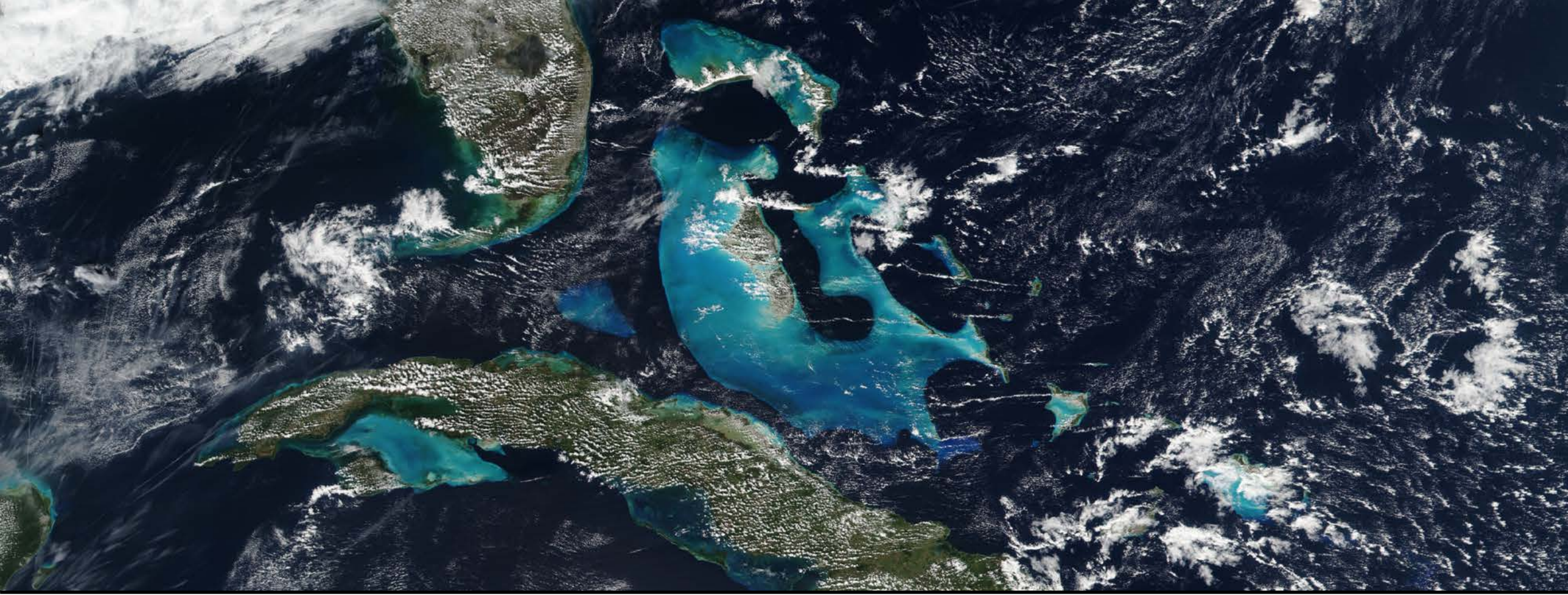


Overview of Target 15.1 and Indicator 15.1.1

Brock Blevins





Target 15.1 and Land Cover Tools

SDG Target 15.1

By 2020, ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains, and drylands, in line with obligations under international agreements

- Indicator 15.1.1: forest area as a proportion of total land area

May be used as a rough proxy for the extent to which the forests in a country are being conserved or restored, but it is only partly a measure for the extent to which they are sustainably managed



Indicator 15.1.1

Definitions

- **Forest:** “land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use” (Food and Agriculture Organization (FAO))
- **Total Land Area:** “total surface area of a country less the area covered by inland waters, like major rivers and lakes”



Image Credit: (right) AIRBUS



Indicator 15.1.1

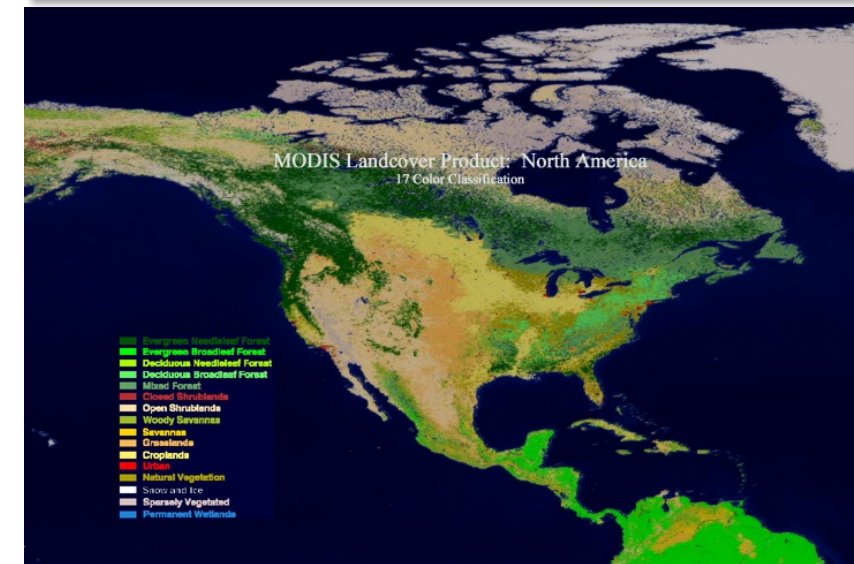
- Custodial Agency: Food and Agriculture Organization of the United Nations (FAO)
- **Computation Method:** $\text{Forest area (reference year)} / \text{Land area (2015)} * 100$
- All data are provided to FAO by countries in the form of a country report
- Detailed methodology and guidance on how to prepare the country reports and to convert national data according to national categories and definitions to FAO's global categories and definitions is found in the document "Guide for country reporting for FRA 2015", <http://www.fao.org/3/a-au190e.pdf>.

Image Credit: (right) AIRBUS



Global Forest and Land Cover Data

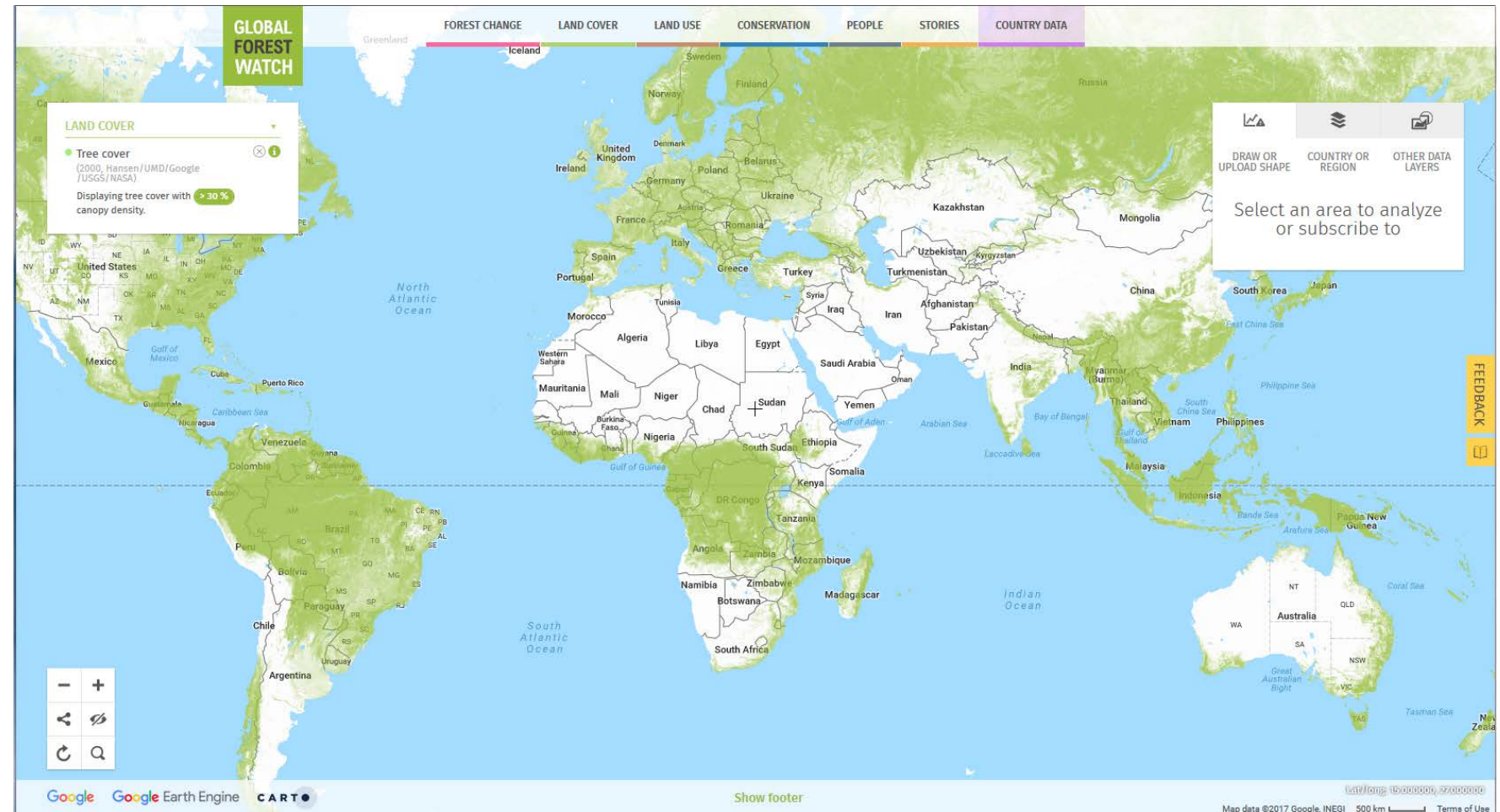
- Global Forest Watch (Hansen, et al. 2013)
- FAO Global Forest Resource Assessments and the Forest Land Use Data Explorer
- FAO Global Land Cover SHARE (GLC-SHARE)
- European Space Agency Climate Change Initiative Land Cover
- MODIS Land Cover



Global Forest Watch

<https://www.globalforestwatch.org>

- Area of tree cover with varying canopy densities
- Spatial resolution: 30 meters
- Date of Data: 2000
- Definition: All vegetation taller than 5 meters in height



Source: Hansen et al. 2013



FAO Global Forest Resource Assessments

<http://www.fao.org/forest-resources-assessment/en/>

- Produced every five years
- Based on two primary sources of data:
 - country reports prepared by national correspondents
 - remote sensing conducted by FAO and national and regional partners
- Key Outputs:
 - synthesis document: “How are the World’s Forests Changing?”
 - country reports
 - maps (downloadable images)
 - Forest Land Use Data Explorer (FLUDE) – online visualization platform

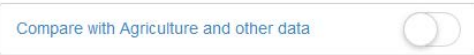


Forest Land Use Data Explorer

Global Forest Resources Assessments



Analysis Dashboard



Forest resource data (FRA) Download the whole set of topics - CSV

Choose Topic
Forest Area and Characteristics Download the selected topic - CSV

Filter Data

Indicator Forest area	Year 2015	Domains	Incomes	Subregions
--------------------------	--------------	---------	---------	------------

Filter

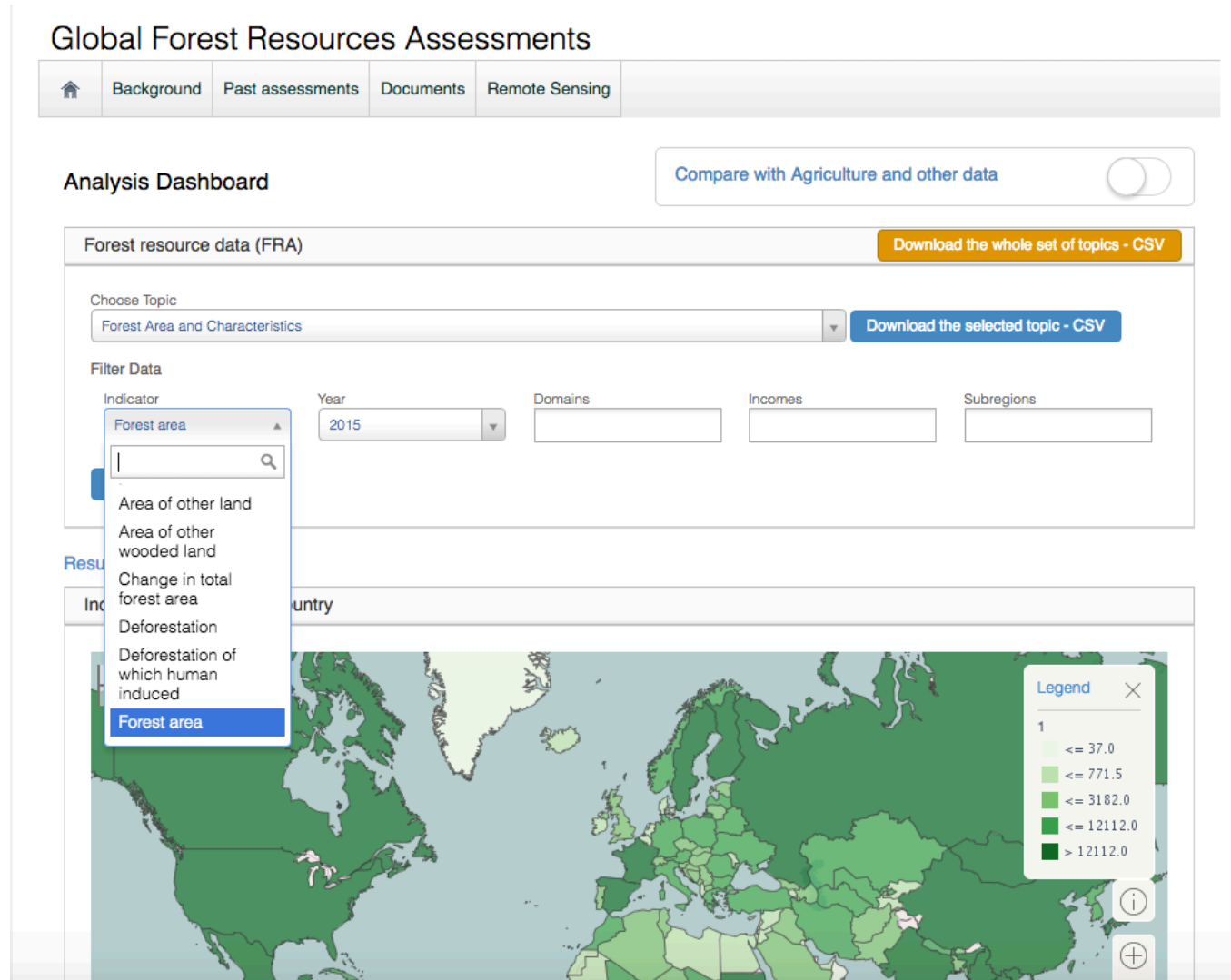
Results



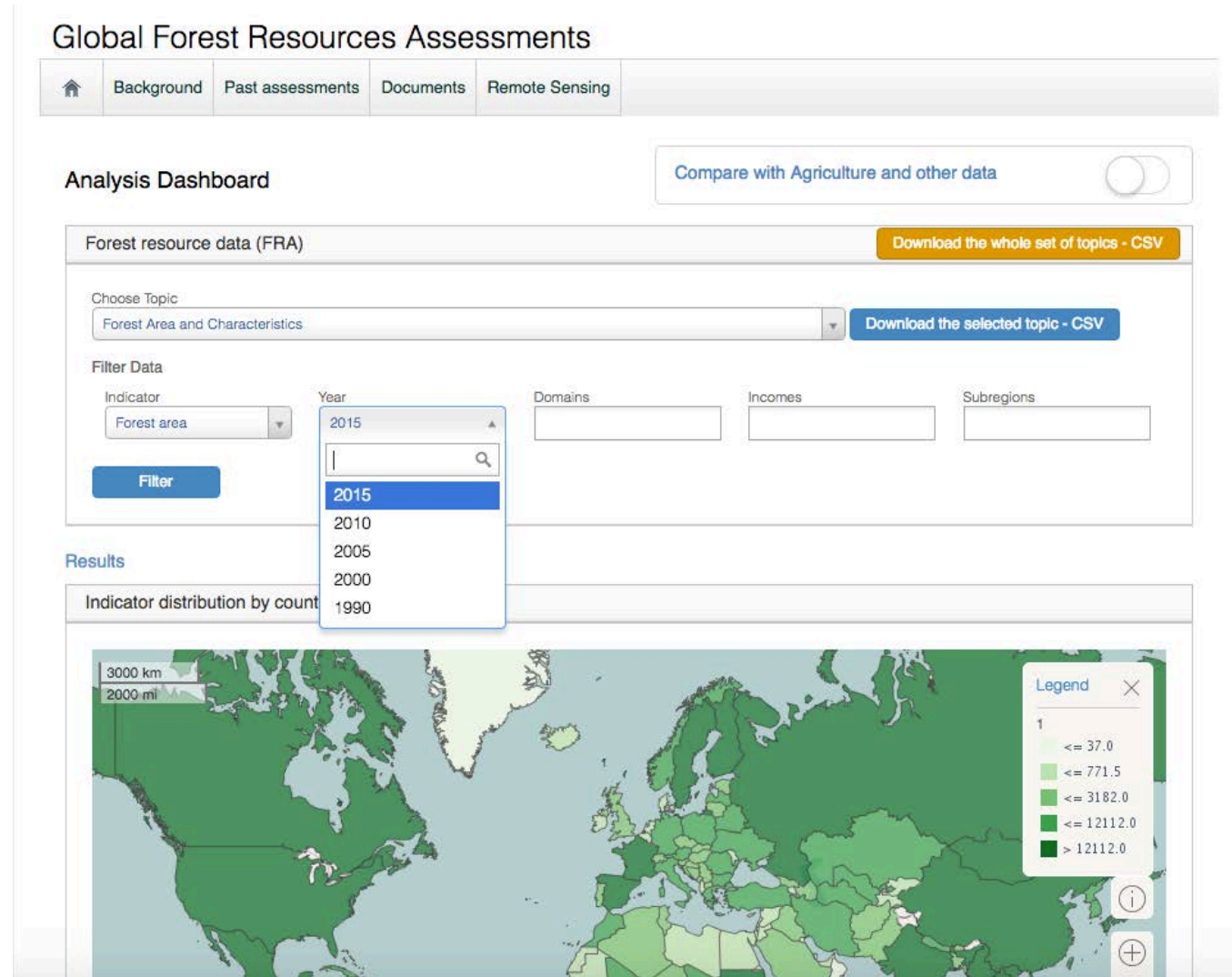
- Most data from the Global Forest Resources Assessment from 2015
- Provides access to datasets that relate to forests, including:
 - agriculture
 - rangelands
 - demographics
 - market prices
 - land use classifications and maps
- You can download data or assemble and analyze data



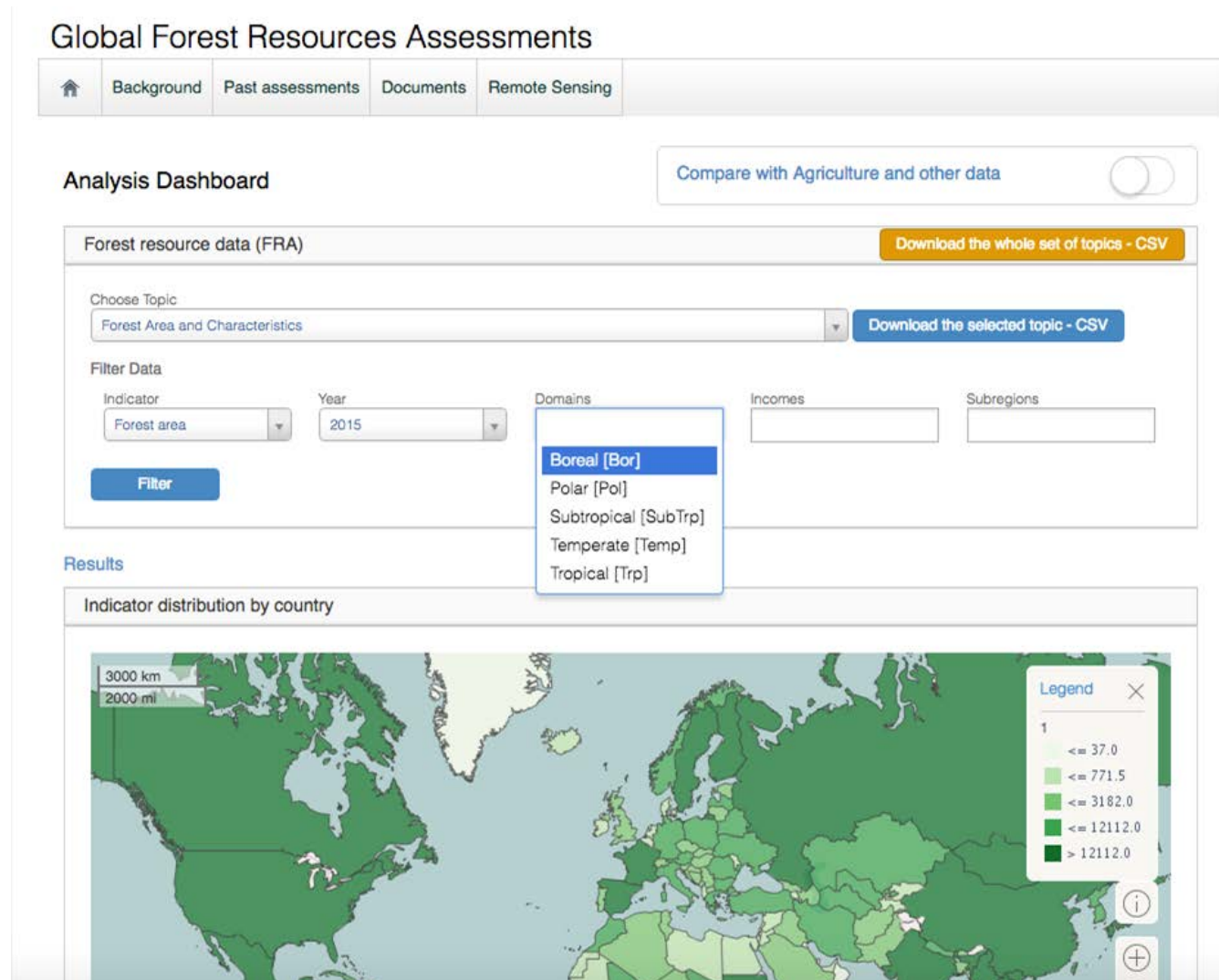
Forest Land Use Data Explorer



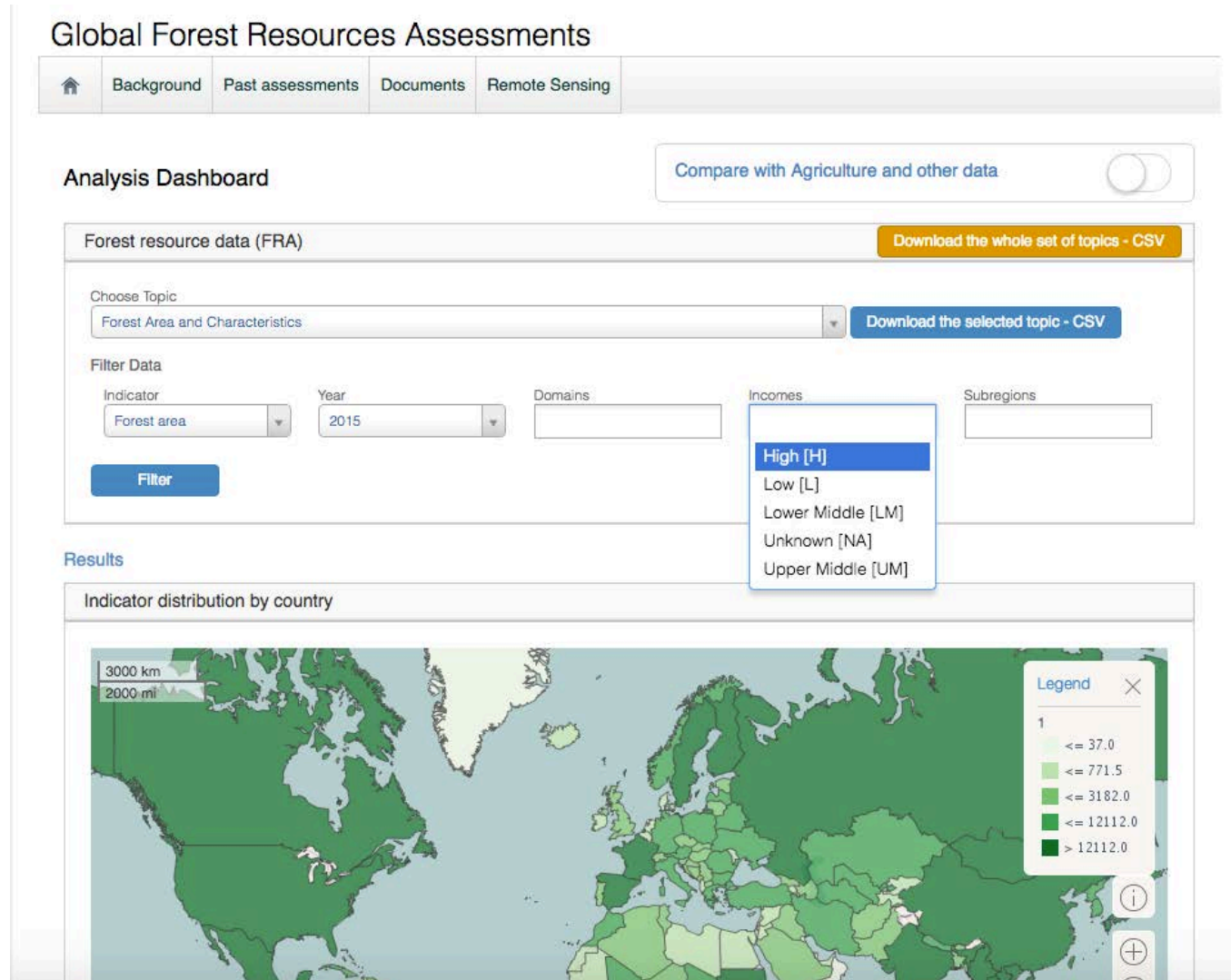
Forest Land Use Data Explorer



Forest Land Use Data Explorer



Forest Land Use Data Explorer



FAO Global Land Cover-SHARE

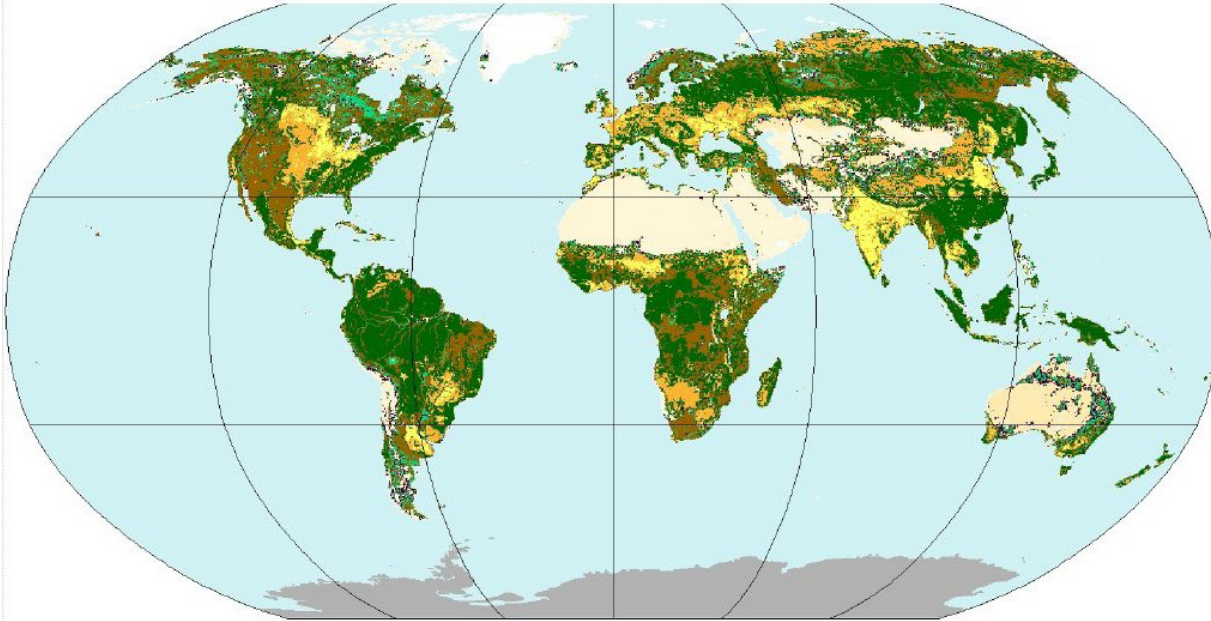


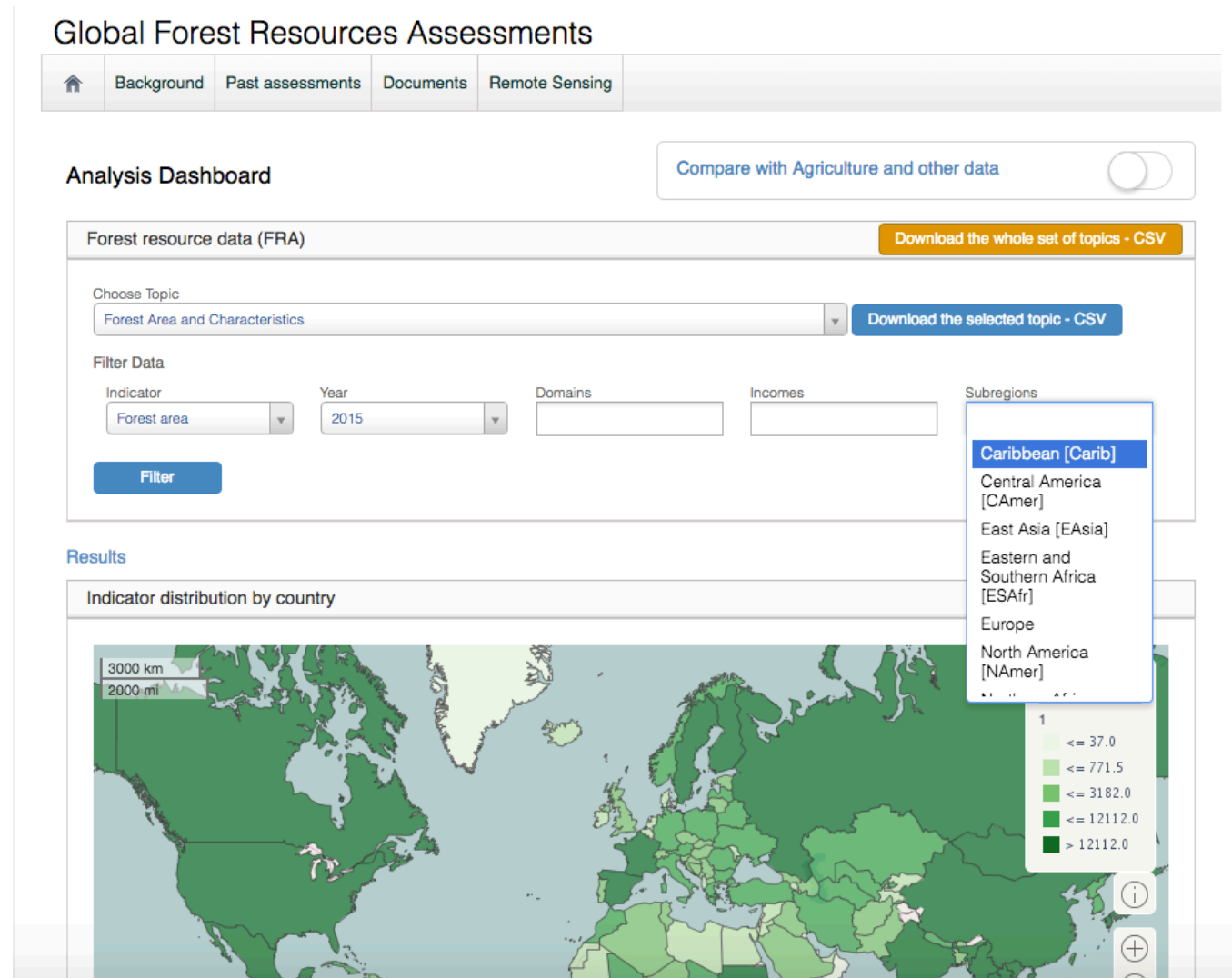
Figure 3 – Distribution of dominant GLC-SHARE Land Cover Database.



- Available for 2014
- Includes 11 land cover classes
- Available for download through FAO GeoNetwork portal:
<http://www.fao.org/geonetwork/srv/en/main.home>
- FAO also has national and regional land cover datasets for many countries in Africa and the Himalayas:
http://www.glcncn.org/dat_1_en.jsp



Forest Land Use Data Explorer



ESA Climate Change Initiative Land Cover

<http://www.esa-landcover-cci.org>

- Annual global land cover time series from 1992-2015
- Spatial Resolution: 300 meters
- Remote Sensing Sources:
 - NOAA AVHRR, SPOT, ENVISAT, PROBA-V
- 22 land cover classes based on the UN Land Cover Classification System
- Visualization and download:
 - CCI Land Cover viewer: <http://maps.elie.ucl.ac.be/CCI/viewer/>



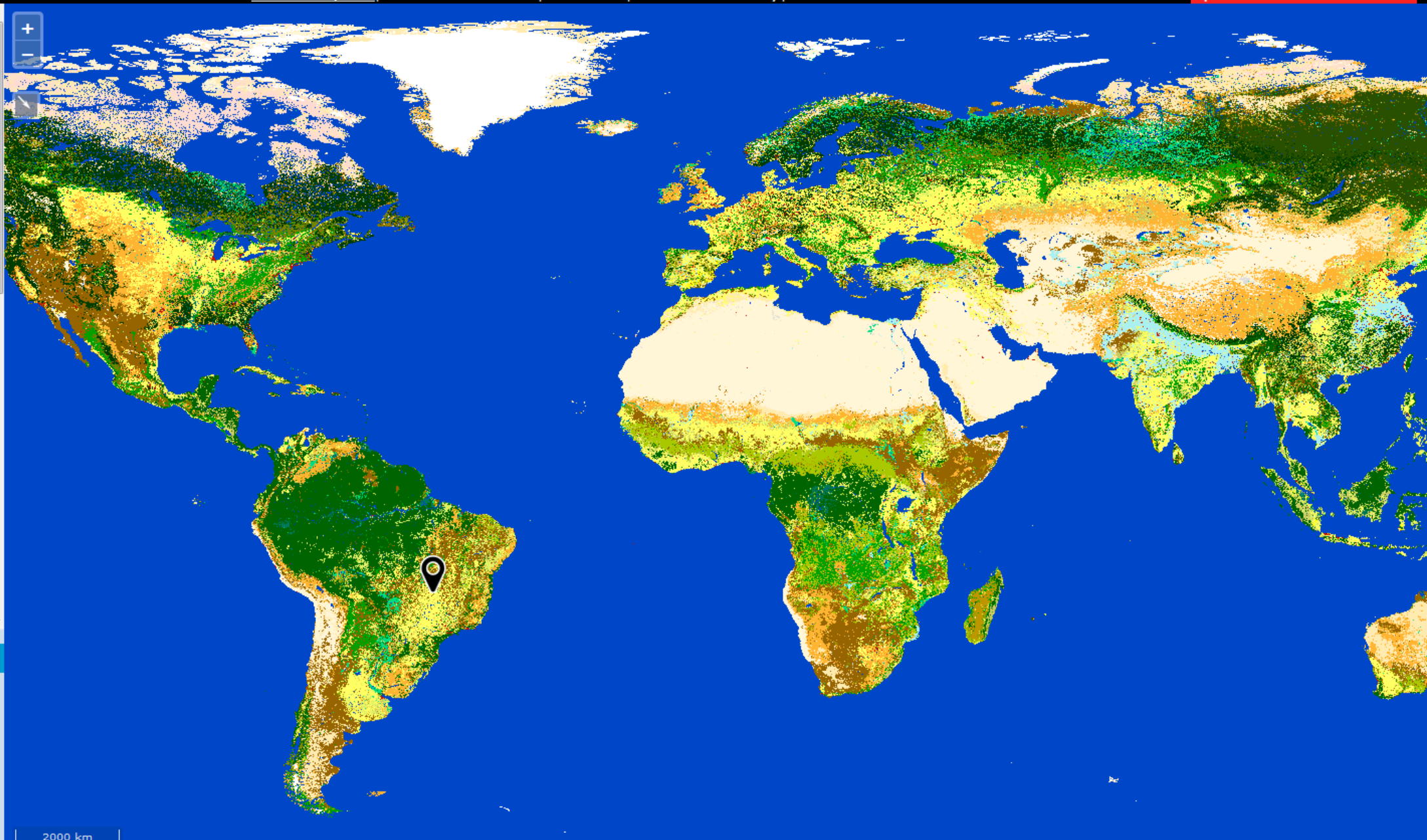
Land cover legend

view global (level 1)

- Cropland, rainfed
- Herbaceous cover
- Tree or shrub cover
- Cropland irrigated or post-flooding
- Mosaic cropland (>50%) / natural vegetation (Tree, shrub, herbaceous cover) (<50%)
- Mosaic natural vegetation (Tree, shrub, herbaceous cover) (>50%) / cropland (<50%)
- Tree cover, broadleaved, evergreen, closed to open (>15%)
- Tree cover, broadleaved, deciduous, closed to open (>15%)
- Tree cover, broadleaved, deciduous, closed (>40%)
- Tree cover, broadleaved, deciduous, open (15-40%)
- Tree cover, needleleaved, evergreen, closed to open (>15%)
- Tree cover, needleleaved, evergreen, closed (>40%)
- Tree cover, needleleaved, evergreen, open (15-40%)
- Tree cover, needleleaved, deciduous, closed to open (>15%)
- Tree cover, needleleaved, deciduous, closed to open (>15%)

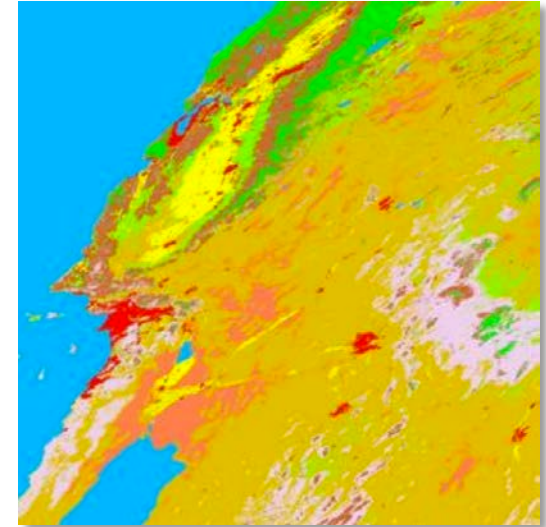
Documentation

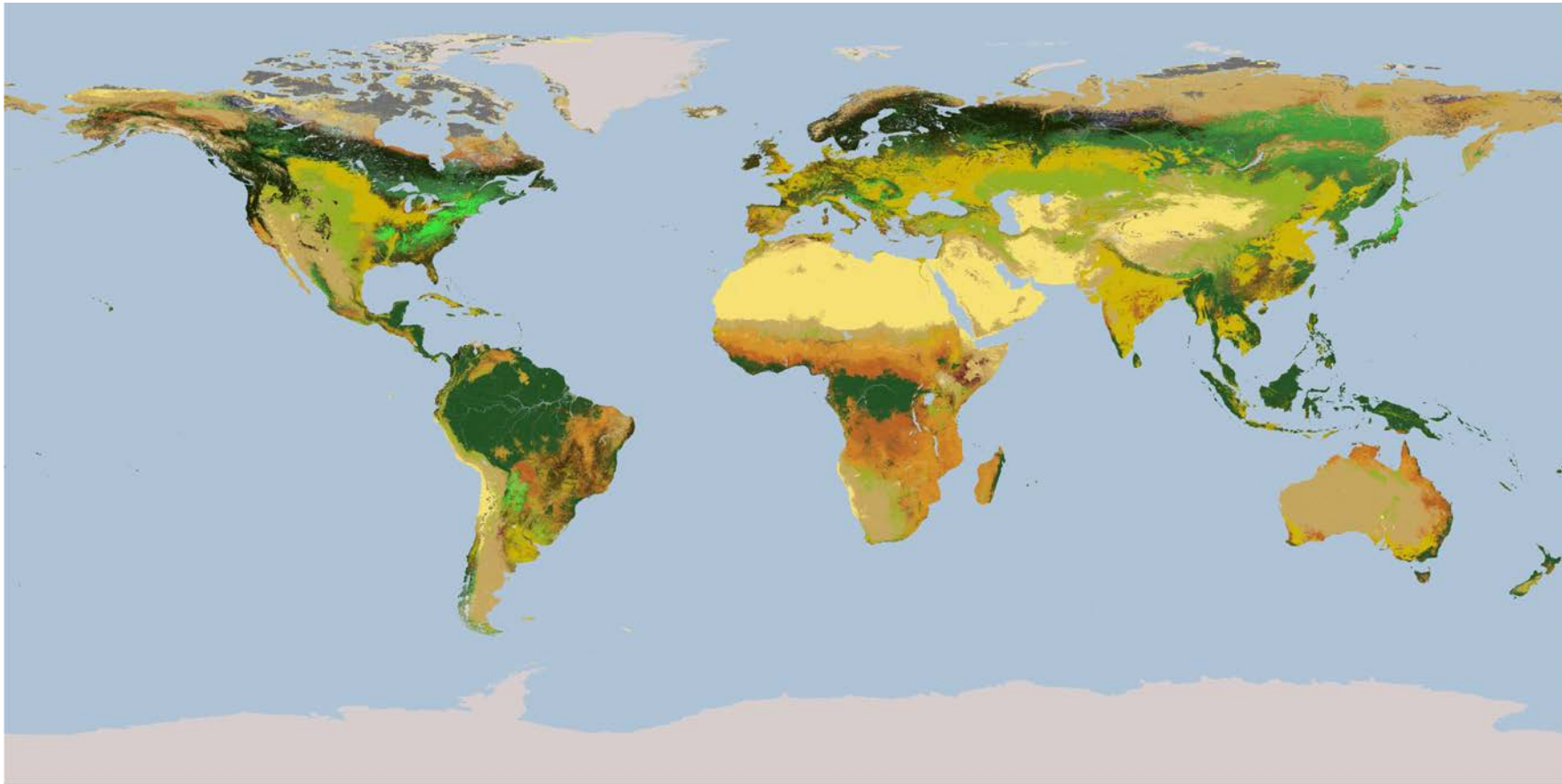
- [Product User Guide v2](#)
- [Quick User Guide for Maps v2.0.7](#)
- [Quick user guide Land Surface Seasonality products](#)
- [Legend for LC Map v2.0.7](#)
- [Preview LC Map v2.0.7 for Year 2015](#)
- [Preview MERIS SR Composite](#)



MODIS Land Cover (MCD12Q1)

- Contains five classification schemes
 - Identifies 17 land cover classes identified by the International Geosphere Biosphere Programme, which includes 11 natural vegetation classes, 3 developed and mosaicked land classes, and 3 non-vegetated land classes
- Spatial Resolution: 500 meters
- Temporal Coverage: 2001-2013 annually
- **Note:** MODIS Version 5 processing has ended so years after 2013 will not be processed. The new suite of Version 6 land cover products are expected to be complete by end of 2017
- Download data from NASA's Earthdata: <http://search.earthdata.nasa.gov/>





- | | | |
|---|---|---|
|  0 Water |  6 Closed Shrublands |  12 Croplands |
|  1 Evergreen Needleleaf Forest |  7 Open Shrublands |  13 Urban and Built-Up |
|  2 Evergreen Broadleaf Forest |  8 Woody Savannas |  14 Cropland/Natural Veg. Mosaic |
|  3 Deciduous Needleleaf Forest |  9 Savannas |  15 Snow and Ice |
|  4 Deciduous Broadleaf Forest |  10 Grasslands |  16 Barren or Sparsely Vegetated |
|  5 Mixed Forests |  11 Permanent Wetlands |  17 Tundra |



EARTHDATA Search

Browse Collections

Features

- Map Imagery
- Near Real Time
- Subsetting Services

Keywords

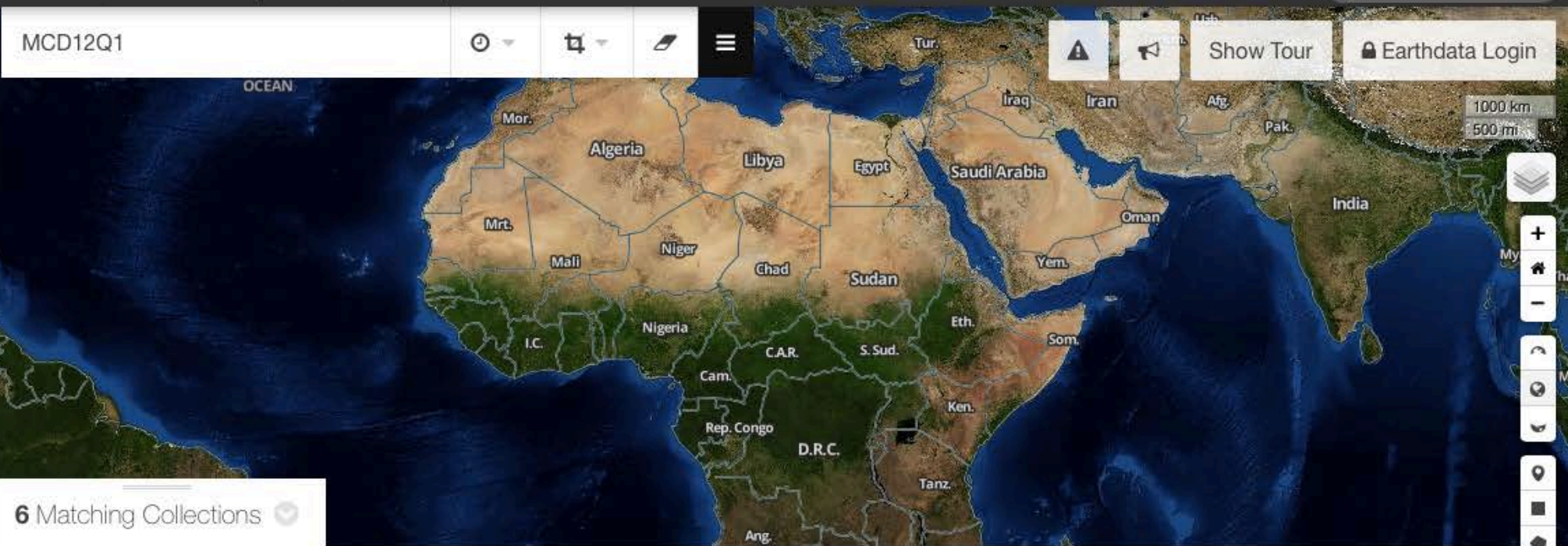
Platforms

Instruments

Organizations

Projects


Processing levels




6 Matching Collections

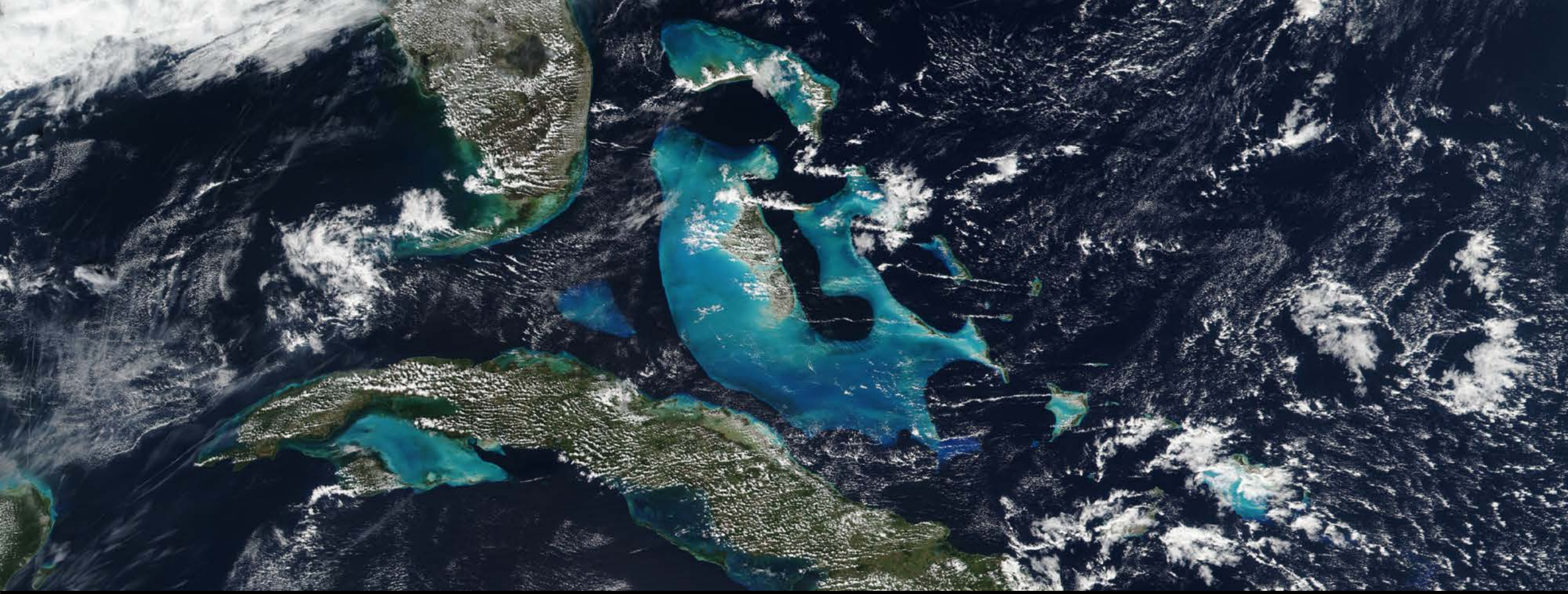
Only include collections with granules Include non-EOSDIS collections
 Tip: Add + collections to your project to compare and download their data. [Learn More](#)

[Report a metadata problem](#)

- 

MODIS/Terra+Aqua Land Cover Type Yearly L3 Global 500m SIN Grid V051
 4121 Granules • 2001-01-01 ongoing • The MODIS Land Cover Type product contains five classification schemes, which describe land cover properties derived from observations spanning a year's input of Terra- and Aqua-MODIS data. The primary land cover scheme identifies 17 land cover classes defined by the Internation...
[SUBSETTING](#) MCD12Q1 v051 - LP DAAC
- 

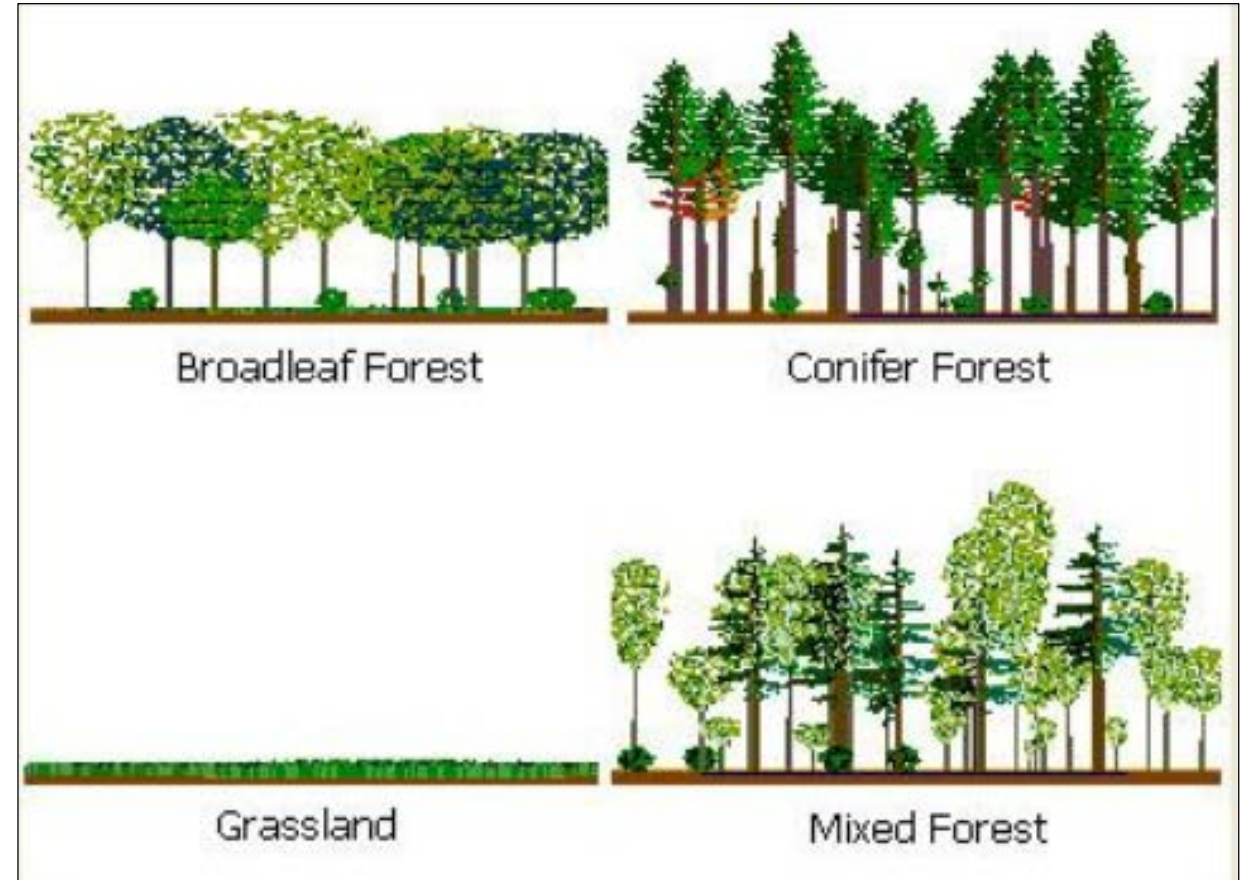
GLDAS Noah Land Surface Model L4 3 hourly 0.25 x 0.25 degree V2.0 (GLDAS_NOAH025_3H) at GES DISC
 184087 Granules • 1948-01-01 to 2010-12-31 • Global Land Data Assimilation System Version 2 (hereafter, GLDAS-2) has two components: one forced entirely with the Princeton meteorological forcing data (hereafter, GLDAS-2.0), and the other forced with a combination of model and observation based forcing data sets (hereafter, ...
[GLDAS_NOAH025_3H V2.0 - NASA/GSFC/SED/ESD/GCDC/GESDISC](#)



Land Cover Classification from Satellite Imagery

Classification Scheme

- The schema is used to categorize and label land cover
- A well designed classification scheme is critical to deriving useful information
- Rules:
 - Must be exhaustive: all land cover in image must be included
 - Must be mutually exclusive: no overlap between classes
 - Must be based on what can be interpreted in the imagery



Turning Data Into Information

Spectral vs. Informational Classes

Spectral Classes

- Groups of pixels that are uniform with respect to their pixel values in several spectral bands

Informational Classes

- Categories of interest to users of the data (e.g. water, forest, urban, agriculture, etc.)

Image classification is the process of grouping spectral classes and assigning them informational class names

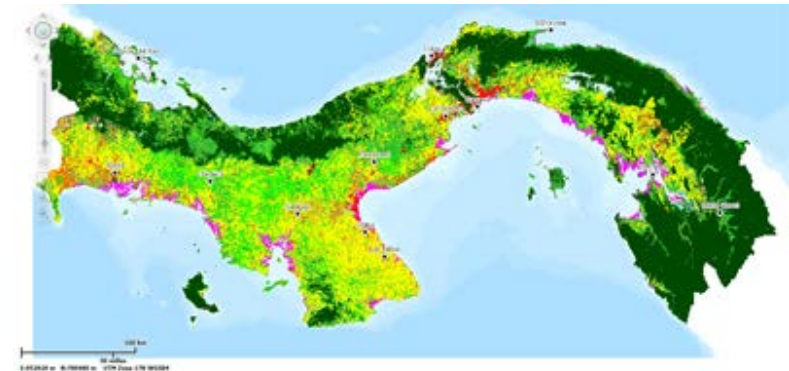


Image Classification

- Requires delineating boundaries of classes in n-dimensional space using class statistics
- Each group of pixels is characterized by:
 - min.
 - max.
 - mean
 - standard deviation
- All the pixels in the image that fall within those statistics are given those labels

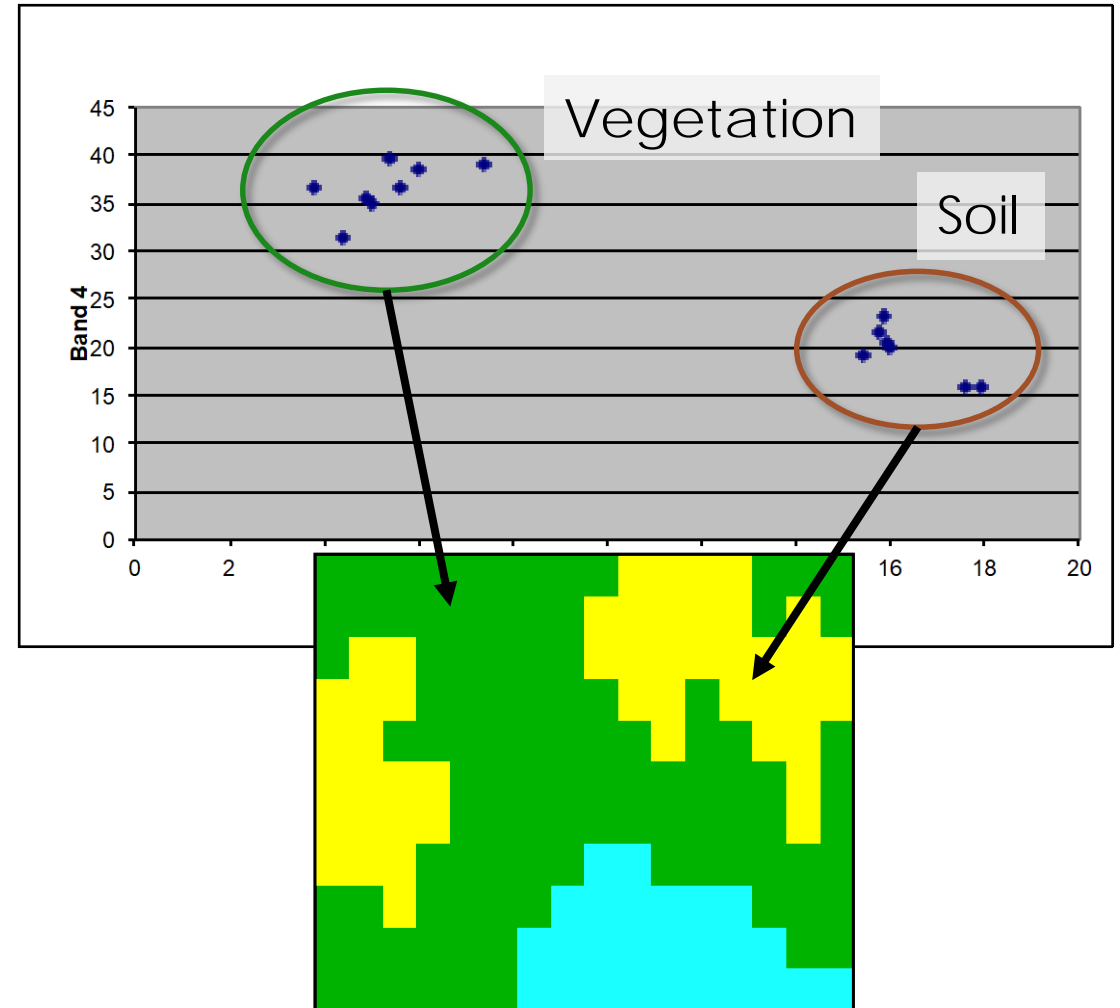
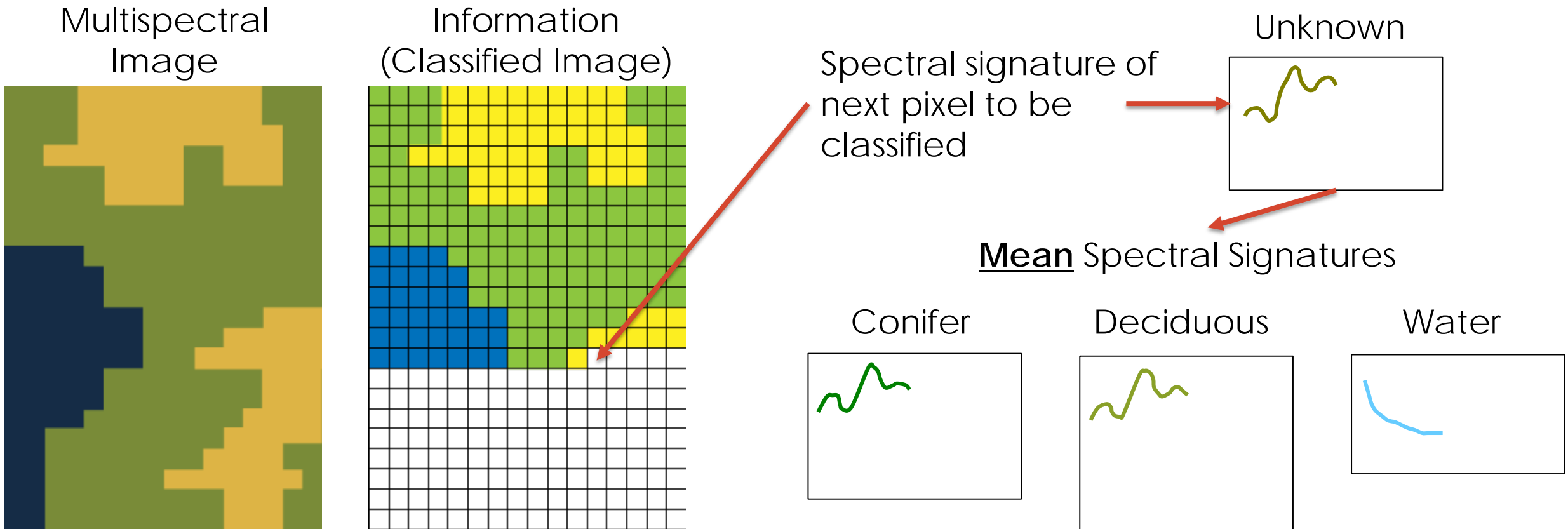


Image Classification

Supervised Method

The spectral signature of each pixel in the image gets matched with the training signatures and the image is classified accordingly



Summary

- Indicator 15.1.1: Forest area as a proportion of total land area
- Satellite imagery can be used to derive forest area in several ways
 - Existing forest maps (e.g. Global Forest Watch)
 - Existing land cover maps (e.g. ESA Climate Change Initiative Land Cover)
 - Create your own land cover map





Thank You!



MODIS and Demo
<https://earthdata.nasa.gov/>