Global land cover validation activities

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www.fao.org/gtos/gofc-gold
www.gofc-gold.uni-jena.de

GTOS

GOFC-GOLD

Global Observations of Forest Cover and Land Dynamics

What is GOFC-GOLD?

- GOFC-GOLD is a coordinated international effort:
  - to ensure a continuous program of space-based and on-the-ground forest and land cover observations for global monitoring of terrestrial resources and the study of global change.
- A technical panel of the Global Terrestrial Observing System (GTOS)
- A network of participants implementing coordinated research, demonstration and operational projects
- A vision to share data, information and knowledge, leading to informed action and decision support
- A long term process of building an improved match between Observations, Data Products and User Needs
- GOFC-GOLD operates through:
  - Executive committee, Science and technical board
  - Implementation teams and 3 project office (CA, US, Germany)
  - Dedicated working groups
  - 6 Regional networks

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Overview

1. Political initiatives driving observation progress and needs for validation
2. Global land cover observations and accuracy assessments
   - Standard methods (CEOS protocols)
   - New datasets: GLOBCOVER validation
   - Comparative validation / best map prototype
3. Accuracy assessment for fine-scale land cover change and area estimates

International drivers

1. United Framework Convention on Climate Change:
   - Reduce uncertainties in monitoring the global climate system through observing essential climate variables
   - Capacity building needs to address stronger role of developing countries in post-2012 agreement
     - Major REDD readiness funds are currently being allocated
2. Group on Earth Observation (GEO) task DA-07-02:
   - Provide a suite of global land cover datasets, initially based on improved and validated moderate resolution land cover maps and eventually including land-cover change at high resolution (task co-lead by USGS and GOFC-GOLD)
3. Global land cover monitoring and assessments:
   - GLOBCOVER, FAO-Forest Resources Assessm. 2010
   - Operational validation / Efforts for deriving “Best map”

DA-07-02 key activities

2006 2007 2008 2009 2010

Global level

Strategies (IGOS): Integrated Global Observations for land (IGOL)

Integration of IGOL into GEO

Standards: LCCS land cover classifiers and validation procedures

Harmonization: "best" available map

New global products: GLOBCOVER (link to regional level)

Continuity of observations:

Mid-decadal global Landsat survey (MDGLS) Global Land Survey 2010

Specifications for fine-scale global land cover change dataset (incl. validation framework)

Technical guidance for UNFCCCC/REDD (GOFC-GOLD sourcebook)

Capacity building and support of global assessments:

GLCN + GOFC-GOLD networks / FAO-FRA global remote sensing survey

National level

Observing Essential Climate Variables (ECVs)

Terrestrial ECV	Observing System (i.e. ESA, others)
River Discharge	In situ networks,
Water Use	In situ networks, regional remote sensing activities
Groundwater	In situ networks,
Lake and Reservoir Levels & Volumes	In situ networks, regional remote sensing activities
Snow Cover	GLOBSNOW
Glaciers and Ice Caps	GLOBGLACIER
Permafrost	Regional activities (i.e. circum-arctic)
Albedo and Reflectance Anisotropy	GLOBALBEDO
Land Cover	GLOBCOVER, MODIS land cover
Fraction of Absorbed Photosynthetically Active Radiation (FAPAR)	GLOBCARBON, MODIS and Seawifs products
Leaf Area Index	GLOBCARBON, MODIS products
Biomass	Regional activities, e.g. Siberia
Fire Disturbance	Several global products from AATSR or MODIS
Soil moisture	SMOS satellite mission

GCOS implementation plan actions for land cover

1. Establish international standards (T22)
   - UN Land Cover Classification System (LCCS) classifiers
2. Methods for map accuracy assessment (T23)
   - CEOS WGCV/GOFC-GOLD best practices report
3. Continuity for fine-scale satellite observations (T24)
   - Commitments to operate Landsat 8 (US) and Sentinel 2 (EU)
4. Develop an *in situ* reference network (T25)
   - Global operational validation implementation plan


Annual global land-cover products (T26)

- Release (and continuation) of GLOBCOVER

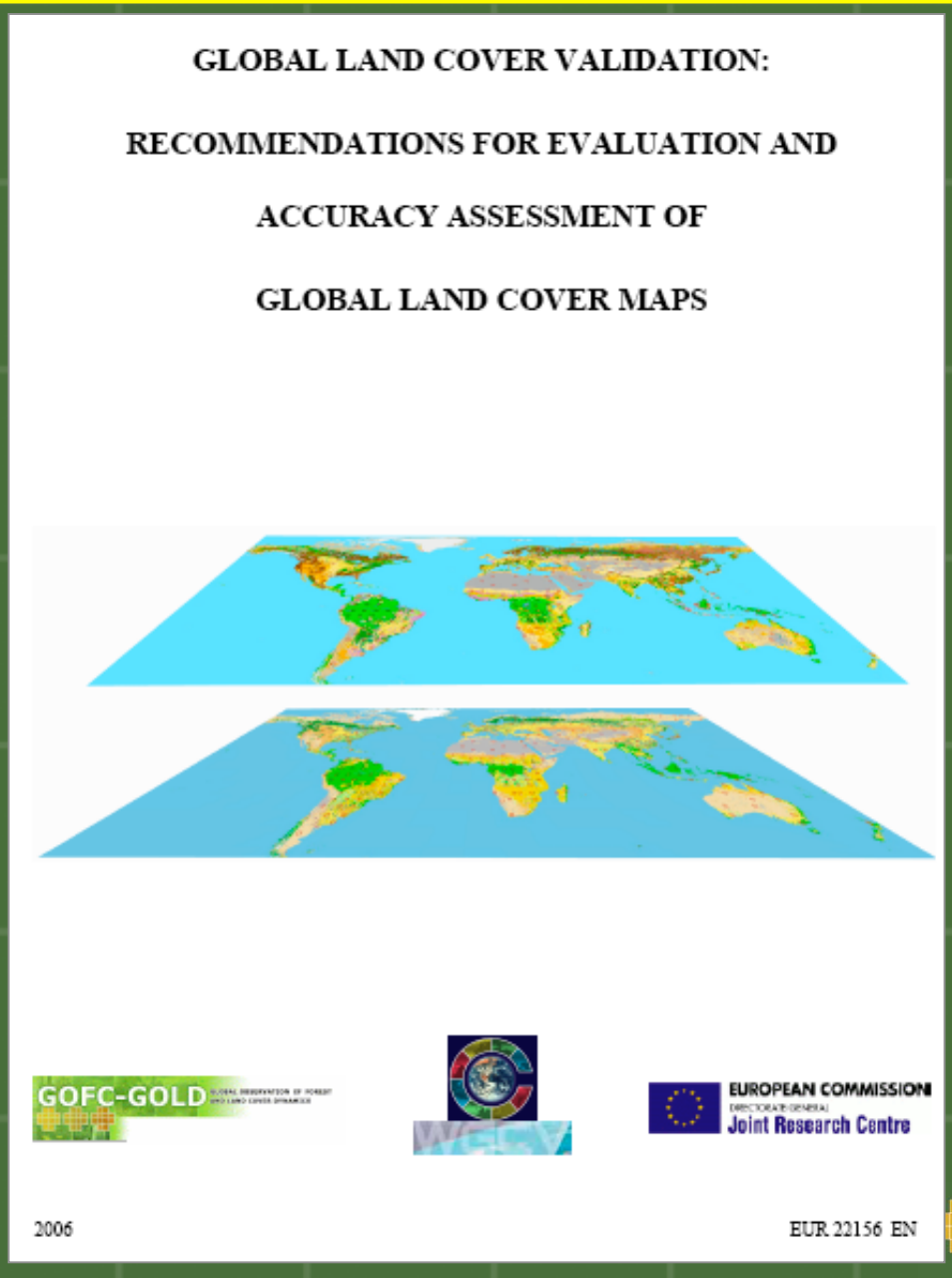

High-resolution global land cover change (T27)

- FAO/FRA 2010 global sampling & GEO definition of specifications

International consensus on technical issues

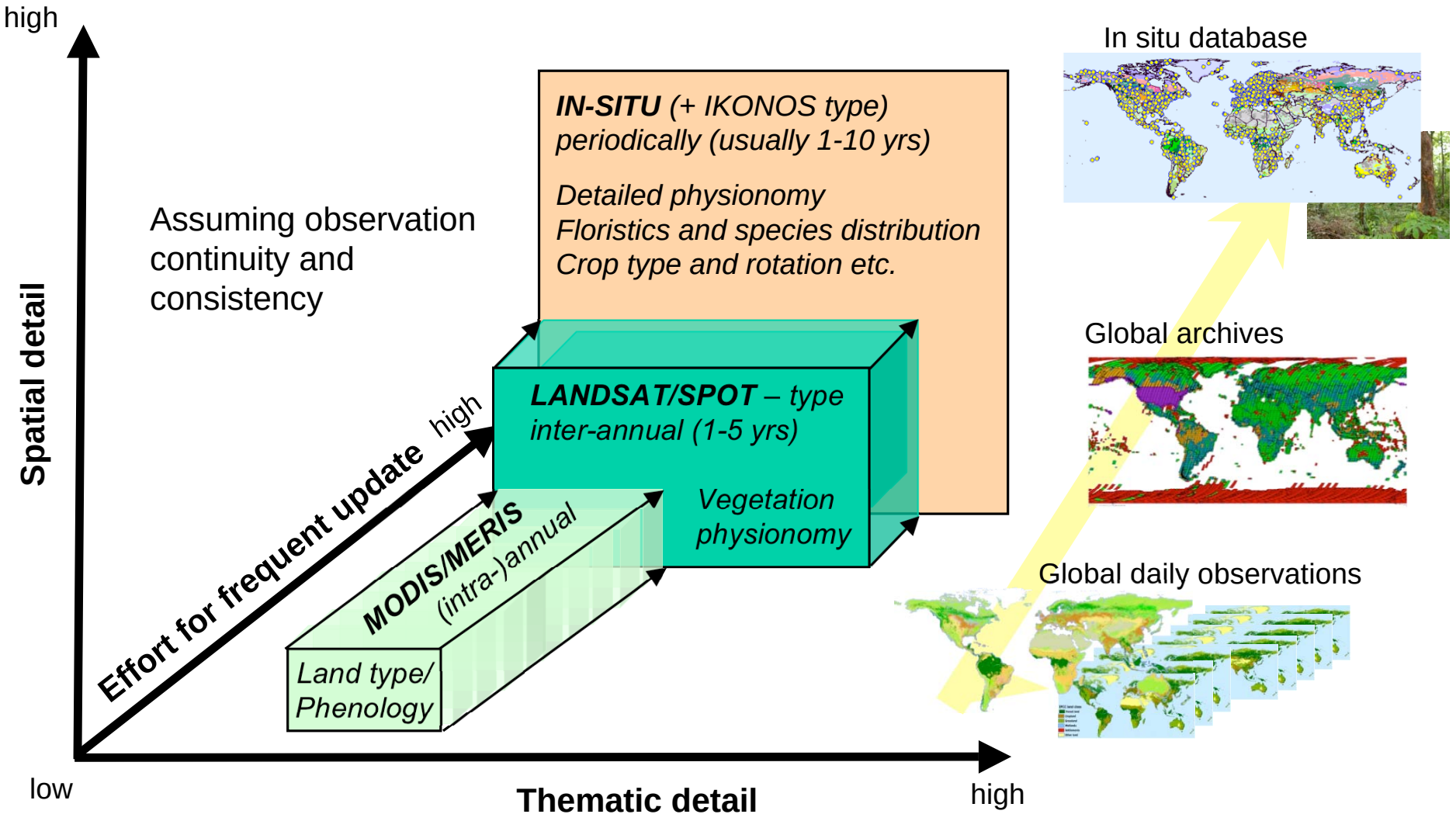
“Best Practices Document”

Strahler et al., 2006



Integrated land cover observations

Completed and endorsed by IGOS partnership and GEO in 2007



From Herold et al 2008, IEEE Systems

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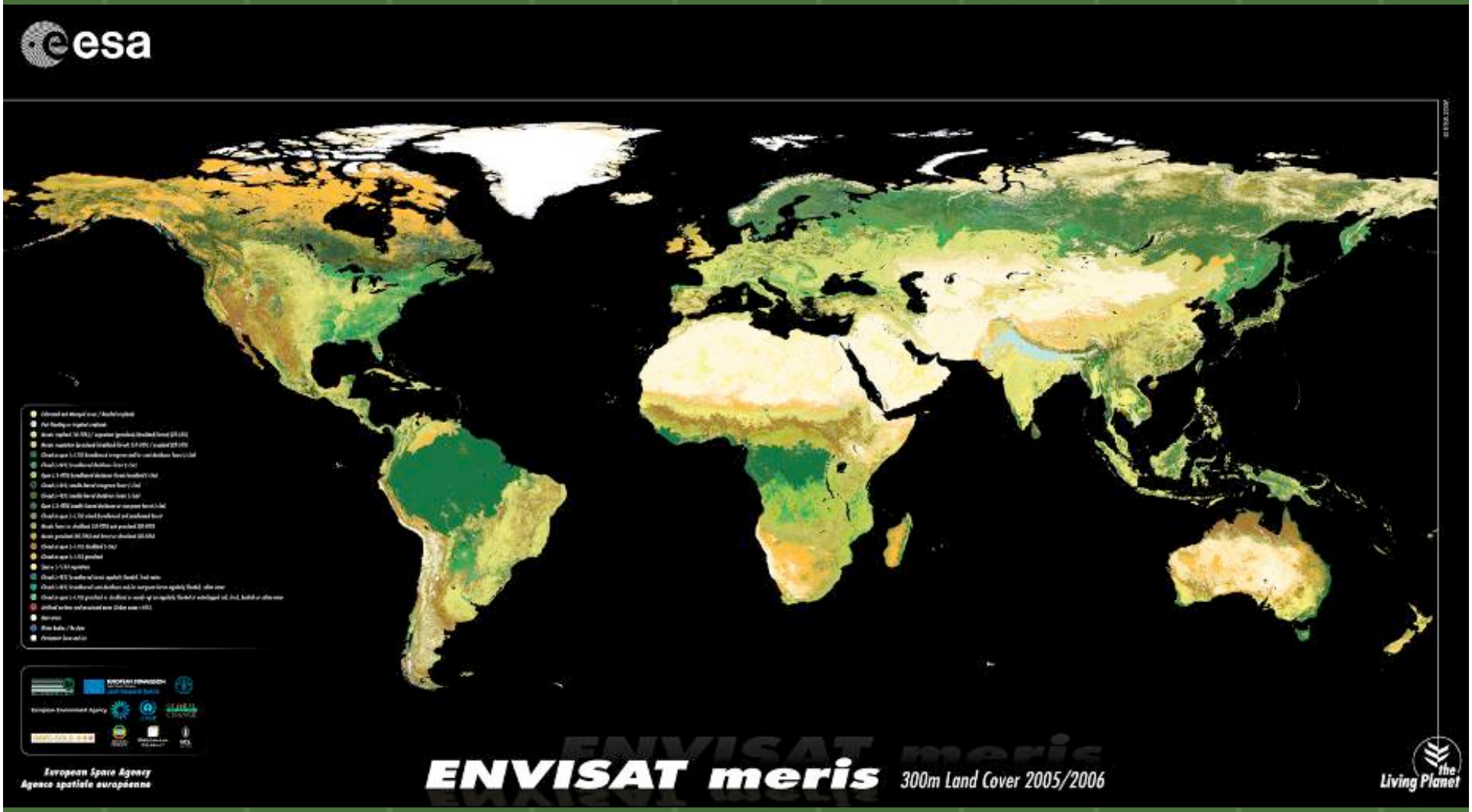
GLOBCOVER (2005/6)



Dataset release: September 2008

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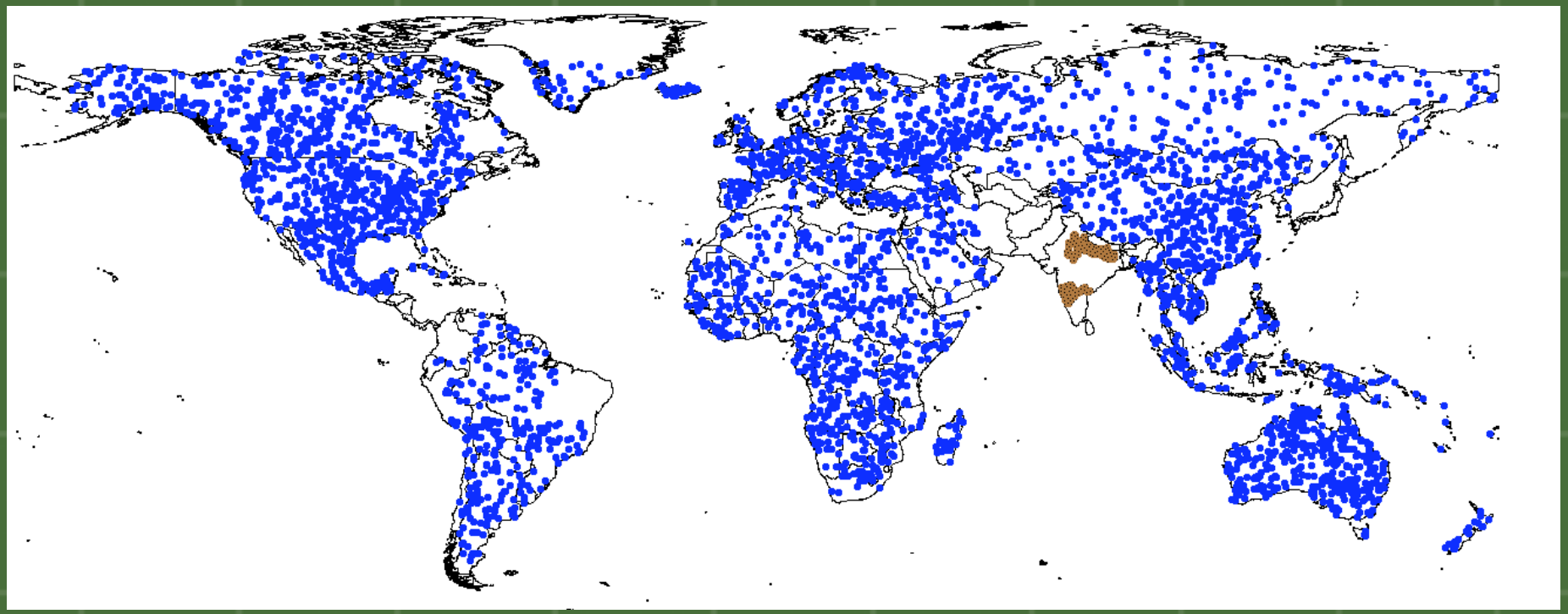
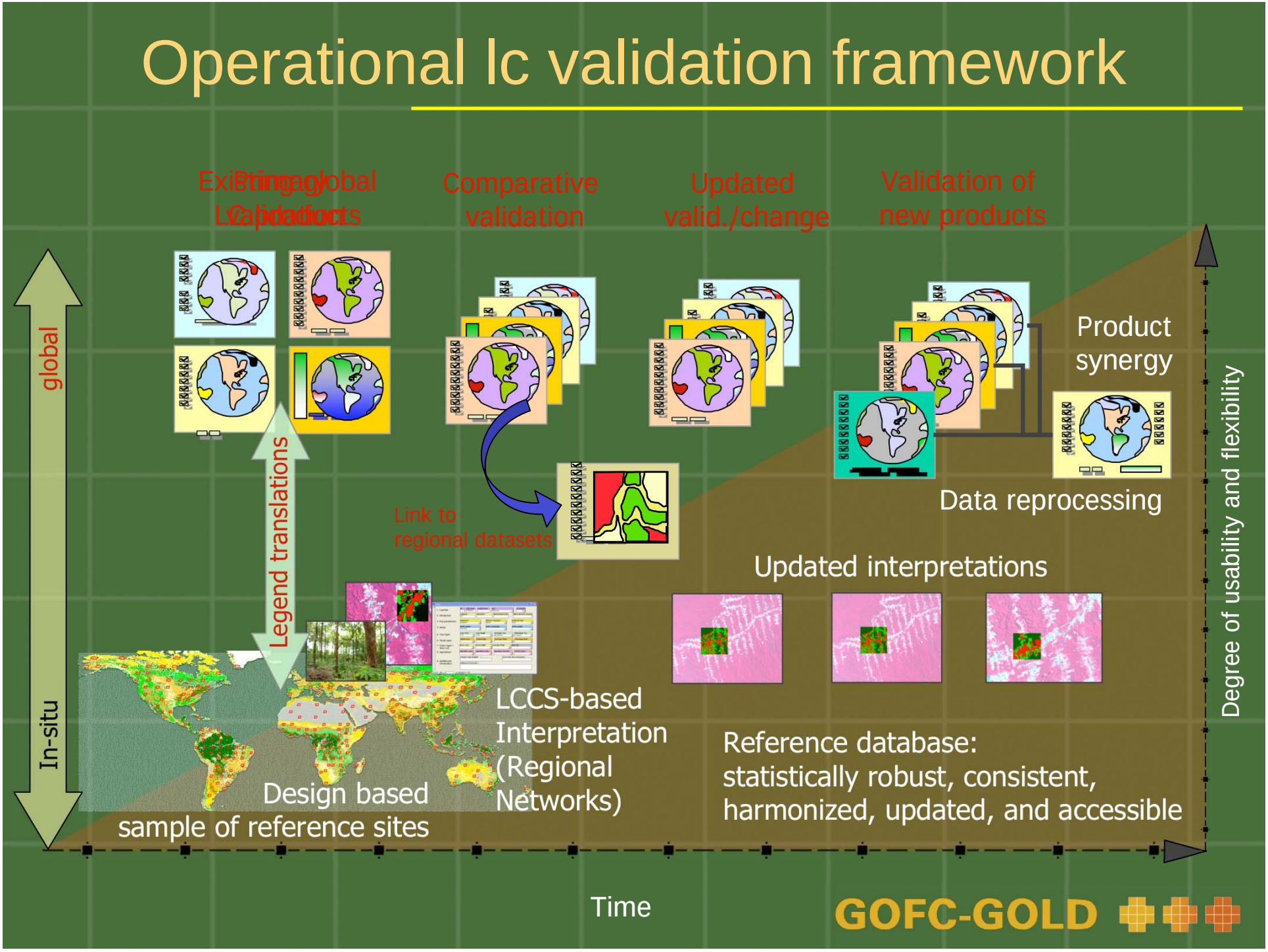
GLOBCOVER validation



More than 4300 validation points interpreted by int. experts
Blue points: Globcover project (3835 points) + Gond's set (n~80)
(including 225 double interpretation by 2 experts)
Brown points: IMWI data (403 points)
Global area weighted accuracy: ~73 % based on 3167 reference points
Validation report available ~ 15. October 2008

Operational lc validation framework



Operational lc validation framework

- Effort serves purpose for estimating:
  - Individual map accuracy / best available map
  - Area of land-cover classes or land-cover change
- Sampling design:
  - 10 km by 10 km block (Landsat – MODIS)
  - Flexible to increase sample size to provide precise country or region specific estimates
  - Stratification by geographic reporting regions, areas where maps differ, important rare land-cover classes
- Response design:
  - Reference data (i.e. SPOT) interpreted by regional experts (i.e. GOFC-GOLD networks) using LCCS classifiers
- Analysis design:
  - Error matrix for each map and region
  - Estimates of class area
  - Supplementary accuracy information on land-cover composition and landscape pattern

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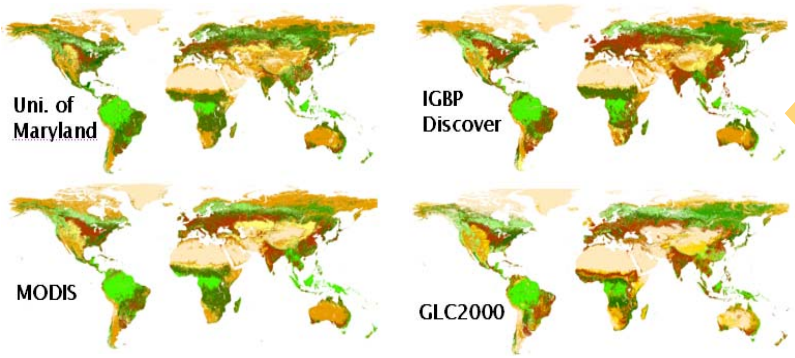
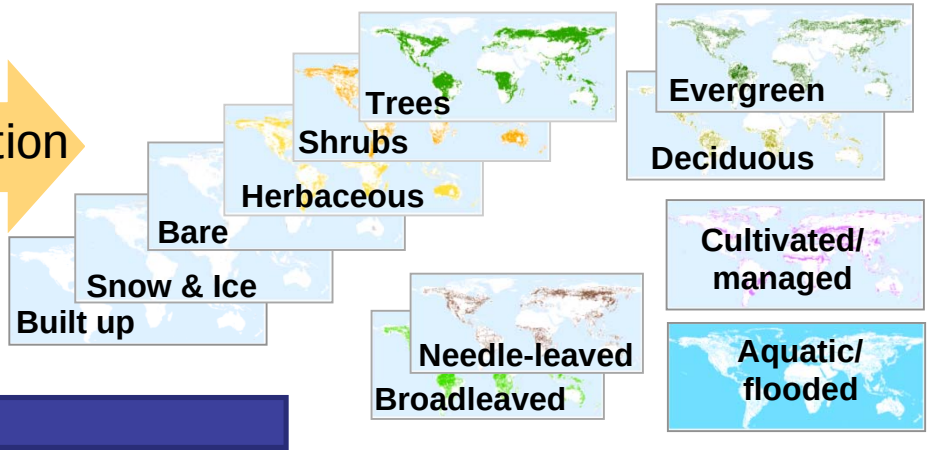
Categories in existing global datasets



Translation

Terminology: land cover classifiers (LCCS)



Common classifiers
(Terminology standard)

- Classifiers commonly used to characterize land cover worldwide
- i.e. life form & surface type, leaf type & phenology, terrestrial/aquatic

Generic classes
(Thematic standard)

- Basic set of standardized classes based on combination of common classifiers and independent of any cartographic standard
- i.e. broadleaved evergreen trees, herbaceous crops, built up area

Mapping Categories
(Cartographic standard)

- Application of cartographic generalization (MMU) to generic classes
- Definition of mixed categories or using density thresholds
- i.e. Closed to open (>15%) broadleaved evergreen forest (> 5m)

Thematic standards

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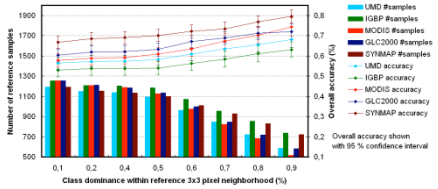
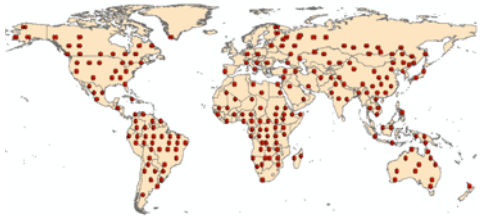
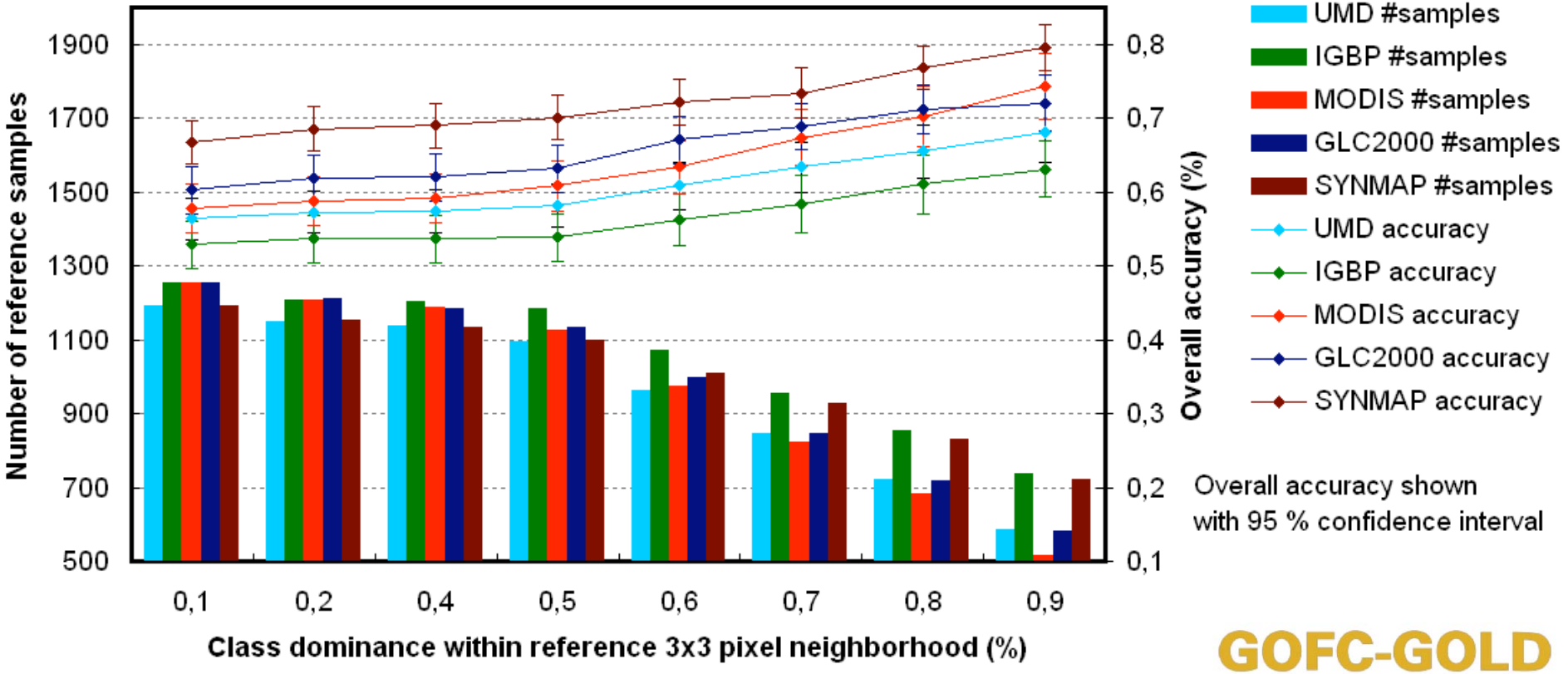
Comparative validation & assessment



Reference database (GLC2000)





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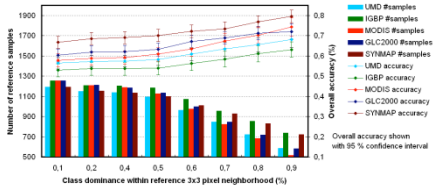

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