Global land cover validation and a "Best Currently Available" LC Map

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And the LC IT

www.fao.org/gtos/gofc-gold
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GTOS

GOFC-GOLD

Global Observations of Forest Cover and Land Dynamics

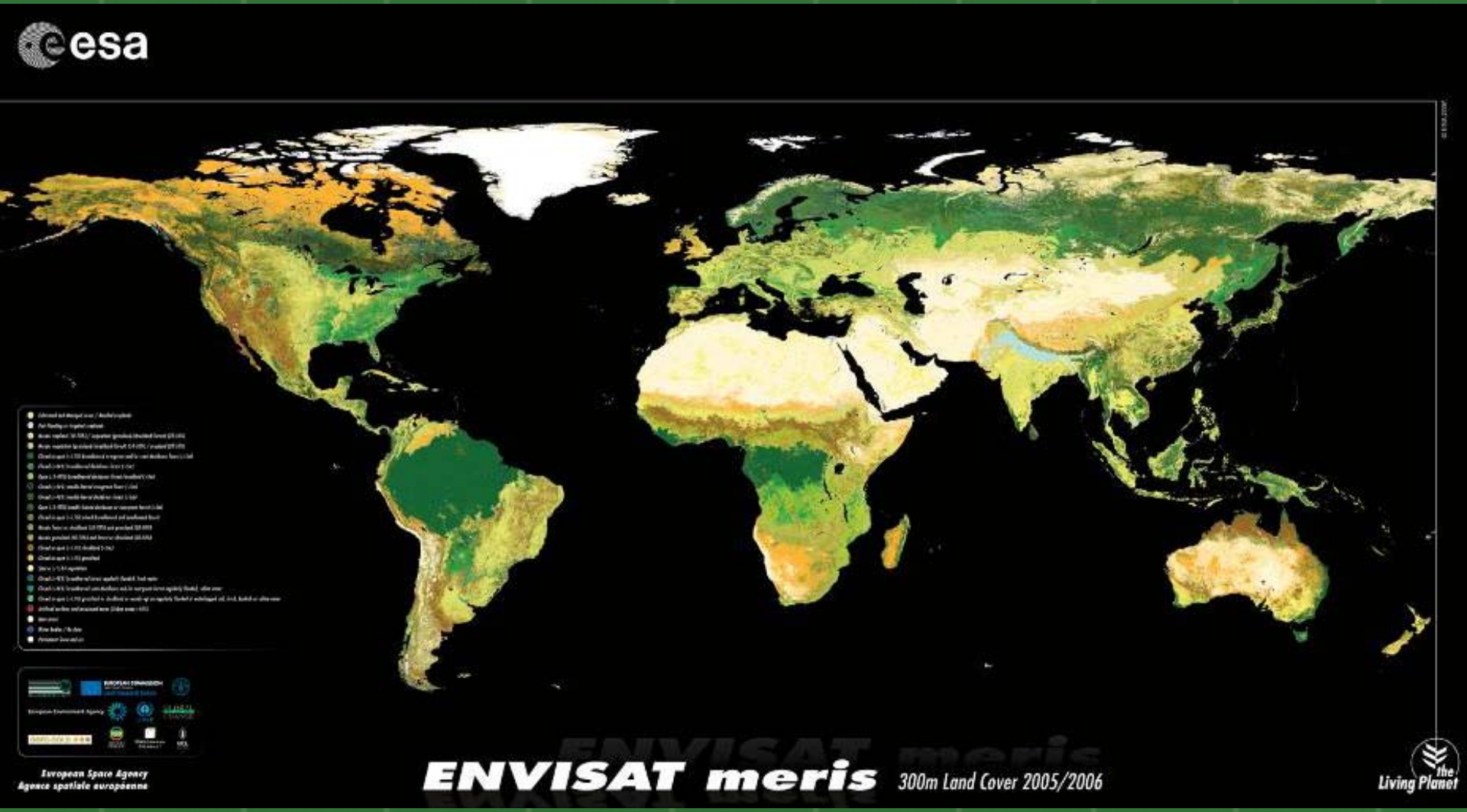
International drivers

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
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”

Overview

1. As the land cover community matures, an increasing emphasis on validation and accuracy assessment - a difficult, somewhat unpleasant and somewhat suprisingly expensive activity
2. The LC IT has decided to try to support the broader community through validation
3. Idea is to collect ground reference data independent of any single land cover product to support validation of many land cover datasets
4. Intent is to supplement and complement ongoing validation activities associated with individual land cover datasets

GLOBCOVER (2005/6)



Beta version in review by GEO task team

Dataset release: September 2008

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Notion of a “Best Currently Available” Land Cover Map

Combine the strengths of multiple sources of land cover data across multiple extents and resolutions (national, regional and global sources)

Based on what is learned in the validation exercise

A transparent and community endorsed activity

LCCS compatibility is critical

Simple guidance criteria:

- more accurate is better
- finer spatial resolution is better
- more thematic detail is better

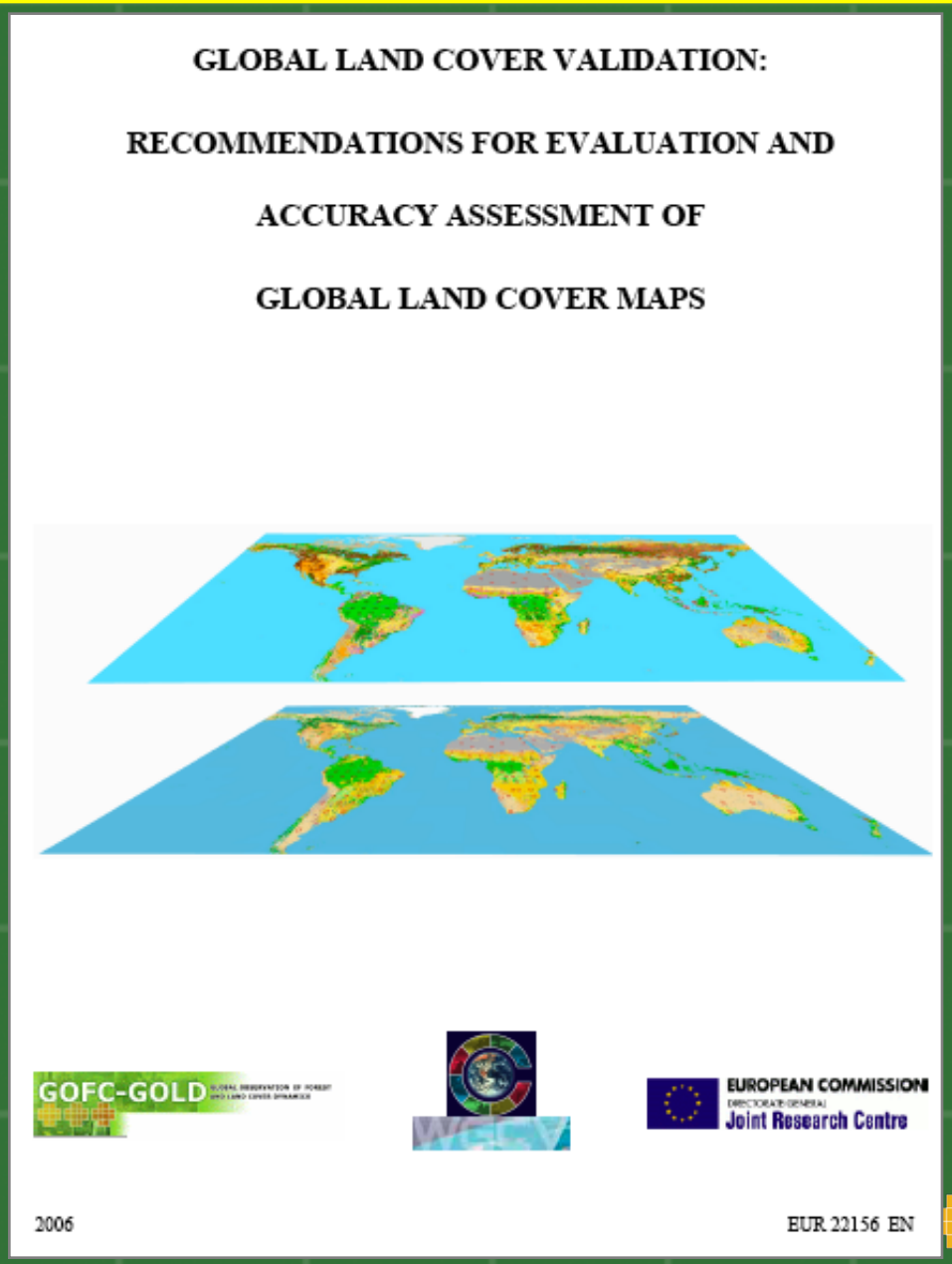
Supporting Developments

1. Prior experiences with global land cover validation
2. Emergence of LCCS - and its value in promoting consistency in land cover descriptors used in the development of legends for land cover datasets
3. Development of community concensus on “best practices for global land cover accuracy assessment (CEOS WGC report)

International consensus on technical issues

“Best Practices Document”

Strahler et al., 2006



A “Living Reference Dataset”

A set of validation sites distributed around the globe

Based on high resolution (a few meters) imagery interpreted by regional experts (the regional networks)

Checked annually for land cover change, and updated periodically

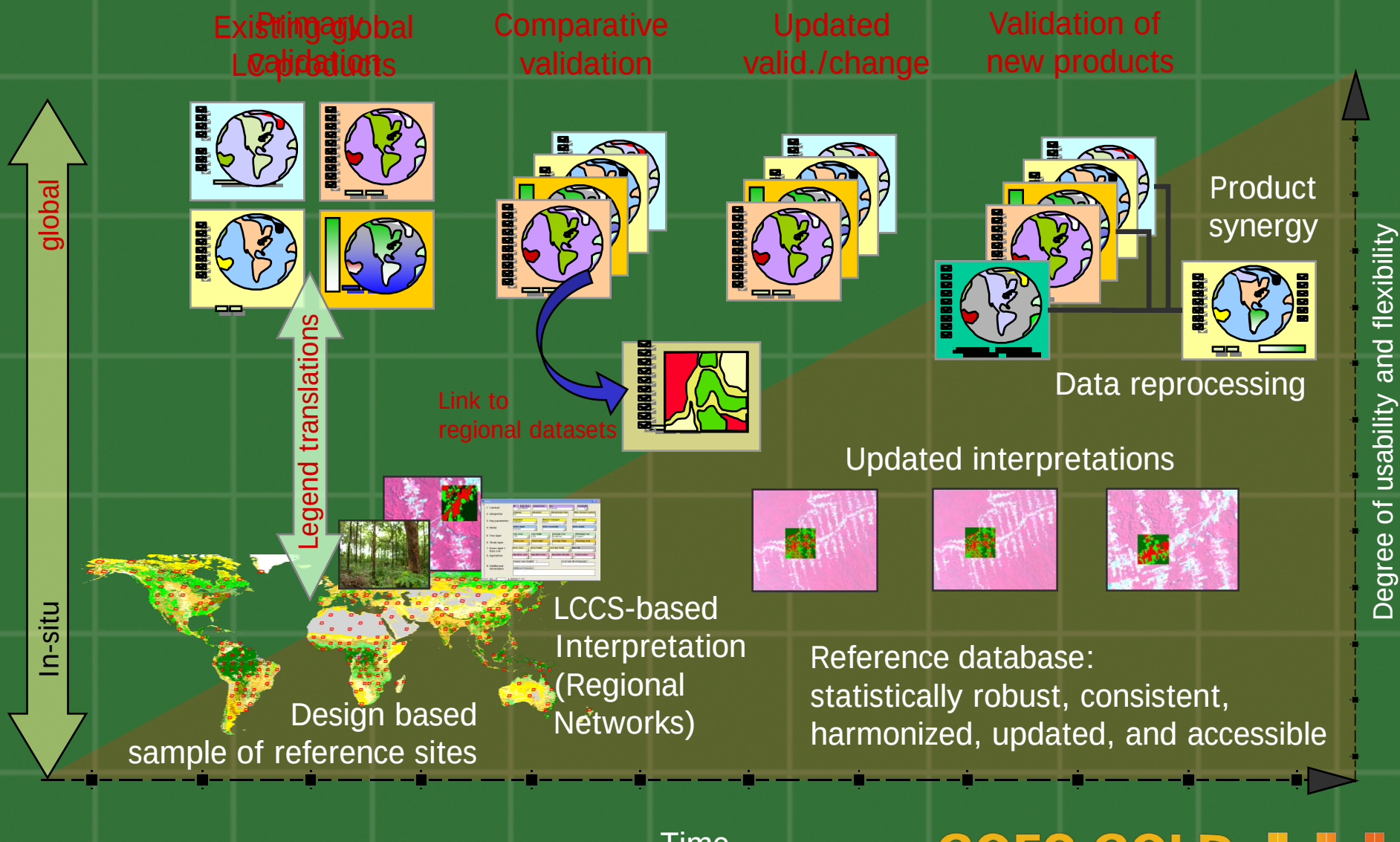
Limited set of land cover classifiers

- life form - (trees, shrubs, herbacious)
  - cover
- leaf type
- leaf phenology

Land Cover validation framework

- Effort serves purpose for estimating:
  - Individual map accuracy / best available map
  - Area of land-cover classes
- 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 (high resolution) 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

Operational lc validation framework



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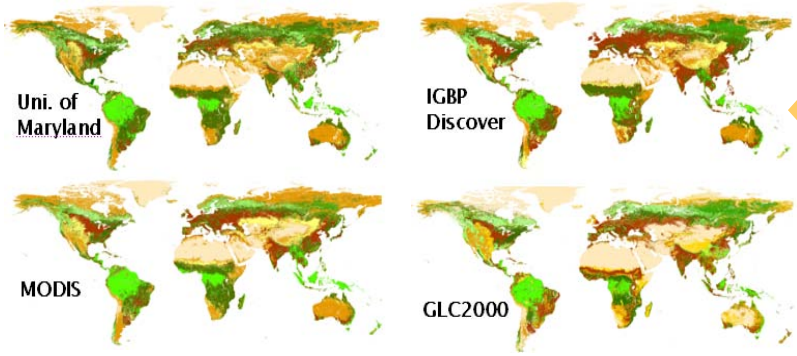
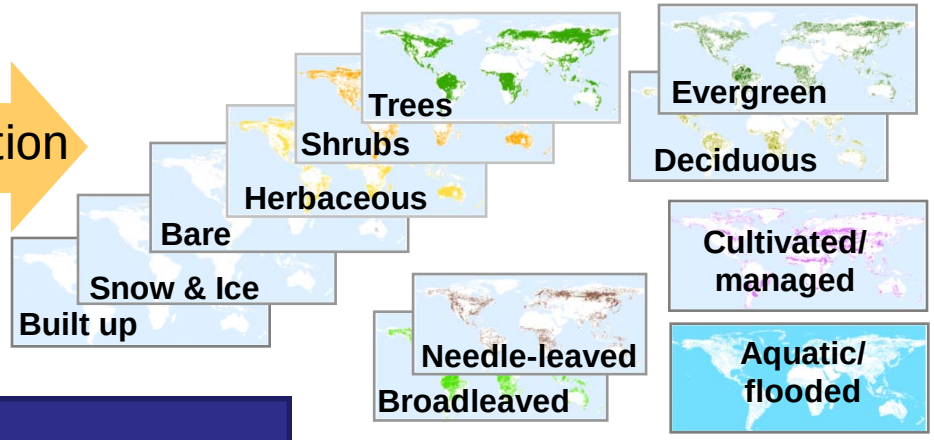
Categories in existing global datasets



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)

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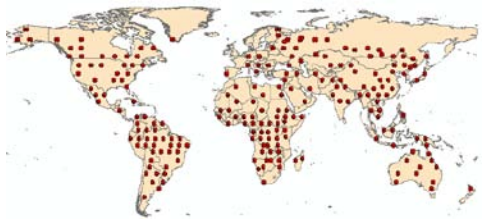
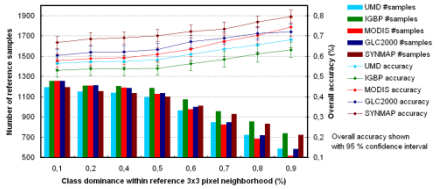
Reference database (GLC2000)



Comparative validation & assessment



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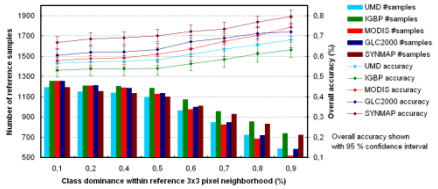

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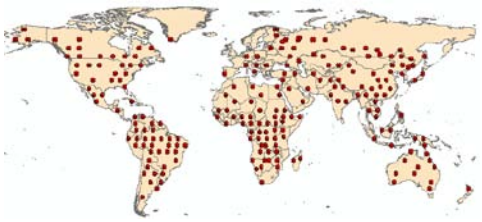

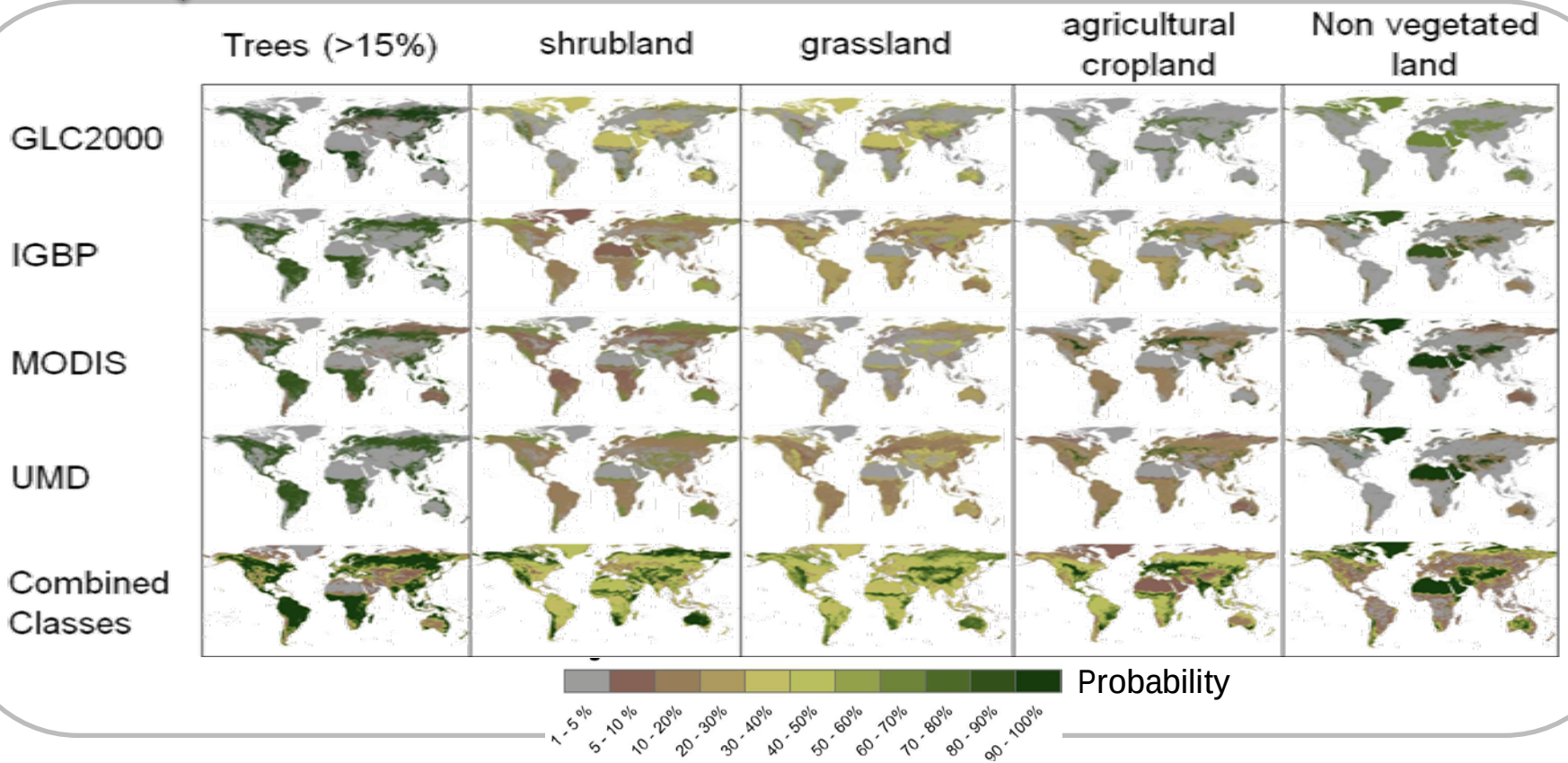

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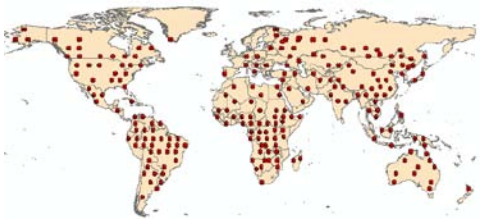

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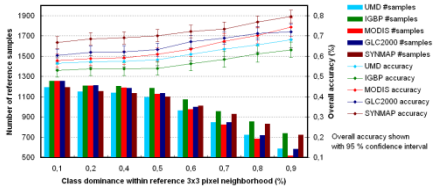
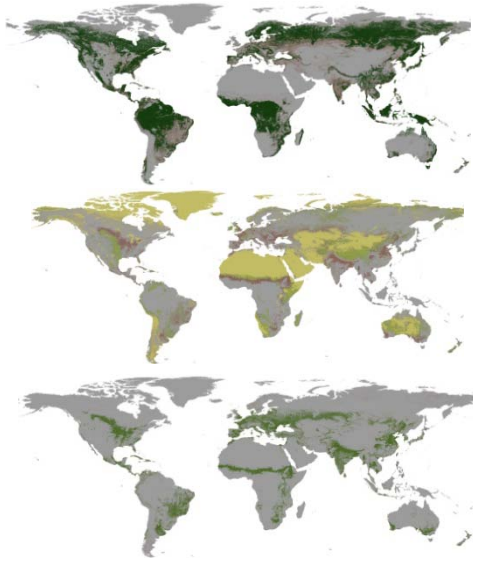
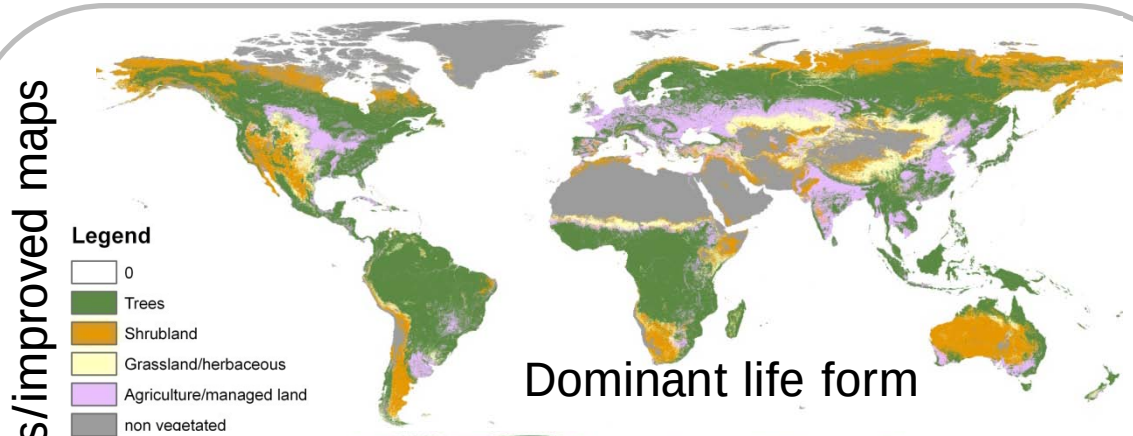


Probability maps

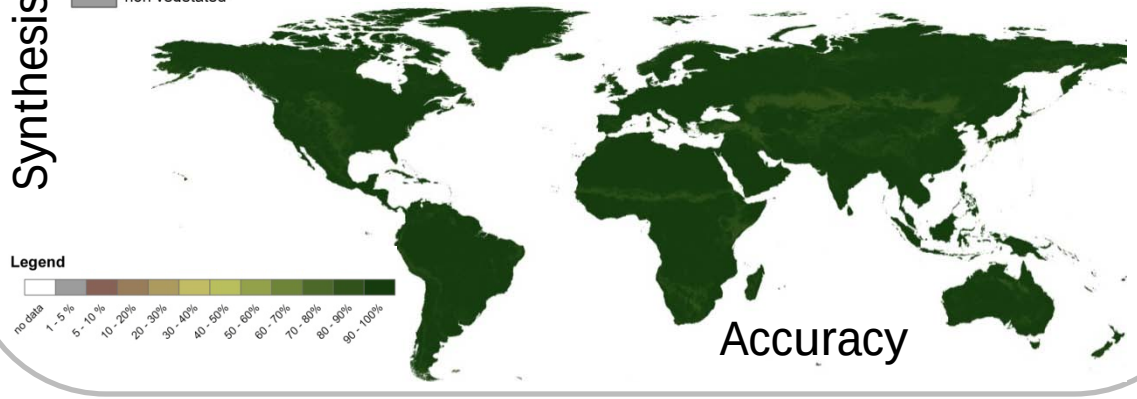


For different datasets, classifiers and landscape heterogeneities

Synthesis/improved maps



Dominant life form



Accuracy

Next Steps

1. Sample Site Selection
2. Find a source for the imagery (several meters)
3. Get the imagery collected and processed
4. Prototype effort
5. Identify regional experts for interpretation
6. Find support for the interpretation by the regional experts
    - training workshops
    - capacity building
    - support for the interpreters
7. Begin validation analysis (working with the land cover data providers)