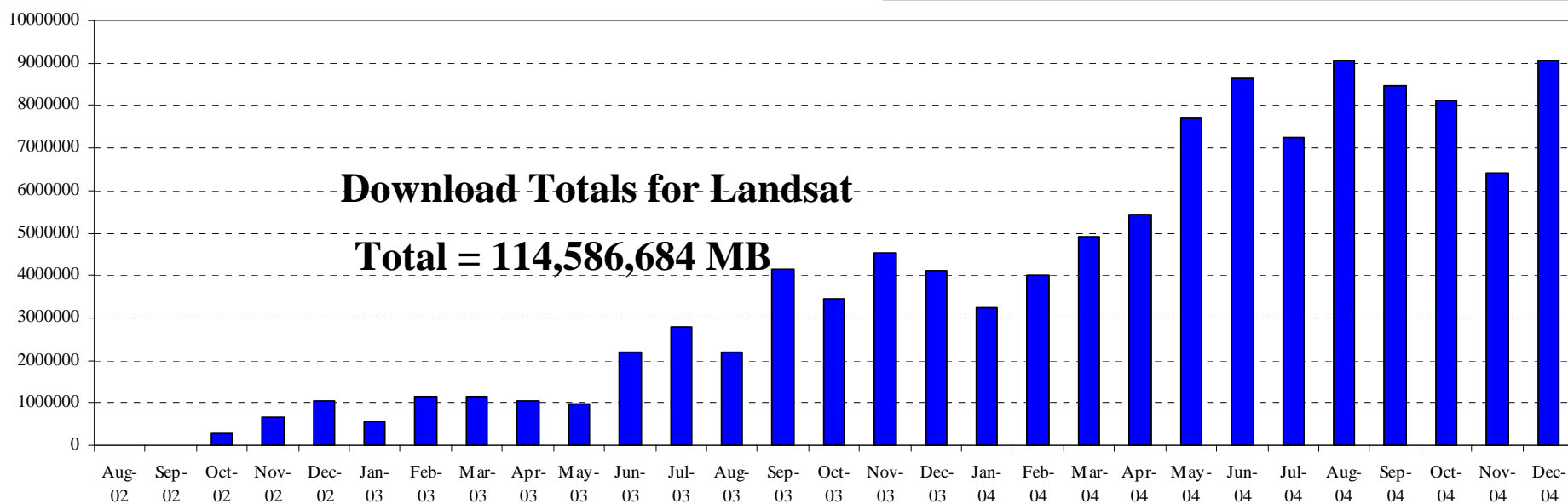
Global Land Cover Facility
<http://glcf.umd.edu>



Notes:
An access to a WRS-2 path/row by an IP address is considered to be a unique download. Subsequent downloads from the same IP address for the same WRS-2 path/row are not included. This map shows actual downloads from the servers and does not reflect Landsat coverage or availability over time.

Download Totals for Landsat

Total = 114,586,684 MB



1st cut at priorities

- Global high resolution wall to wall map, annual, multiyear, land cover and land cover change
- Ensured Data Continuity - operational Landsat-class with equivalent Long Term Acquisition Plan
 - Missions or coordinated international acquisition prior to 2010;
 - Enhanced data access (cost issue)
- Enhanced hyperspatial data availability
 - Kyoto Goal - systematic global, . 5ha, 10m, 24hr revisit
- Near Real Time/ Rapid Response /Alert/ Detection e.g.
 - LCC/Disturbances/Crop condition (hrs)
 - Fire. Floods, drought
 - Early warning of crop pests and drought (High Temporal, SAR Soil Moisture/Hyperspectral Condition and Pests)

1st cut at priorities

- Multi-stage Sampling of Global Land Use
 - (inc. In-situ, RS Land Cover)
- Global 30m DEM
- Urban and Rural Settlement and Infrastructure Products
- Enhanced, georeferenced, disaggregated (gridded) population data
- Enhanced capacity to process, assemble, analyze observations from multiple sources (satellite, in-situ, survey)
- Development of improved Agricultural Monitoring
 - Seasonal/Annual - crop acreage, cropping type, types and distribution, crop growth condition and yield (combination of optical and microwave - issue of SAR continuity)

Cross-cutting issues

- Long term archiving and retrieval, which is also required for monitoring change.
- Funding for re-analysis of data.
- Dynamic continuity of multi-source products.
- Product Validation (standards, protocols)
- Data costs
- Balance between in-situ and satellite support.
- Harmonization of classification systems, data formats and projections.
- Data integration /assimilation (modeling):
- and sustainable infrastructure for data use and monitoring (at national and international level).
- Socioeconomic data and privacy.

Timeline

- September 2004 1st meeting of Team: Agreement on the scope of IGOL
- January 2005 the first preliminary statement made of needed enhancements.
- March 2005 the first draft of plan.
- June 2005 2nd Meeting of Team, USGS Reston.
- September 2005 3rd Meeting of Team, Beijing
- December 2005 - final report submitted.

1st IGOL Meeting

- Review of requirements
 - UNEP and Millenium Development Goals
 - FAO
 - IGBP
 - GOFC/GOLD
 - GCOS/GTOS TOPC
 - MA (Conservation and biodiversity)
 - Soils requirements
 - Socio-economic requirements.
- Review of Capabilities (especially in relation to remote sensing capabilities)
- Identification of deficiencies

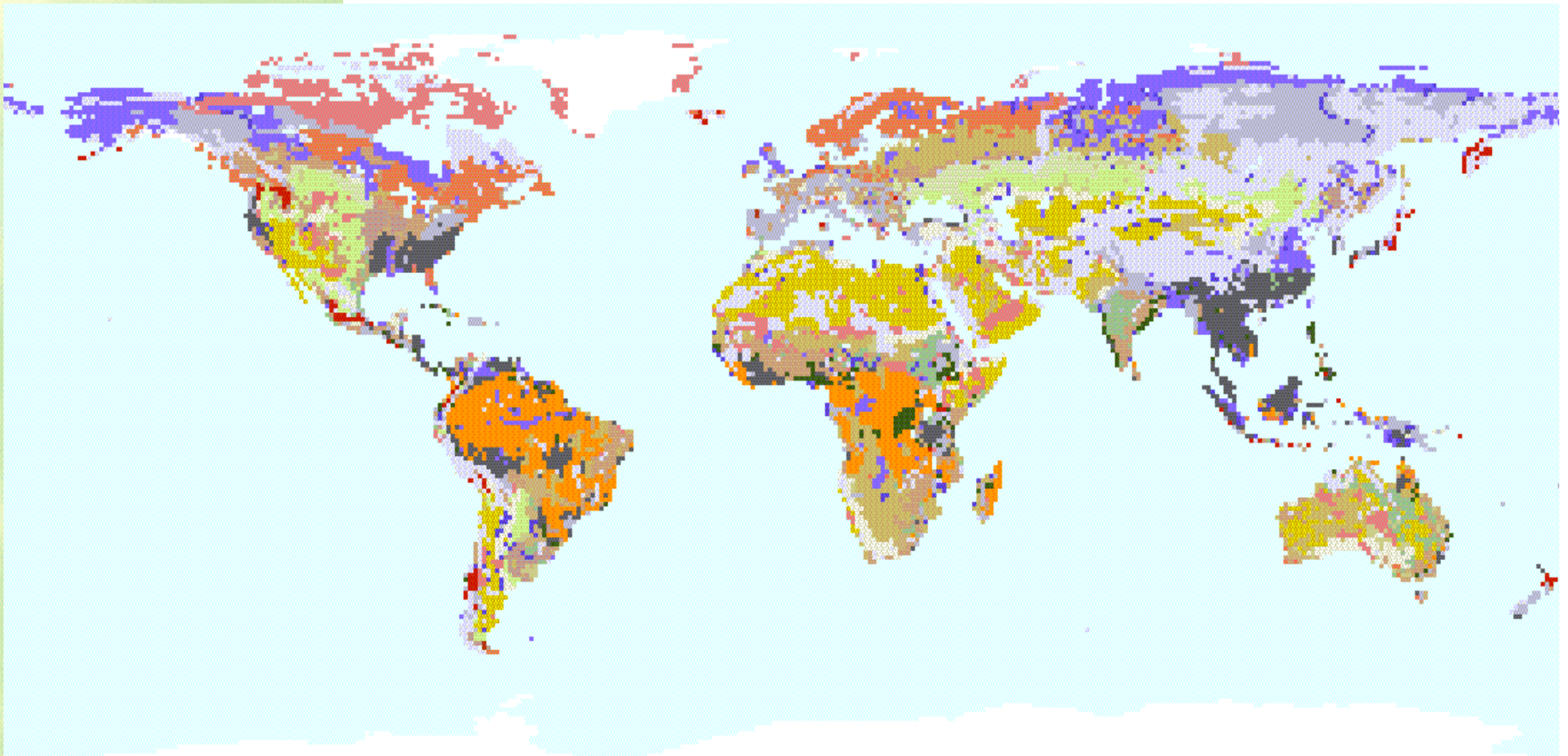


Thank you

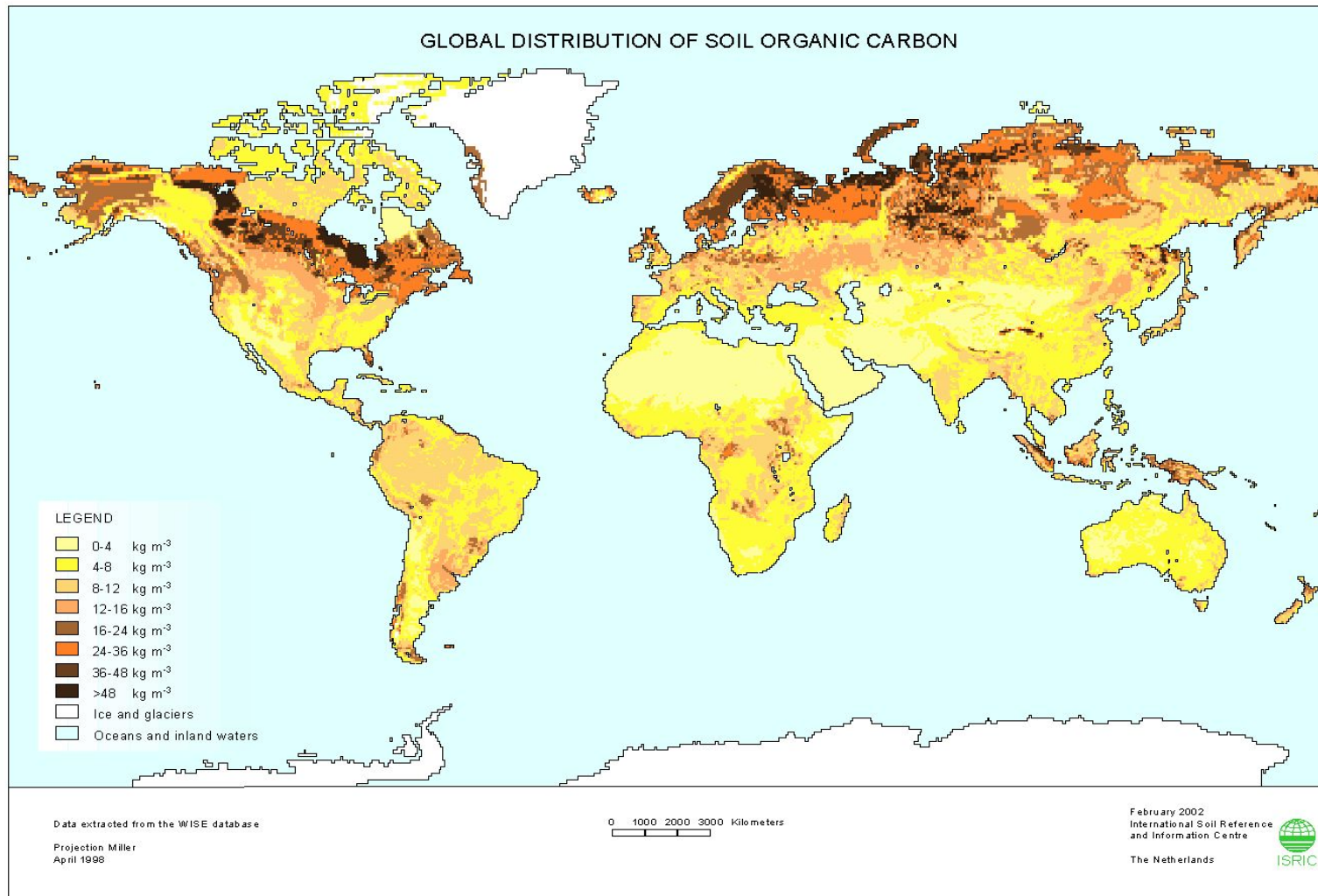
Soils Needs

- The FAO soil map of the world remains the only harmonized global dataset on soils**
- Harmonized more detailed datasets are regionally available in SOTER format.**
- ISRIC's WISE-2 soil profile database is the most comprehensive one containing nearly 10 000 soil profiles, most of them georeferenced.**
- An increasing problem with data availability linked to a misguided “protection” of research results by stringent copyright and distribution provisions, particularly in Western Europe but also in other parts of the world hampering expansion and renewal.**
- Soil Maps, SOTER databases and WISE soil profile databases cannot be used as Base line Information but they are extremely useful for extrapolation of results when stratified sampling schemes are proposed.**
- Soil monitoring where undertaken is a slow and expensive process. Little agreement exist to-date on which parameters to sample as a priority and under which sampling scheme. The TEMS scheme is one example but is not systematic nor universal.**
- The LADA (Land Degradation Assessment in Drylands) project may provide supplementary data.**

- 1981** Publication of the last sheet of the paper map (Europe)
- 1984** ESRI digitizes the map and other information in vector format
- 1989** Zöbler produces a 1° x 1° raster version



- 1991** **FAO produces an Arc/Info vector map including country boundaries**
- 1993** **ISRIC produces a 30' x 30' raster version under the WISE project.**
- 1995** **ISRIC produces a 30' x 30' raster version with derived soil properties**



- 1995** **FAO produces a CD ROM with a global vector map and derived soil properties with a 5' x 5' resolution as raster.**
- 1998** **FAO-UNESCO re-issues the digital version with derived soil properties**



More information on this product is available at
<http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGL/lwdms.htm>

Work Plans

- Develop Statement on enhancement needs – get consensus of drafts (Nov/Dec) – Chair / Secretariat
- Pull together and summarize needs/requirements from existing programmes requirements studies for biodiversity, soils, land degradation, food security, health, wetlands (Oct - Dec) – Secretariat
- Writing assignments for Team Members to Draft Specific Sections (Nov- Feb)
- Next Meeting (March/April– offers from USGS/NRSCC/ESA)
- First Draft of IGOL Theme Report to be completed by July '05
- Document Submitted Dec 05

LU information requirements

Selected information requirements UNFCC, Kyoto Protocol	Required LU data		
	<i>Goods</i>	<i>Services</i>	<i>Mgmt.</i>
Forest & wooded land (unmanaged)	+	+	
Forest & wooded land (managed)	+	+	+
Cropland	+	+	+
Pasture (improved grassland)	+	+	+
Wetland	+	+	
Settlements (villages, urban)	+	+	
Other land	+	+	
Cropland/ grazing land management;	+	+	+
Long-term cultivated; improved pasture, unimproved pasture, new set aside, old set aside, wetland/paddy, shifting agriculture, abandoned/ degraded	+	+	+

IGOL Sub Themes

- Land Cover and Change
 - Inc. Water bodies, Wetlands, Albedo
- Land Use and Change
 - Urban / Human settlement and population
 - Agriculture
 - Pastoralism
 - Forestry
 - Related Human Health issues
- Conservation and biodiversity
- Soils – incl. Degradation
- Elevation; administrative boundaries; coastlines

Harmonization mechanisms

- Harmonization resources:
 - **Capacity building and web-based resources (LCCS)**
 - **Raise awareness and foster use of harmonized products**
- Harmonization experiences for existing datasets:
 - **Develop legend translation protocols/case studies**
 - **Translated legends:**
IGBP/CORINE/GLC2000/Anderson/IPCC ...
 - **Compatibility/Comparability of datasets**
- Harmonization in future mapping products:
 - **Impact on future projects and operational programs**
 - **Standardized legend generation (e.g. MERIS products)**