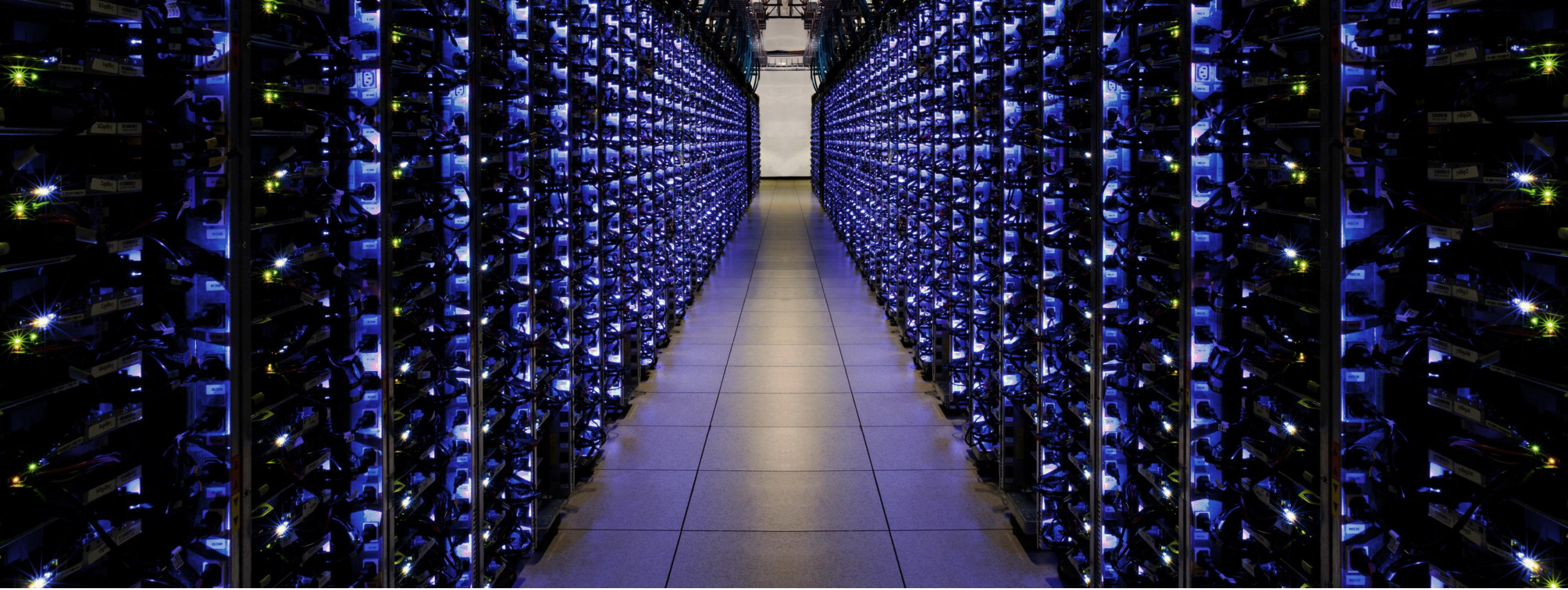

GOOGLE EARTH ENGINE
SPATIAL ALGORITHMS

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December 13, 2017

EÖTVÖS LORÁND UNIVERSITY, FACULTY OF INFORMATICS

WHAT IS EARTH ENGINE?

Google

Earth Engine:

Google's Cloud Platform for Big Earth Data Analytics

WHAT IS EARTH ENGINE?

Google Earth

3D Globe Visualization

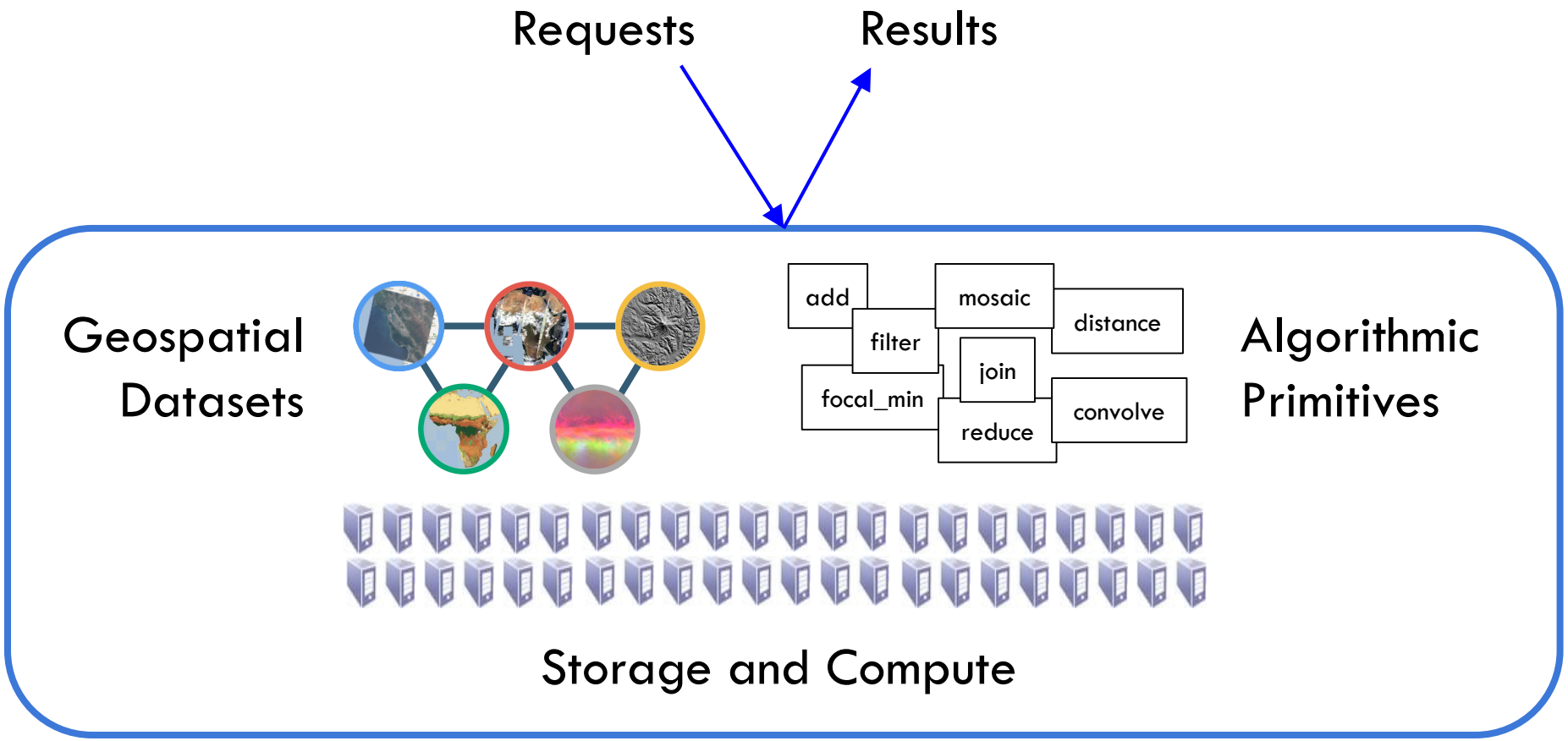
Rich 3D basemap on which raster and vector data can be overlaid.

Google Earth Engine

Geospatial Analysis

Enables the processing of massive amounts of raster and vector data, that may results in a variety of outputs such as tiles for 2-D interactive maps, tables, video, or images that can be displayed on Google Earth.

OVERVIEW


Requests
Results
Geospatial Datasets
add
mosaic
distance
filter
join
focal_min
convolve
reduce
Algorithmic Primitives
Storage and Compute

THE EARTH ENGINE PUBLIC DATA CATALOG

Landsat 4, 5, 7, 8
Raw, TOA, SR, etc.

MODIS
Daily, NBAR, LST, etc.

Terrain
SRTM, GTOPO, NED, etc.

Land Cover
GlobCover, NLCD, etc.

Atmospheric
NOAA NCEP, OMI, etc.

> 200 public datasets

> 5 million images

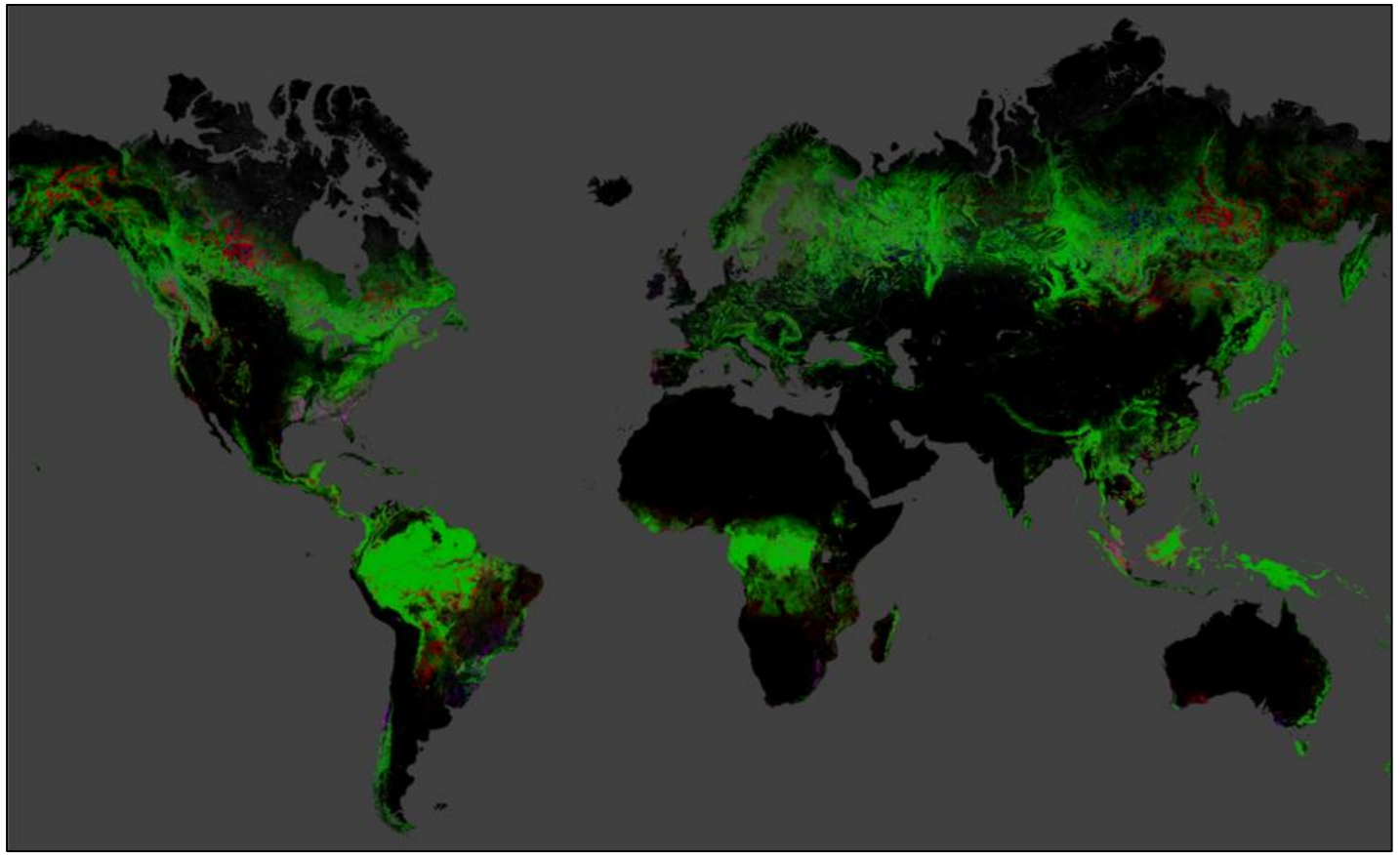
> 4000 new images every day

> 5 petabytes of data

USAGE AND EXAMPLES

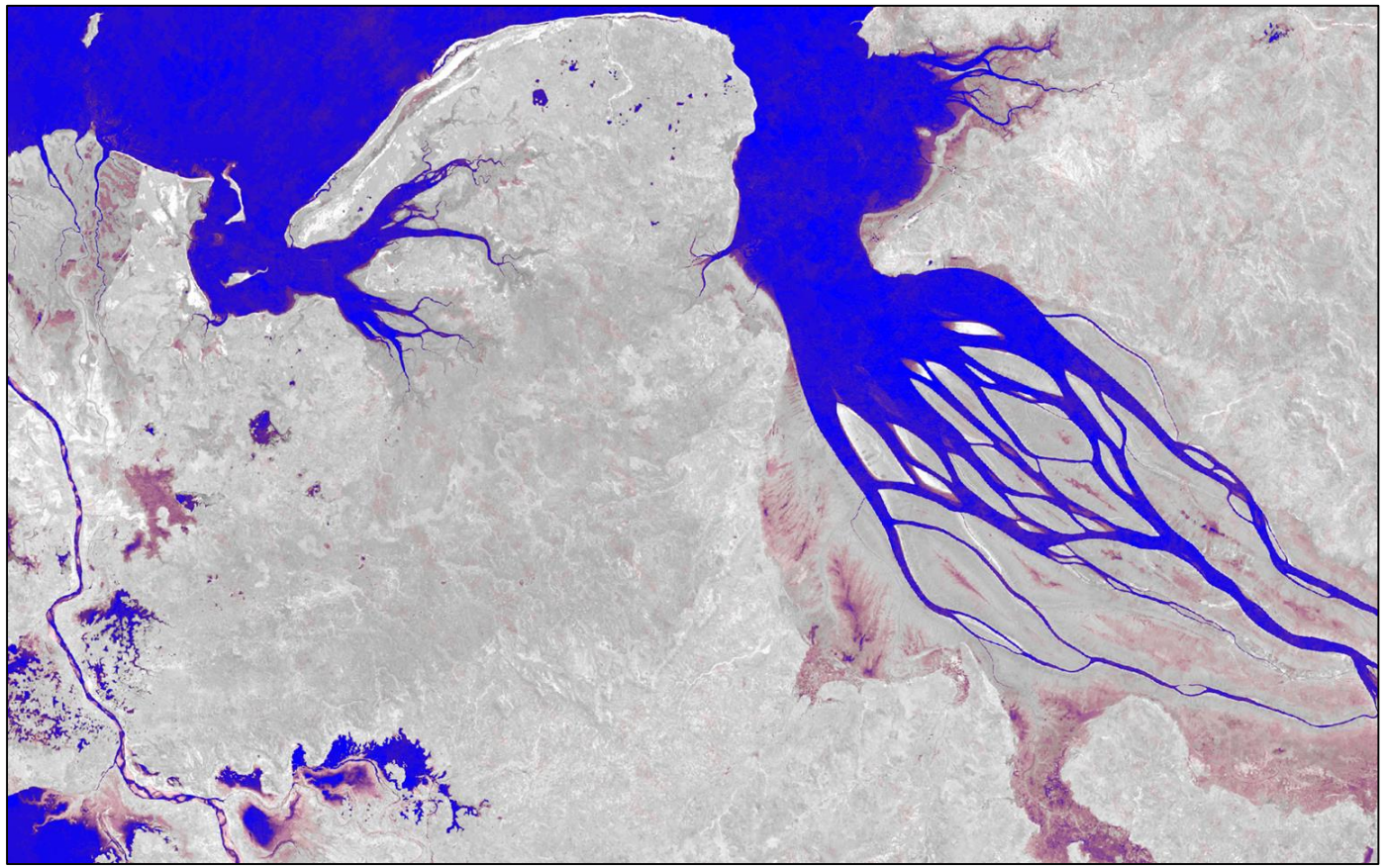
Showcases
Online demonstrations

GLOBAL FOREST EXTENT AND CHANGE



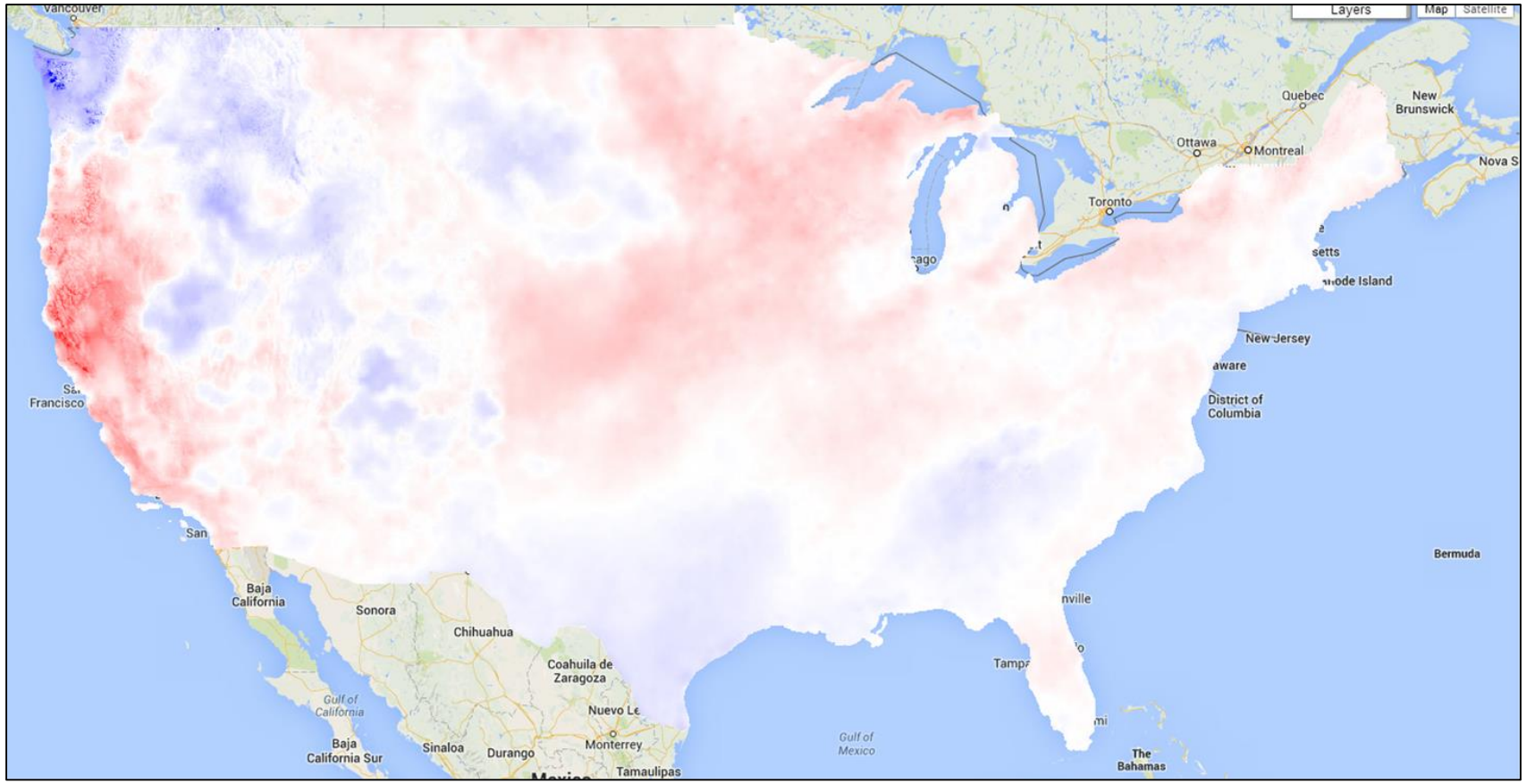
Source: Source: Hansen, Potapov, Moore, Hancher et al. , Science, 15 November 2013

GLOBAL SURFACE WATER



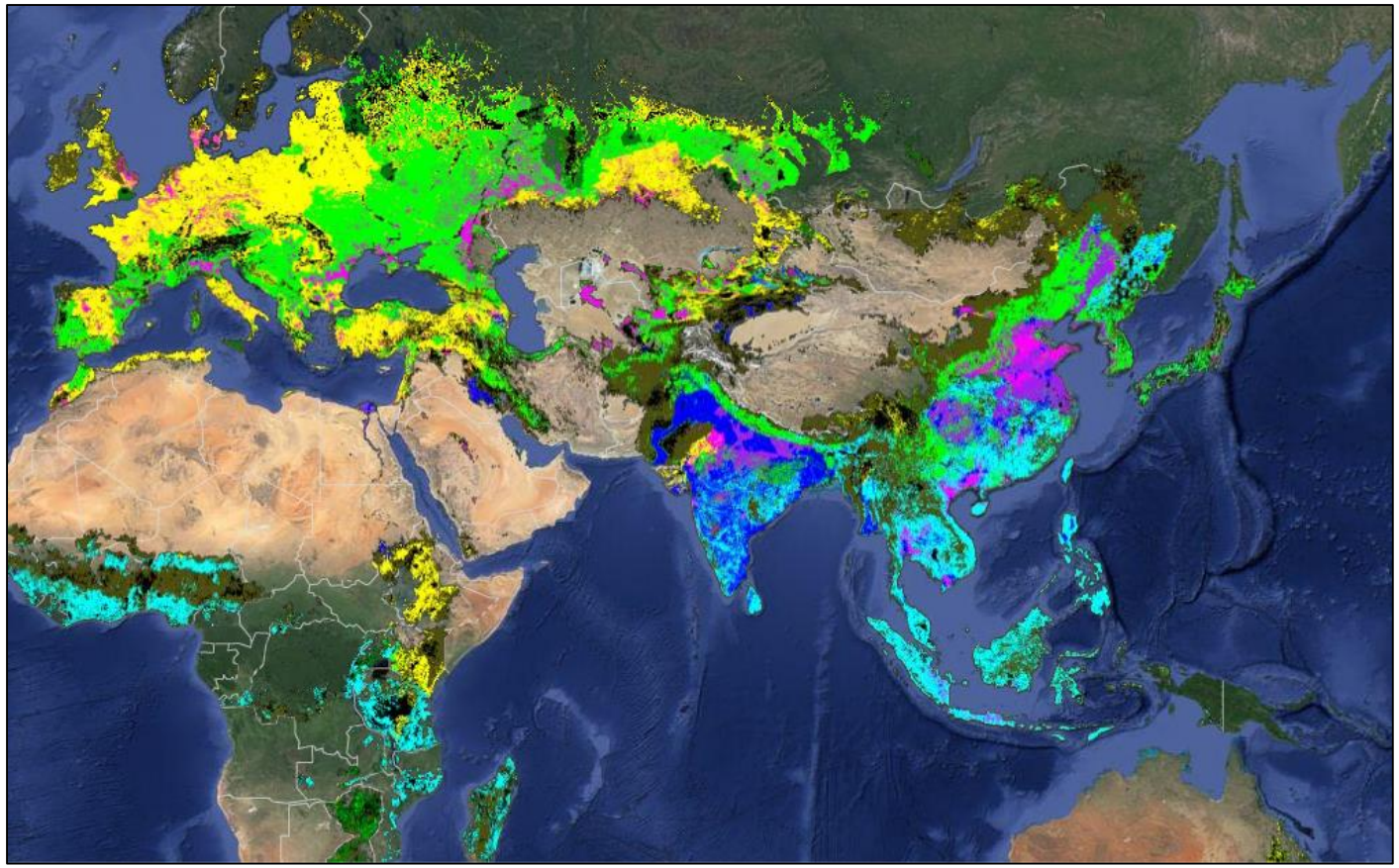
Source: Pekel, Belward, Cotton & Gorelick, 2015

REAL-TIME DROUGHT MONITORING



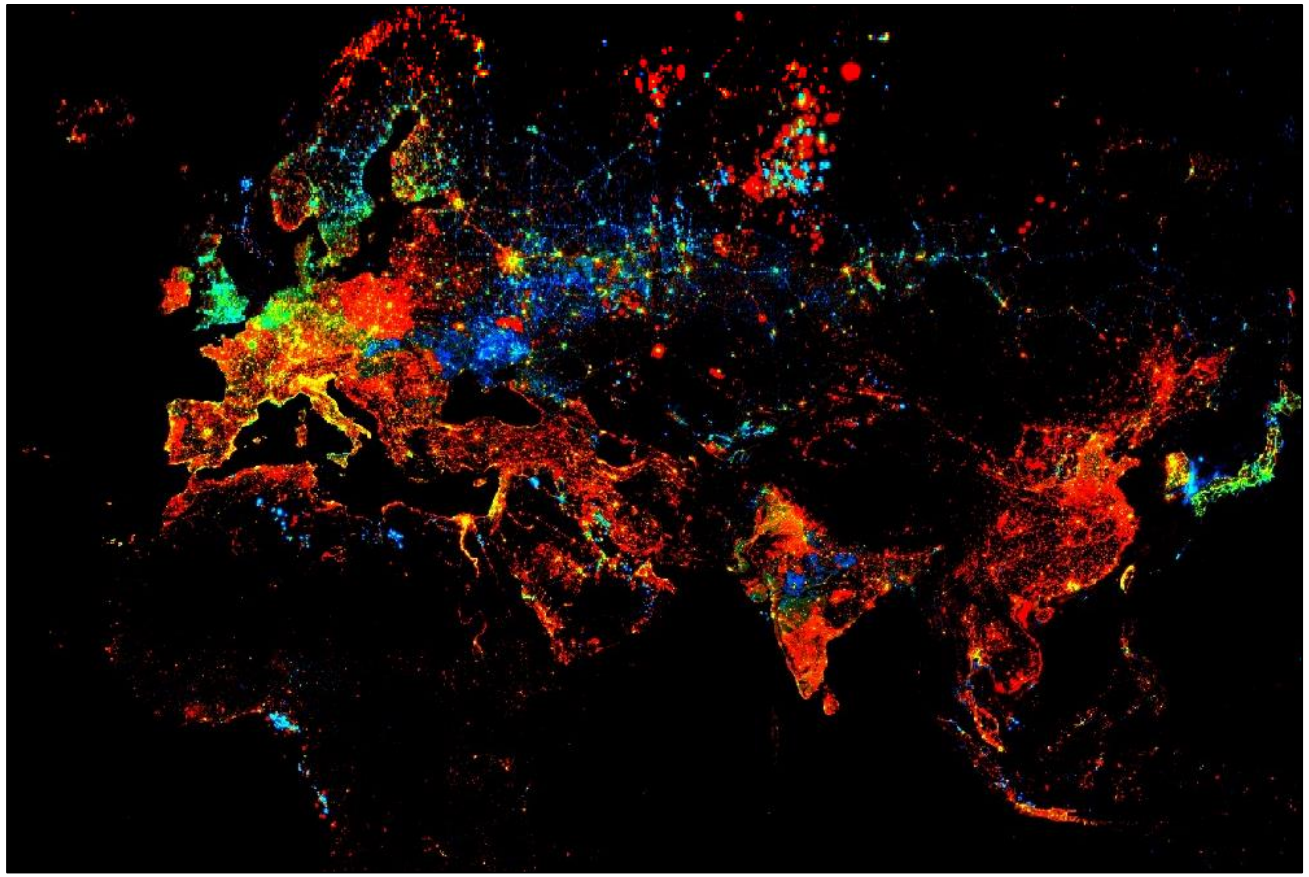
Source: Desert Research Institute - Justin Huntington and Charles Morton

GLOBAL CROP MAP



Source: Prasad Thenkabai, Jun Xiong, USGS

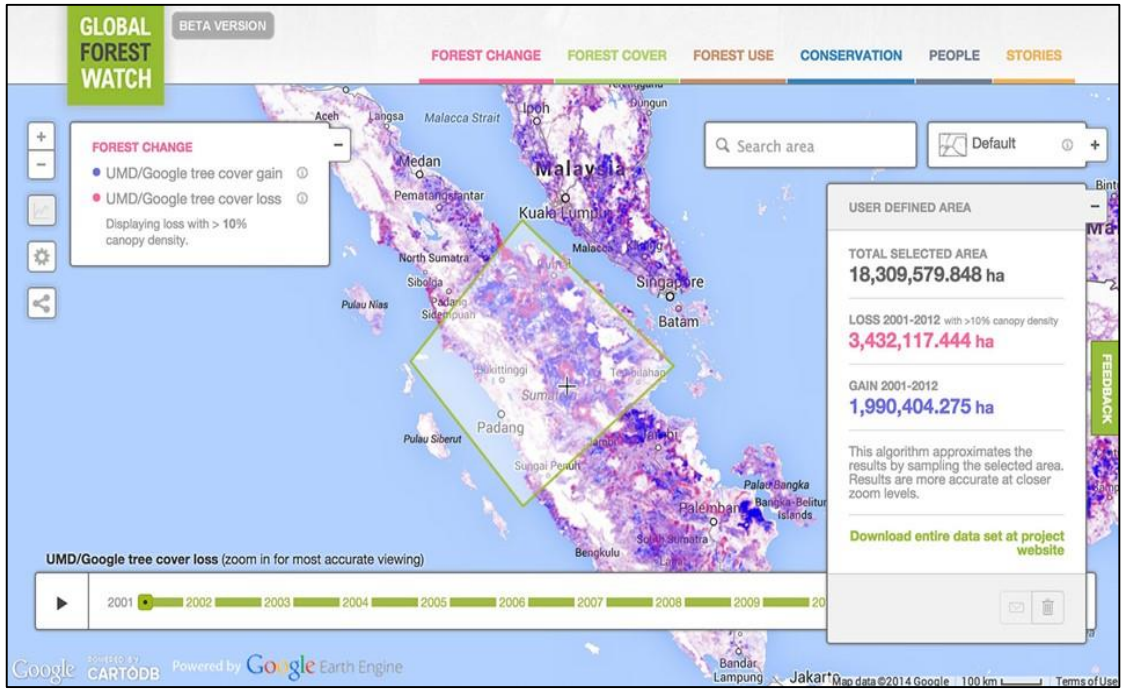
GLOBAL DEVELOPMENT



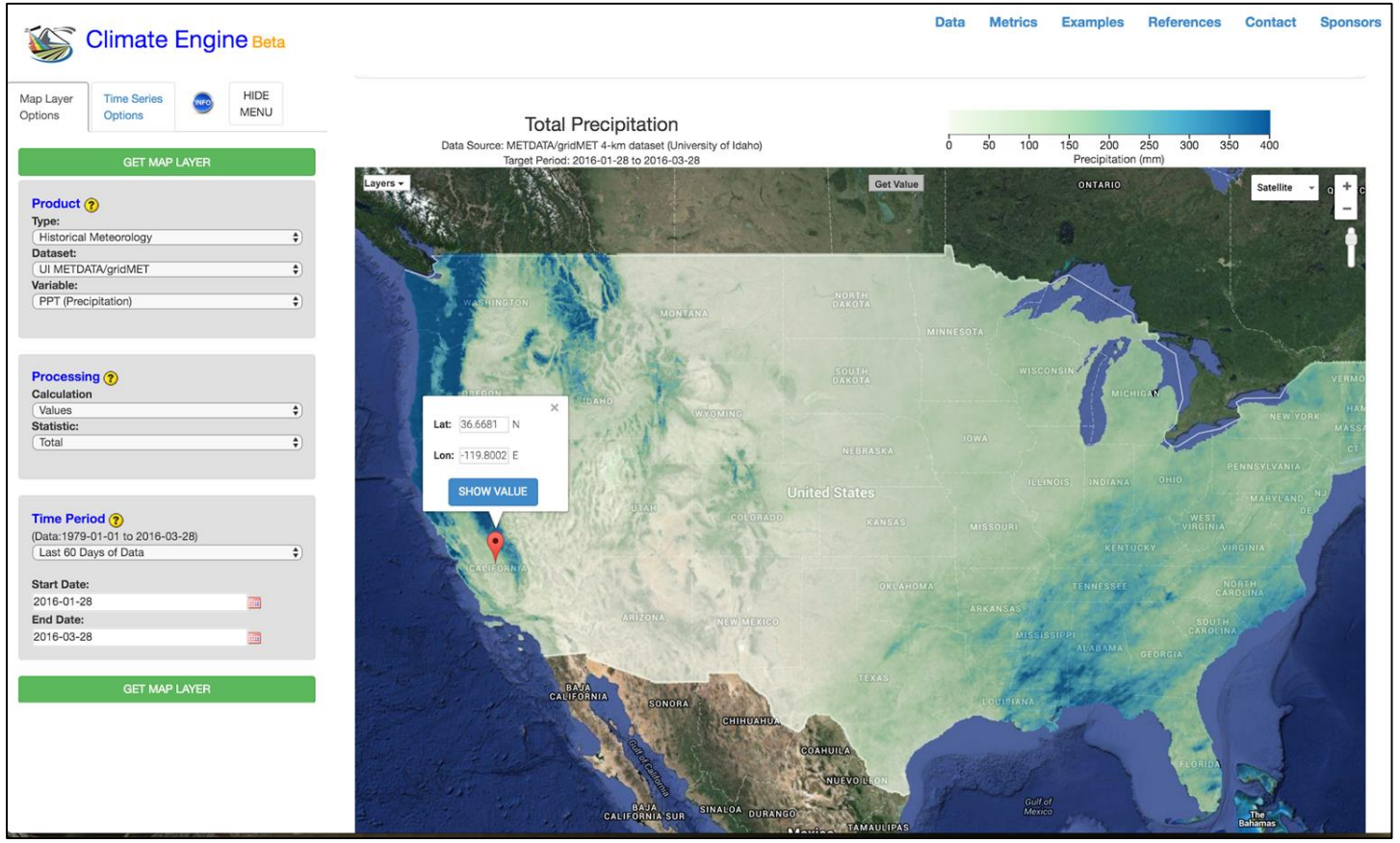
Source: DMSP-OLS, Nighttime persistent lights

GLOBAL FOREST WATCH

www.globalforestwatch.org

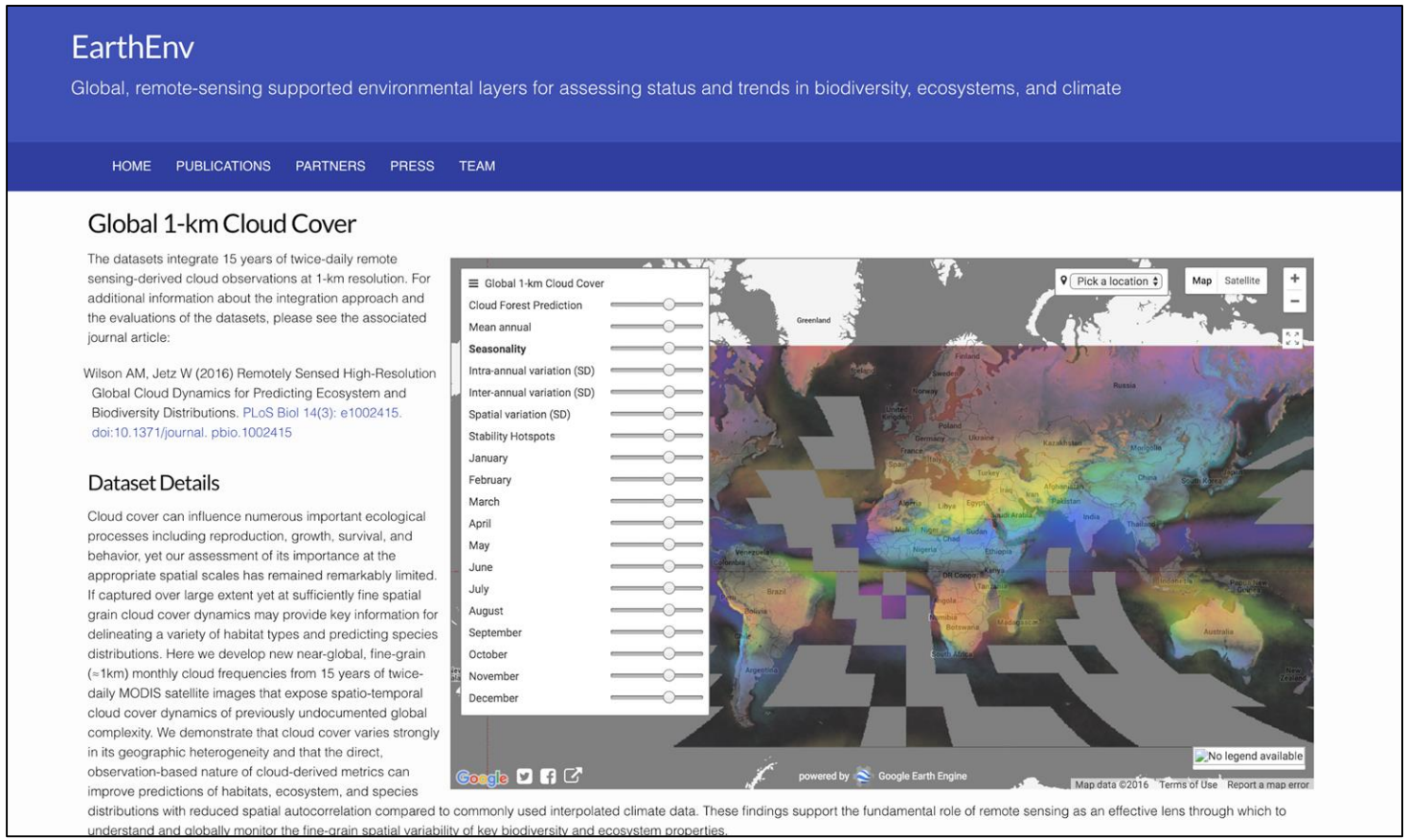


CLIMATE ENGINE



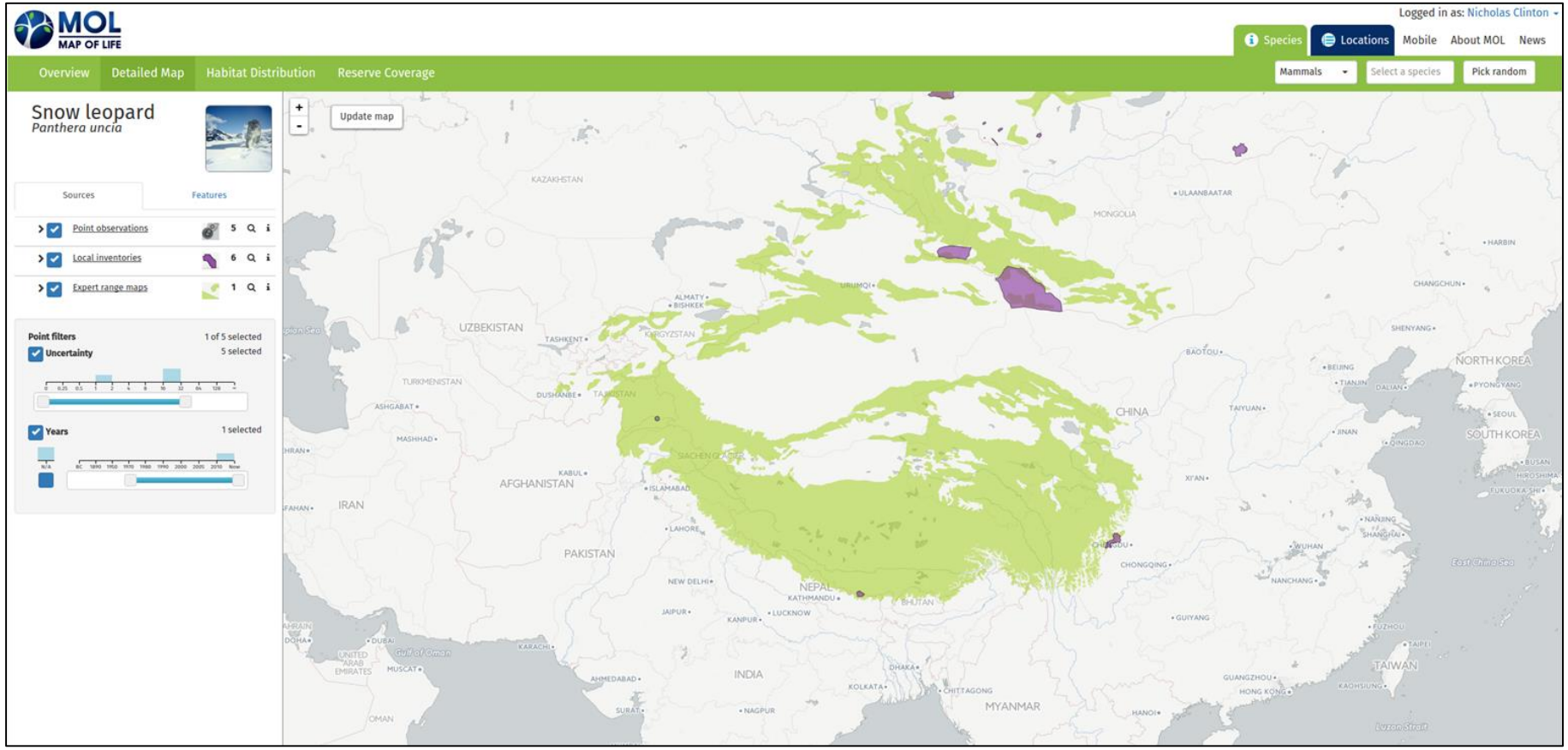
climateengine.org

EARTHENV



www.earthenv.org

MAP OF LIFE



mol.org

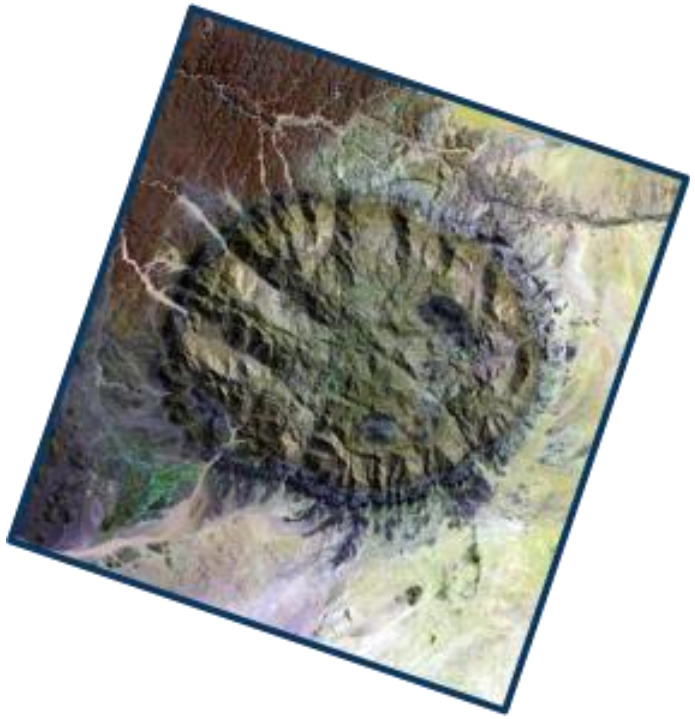
HOW DOES IT WORK?

Global algorithm processing
Map-Reduce paradigm

GLOBAL-SCALE ALGORITHM PROCESSING

Get an image

- Pick projection, resolution, bands, bounding-box, visualization



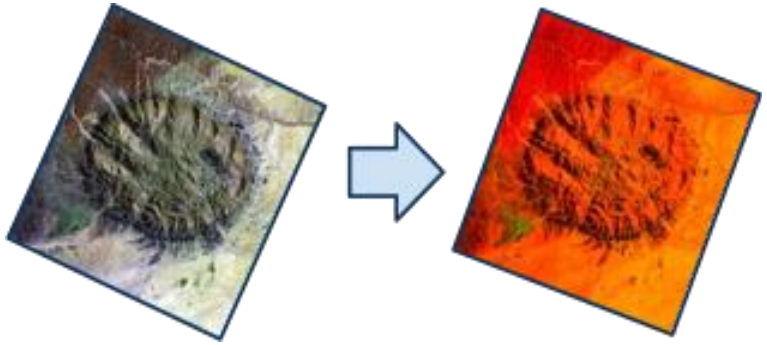
GLOBAL-SCALE ALGORITHM PROCESSING

Get an image

- Pick projection, resolution, bands, bounding-box, visualization

Apply an algorithm to an image

- Library functions or script your own



GLOBAL-SCALE ALGORITHM PROCESSING

Get an image

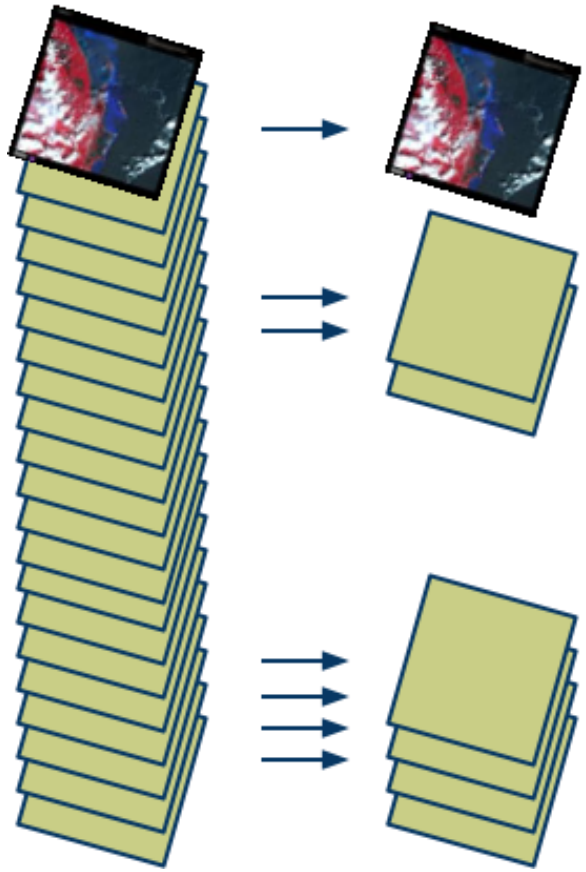
- Pick projection, resolution, bands, bounding-box, visualization

Apply an algorithm to an image

- Library functions or script your own

Filter an image collection

- Time, Space & Metadata search



GLOBAL-SCALE ALGORITHM PROCESSING

Get an image

- Pick projection, resolution, bands, bounding-box, visualization

Apply an algorithm to an image

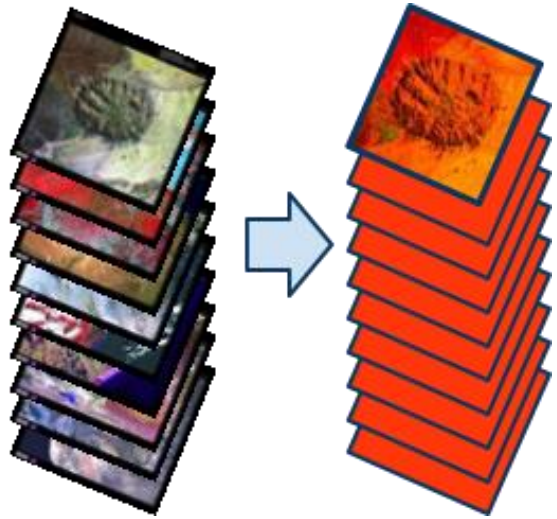
- Library functions or script your own

Filter an image collection

- Time, Space & Metadata search

Map an algorithm over an image collection

- N → N



GLOBAL-SCALE ALGORITHM PROCESSING

Get an image

- Pick projection, resolution, bands, bounding-box, visualization

Apply an algorithm to an image

- Library functions or script your own

Filter an image collection

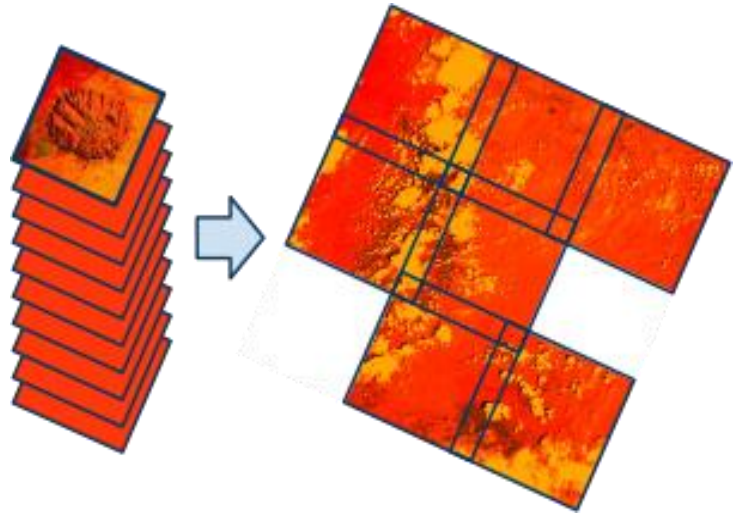
- Time, Space & Metadata search

Map an algorithm over an image collection

- N → N

Reduce a collection

- N → 1 or N → M



QUESTIONS?

Credits:
Noel Gorelick, Google
Gennadii Donchyts, Deltares