



*Wax Lake
Outlet*

*Atchafalaya
River*

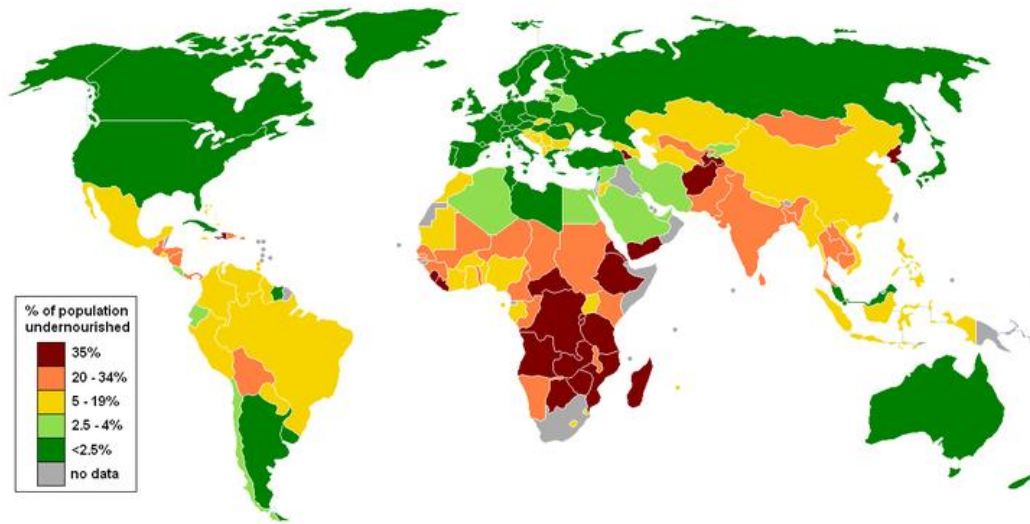
***REMOTE SENSING APPLICATION IN
AGRICULTURAL WATER
MANAGEMENT***

Elizaveta Khazieva

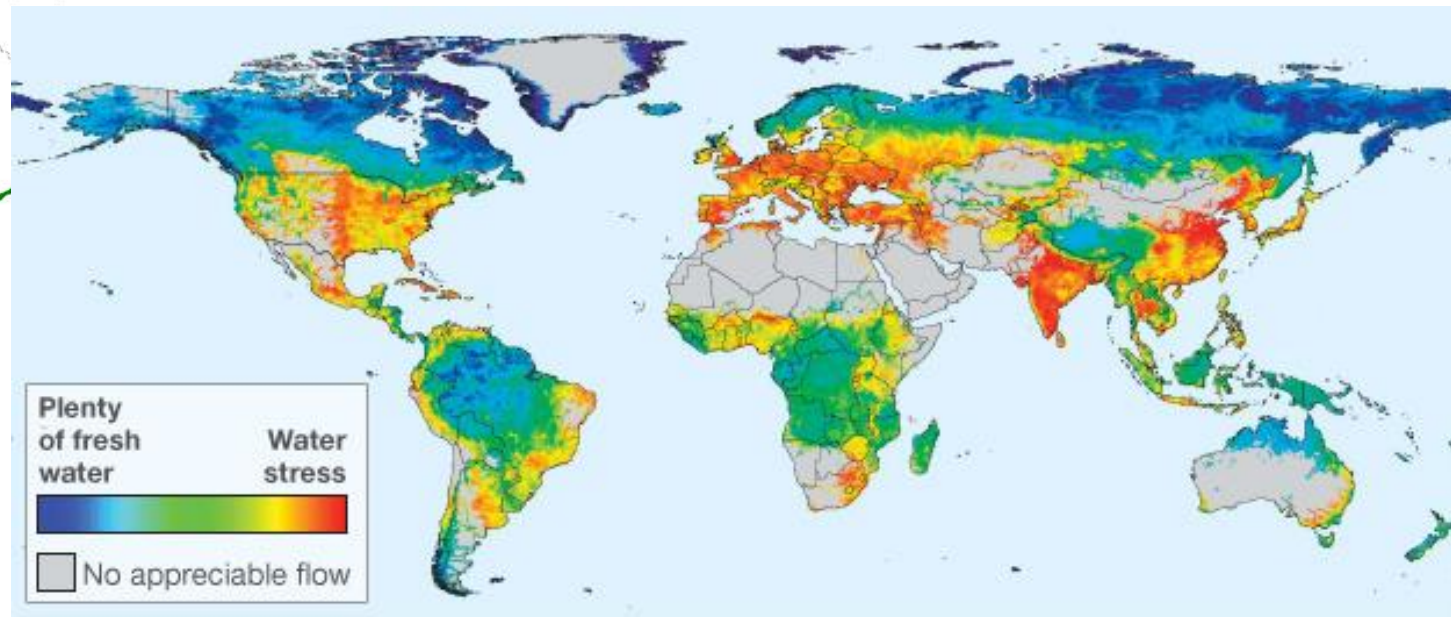
Islamabad, 2018

Agriculture and Food security

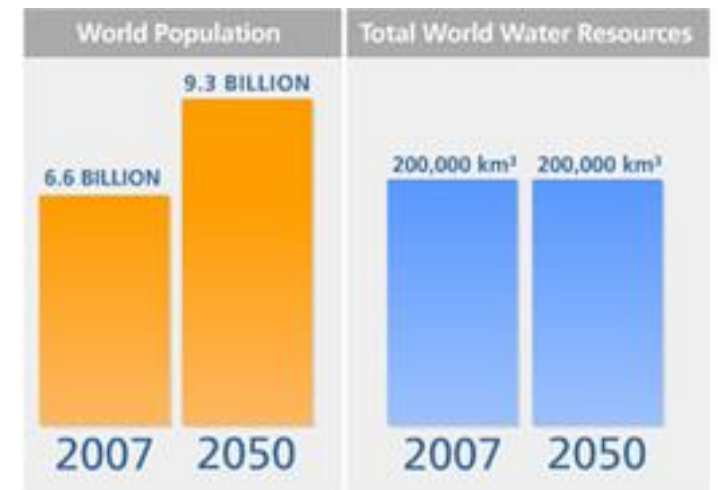
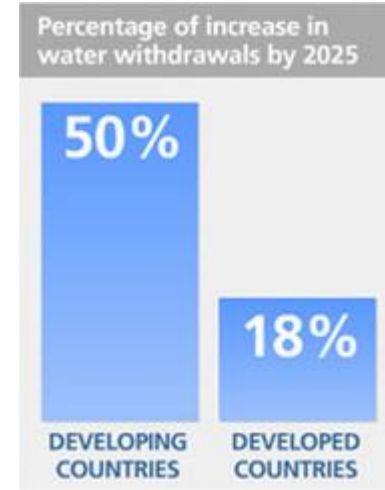
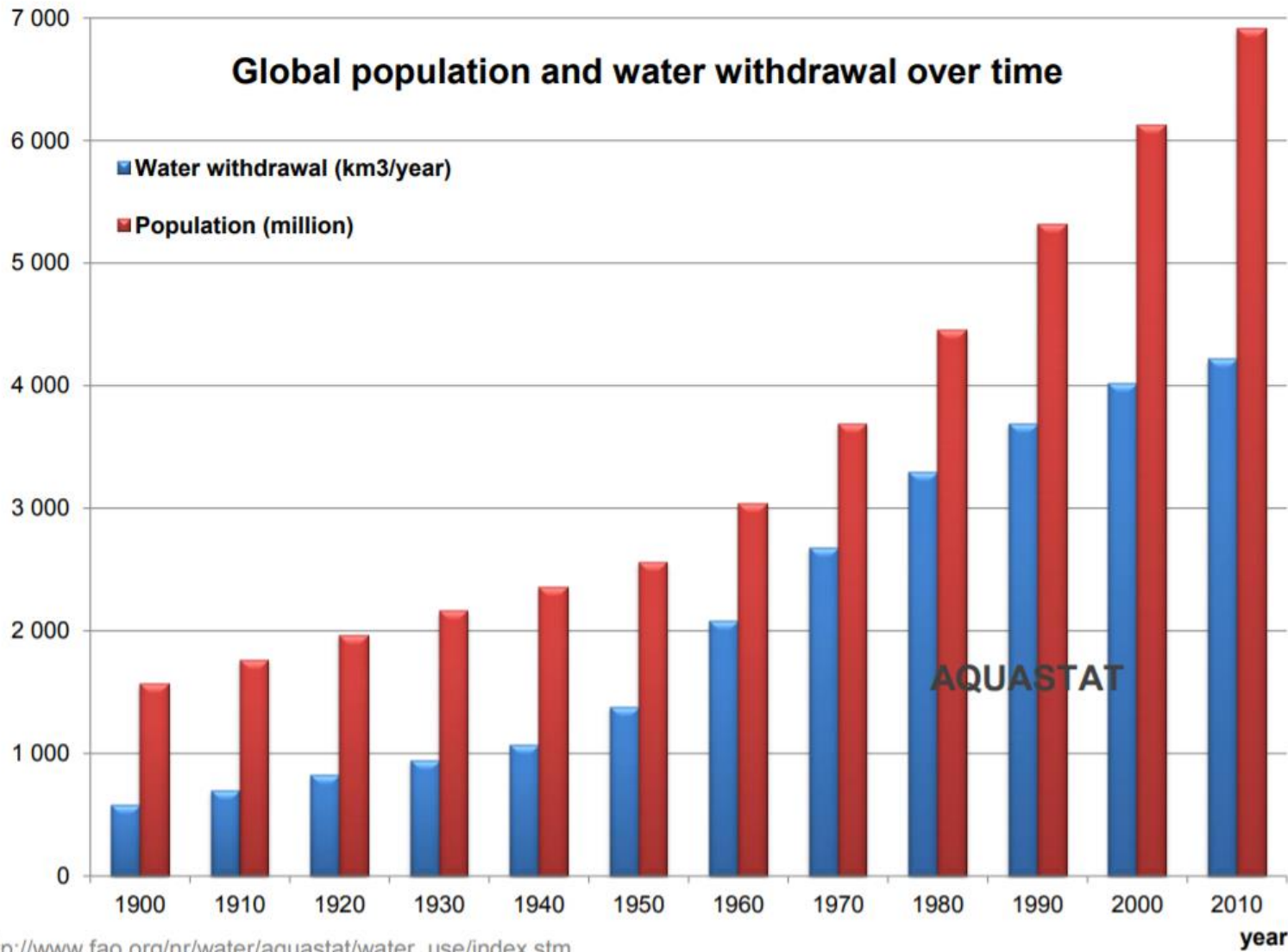
Map depicting the percentage of global undernourishment, 2008



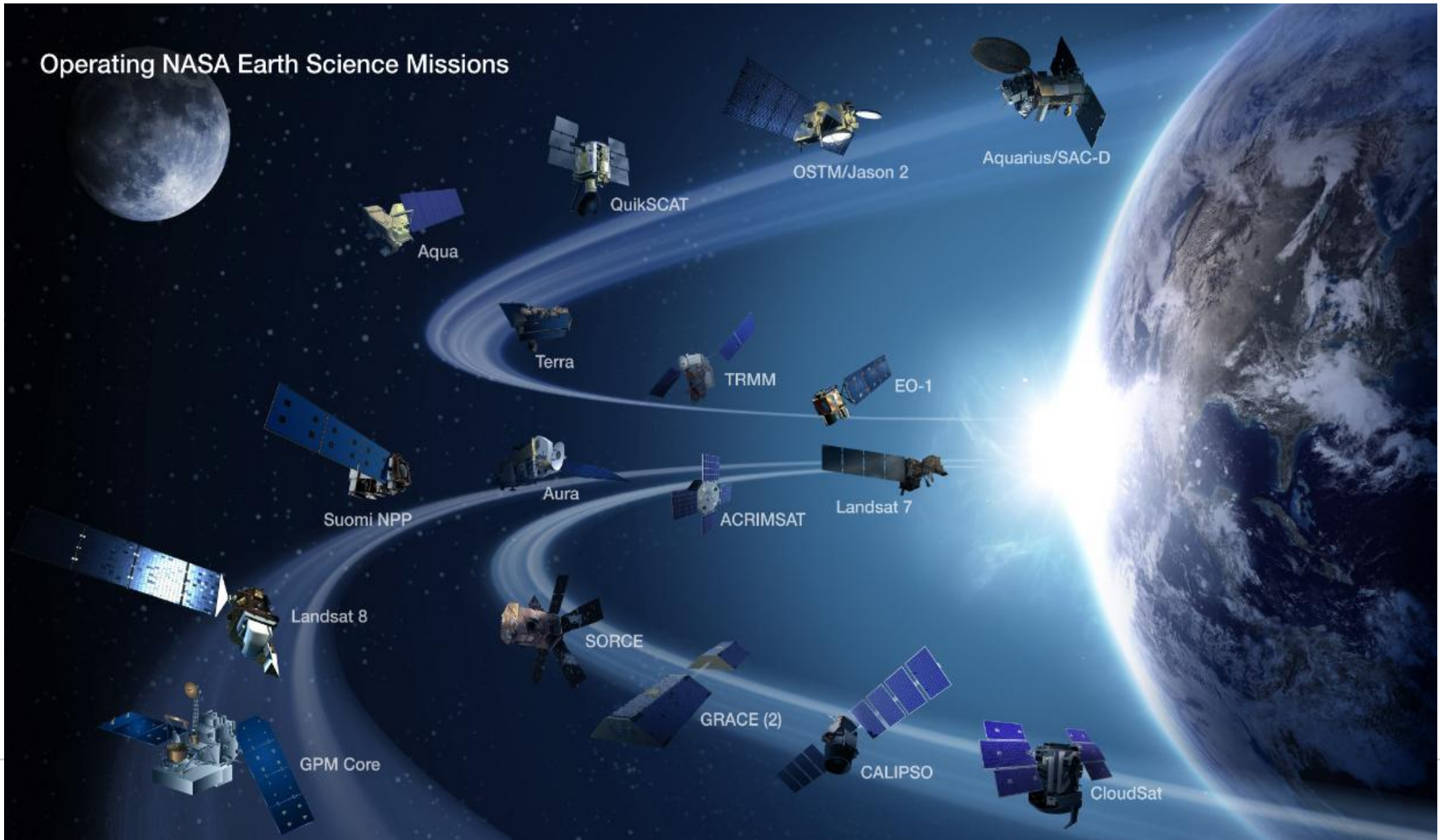
Global Water supply



Global water resources



Satellites around the Earth



Satellites around the Earth

Vegetation
monitoring,
Evapotranspiration

→ **Landsat:** 07/1972 – present

→ **Sentinel:** 05/2015 - present

Precipitation

→ **Tropical Rainfall Measuring Mission (TRMM):** 11/1997 – 04/2015

→ **Global Precipitation Measurements (GPM):** 02/2014 – present

Snow Cover,
Vegetation Index for
Evapotranspiration

→ **Terra:** 12/1999 – present

→ **Aqua:** 05/2002 – present

Soil Moisture

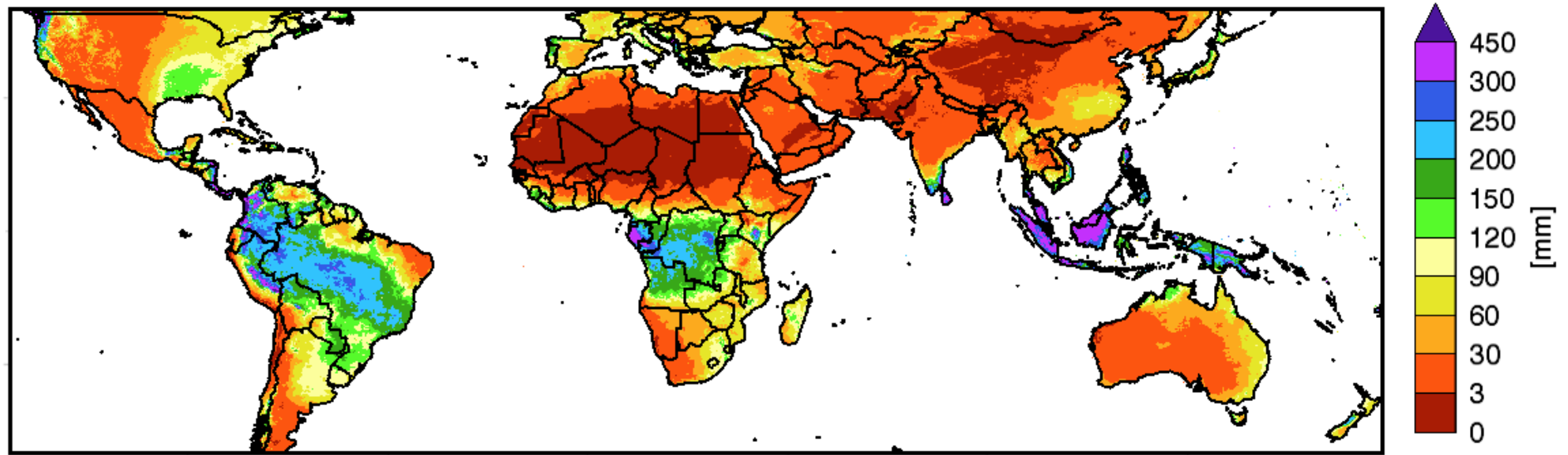
→ **Soil Moisture Active Passive (SMAP):** 01/2015 – present

Ground Water

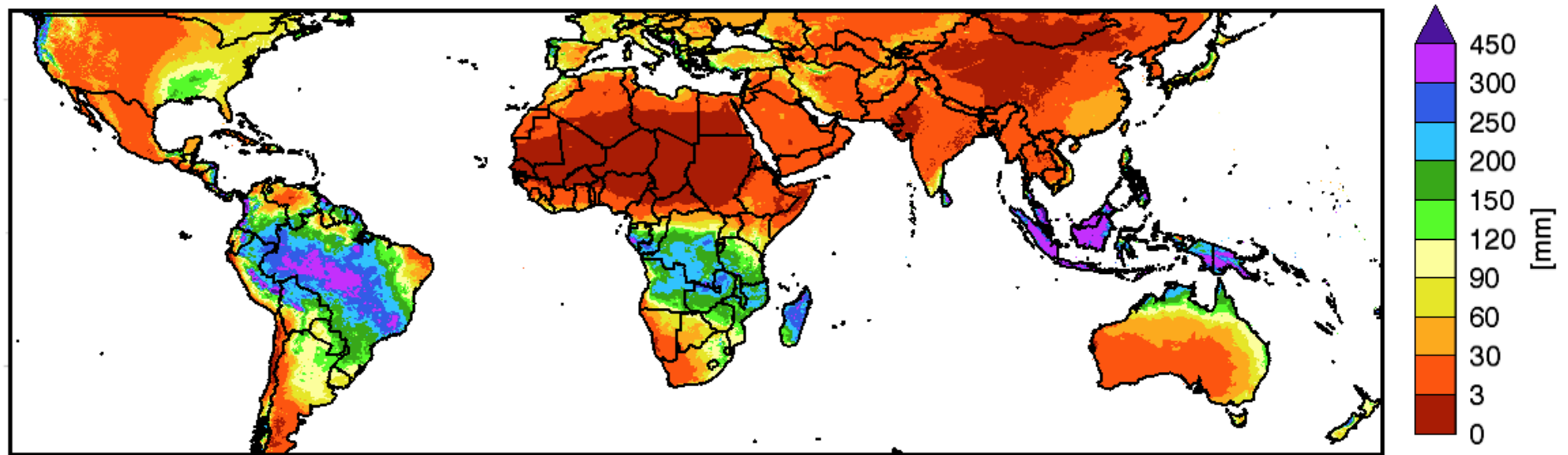
→ **Gravity Recovery and Climate Experiment (GRACE):** 03/2002 – present

CHIRPS

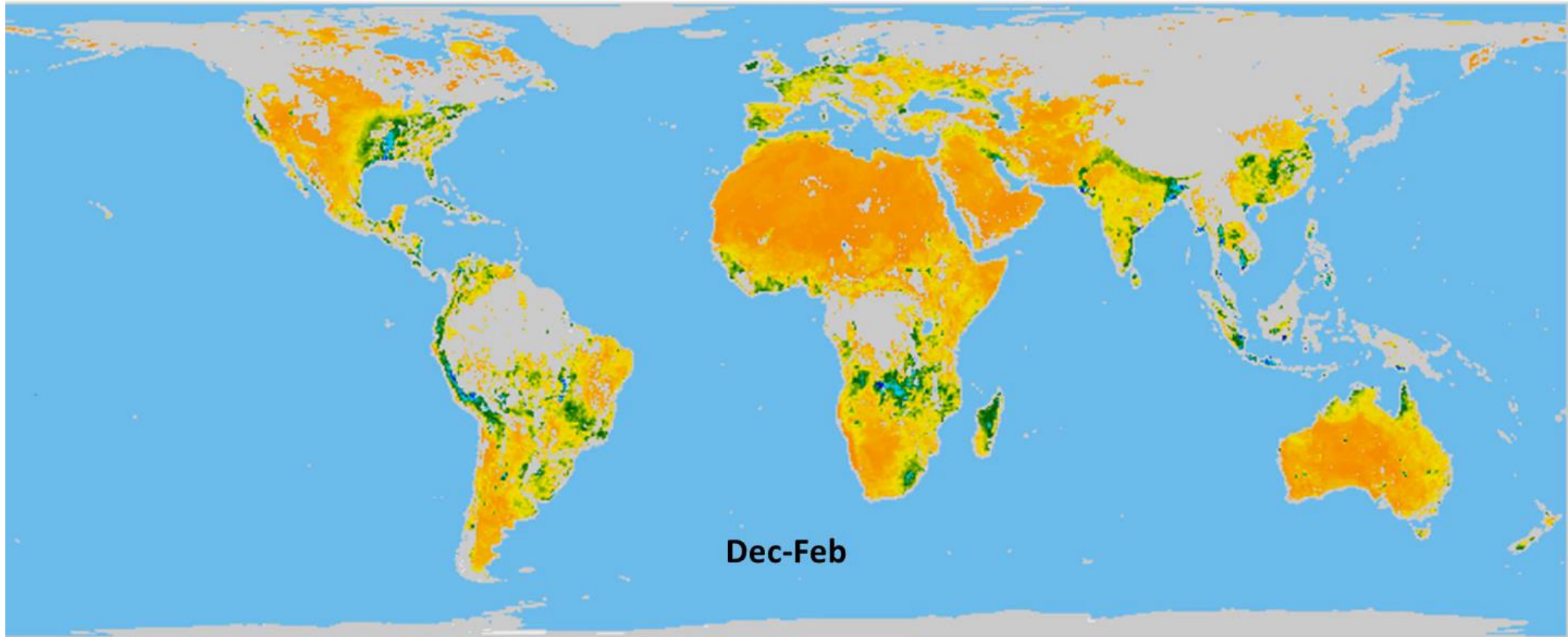
November CHPclim



December CHPclim

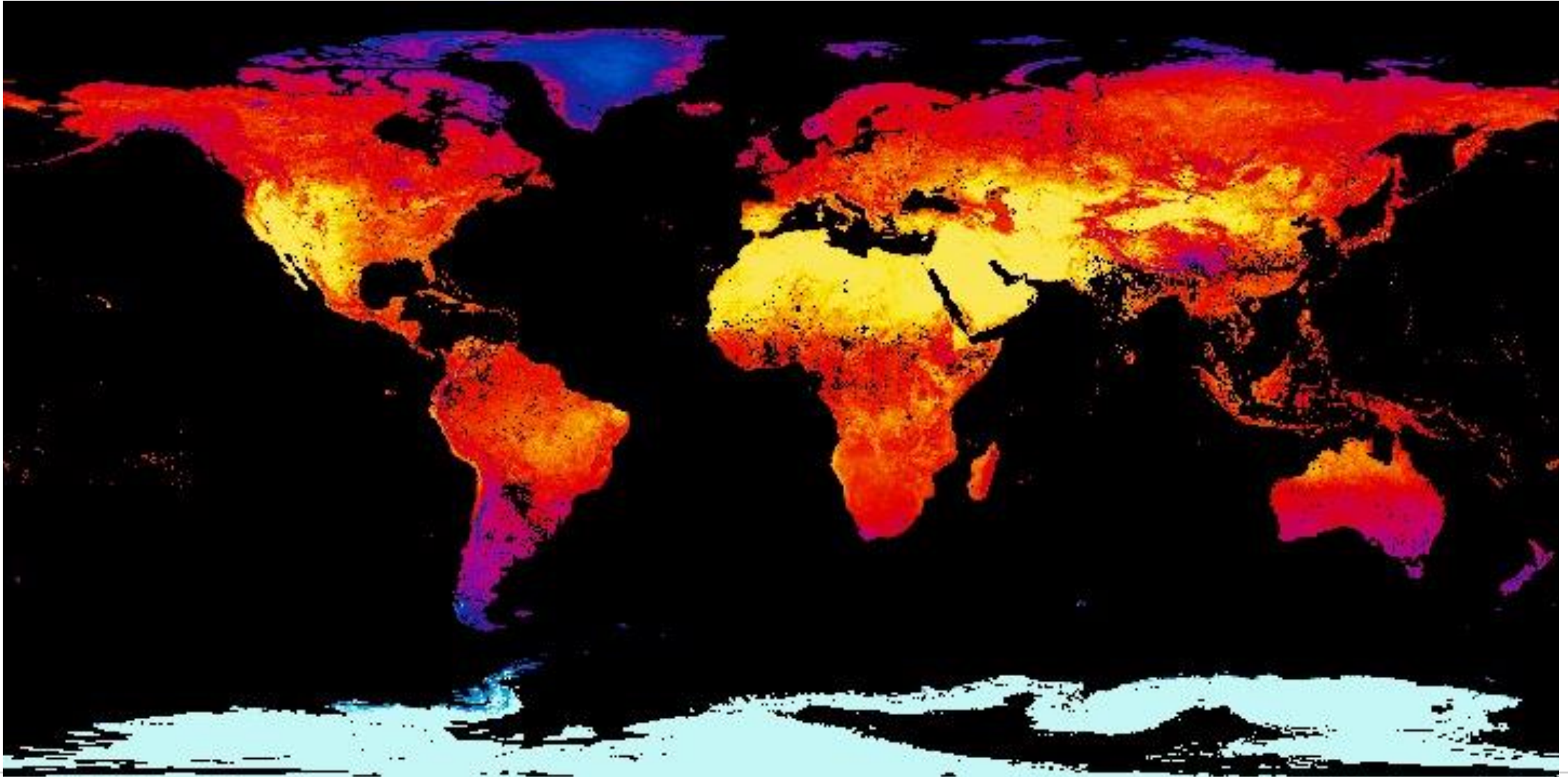


Soil Moisture and Ocean Salinity (SMOS)



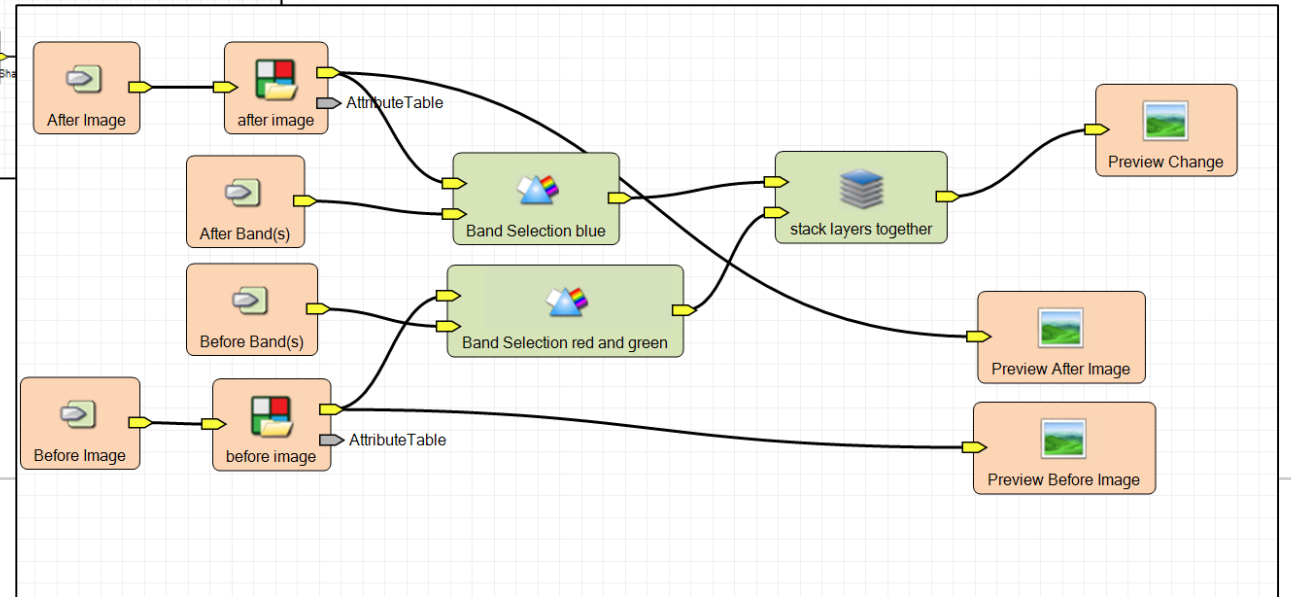
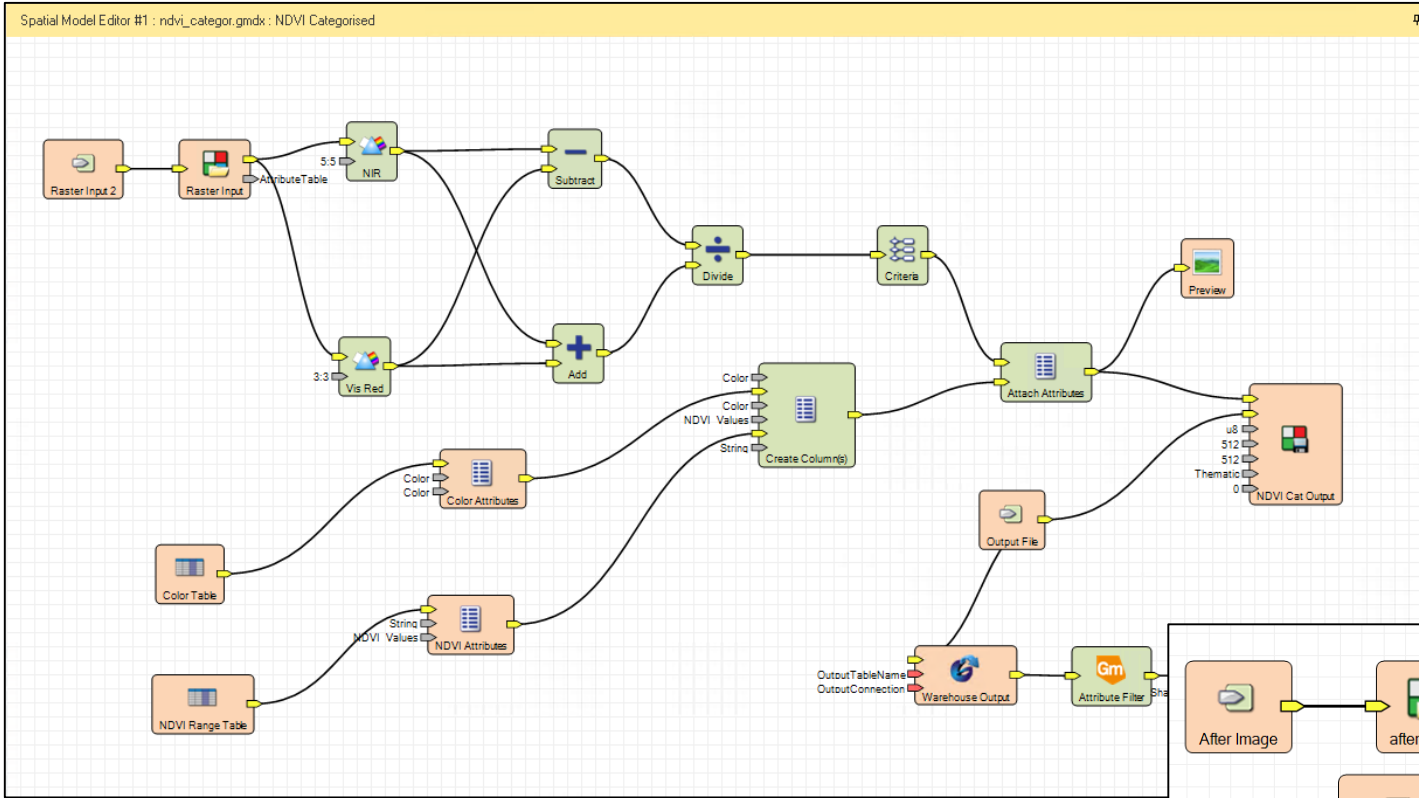
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 (m^3/m^3)

Land Surface Temperature



Summer temperature (2000 – 2016)

Spatial Modelling



JavaScripts



Scripts Docs Assets

- users/esaveleye43/test
 - Writer
 - No accessible repositories.
 - Reader (4)
 - users/allieber/geomed2017
 - 000 Inspecting CHIRPS
 - 000 Inspecting Temperature
 - [00] Javascript Syntax
 - [01] Hello World
 - [02] Hello Image
 - [03] Apply a Computation
 - [04] Apply a Spatial Reducer
 - [05] Load and Filter CHIRPS Data
 - [06] Chart CHIRPS Time Series
 - [07] UI Panel
 - [08] Timeseries at each point
 - [09] Write a Function (NDVI)
 - [10] Map Function (NDVI) over Collection
 - [extra1] Export
 - [extra2] Calculate Monthly CHIRPS Averages
 - [extra3] Determine Anomalies
 - [extra4] Perform a saveAll Join

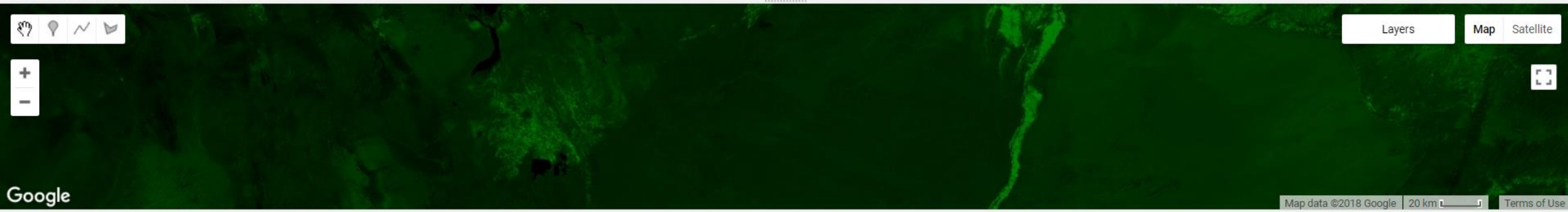
```
[09] Write a Function (NDVI) Get Link Save Run Reset
```

```
Imports (2 entries)
  var imageCollection: (Deprecated) ImageCollection "USGS La...
  var l8: (Deprecated) ImageCollection "USGS Landsat 8 TOA R...

1 var filtered = l8.filterDate('2016-01-01', '2016-03-31');
2 var rgb_viz = {min:0, max:0.3, bands:['B4','B3','B2']};
3 Map.addLayer(filtered, rgb_viz, 'RGB', false);
4
5
6 var median = filtered.median();
7 Map.addLayer(median, rgb_viz, 'median');
8
9 var ndvi = median.normalizedDifference(['B5', 'B4']);
10 var ndvi_viz = {bands: 'NDVI', min:0, max:0.3, palette:'black'};
11
12 function addNdvi(img) {
13   var nd = img.normalizedDifference(['B5', 'B4']);
14   return img.addBands(nd.rename('NDVI'));
15 }
16
17 var ndvi = addNdvi(median);
18 print(ndvi);
19 Map.addLayer(ndvi, ndvi_viz, 'NDVI');
```

Inspector Console Tasks

Click on the map to inspect the layers.



Geospatial Apps



Geospatial Apps



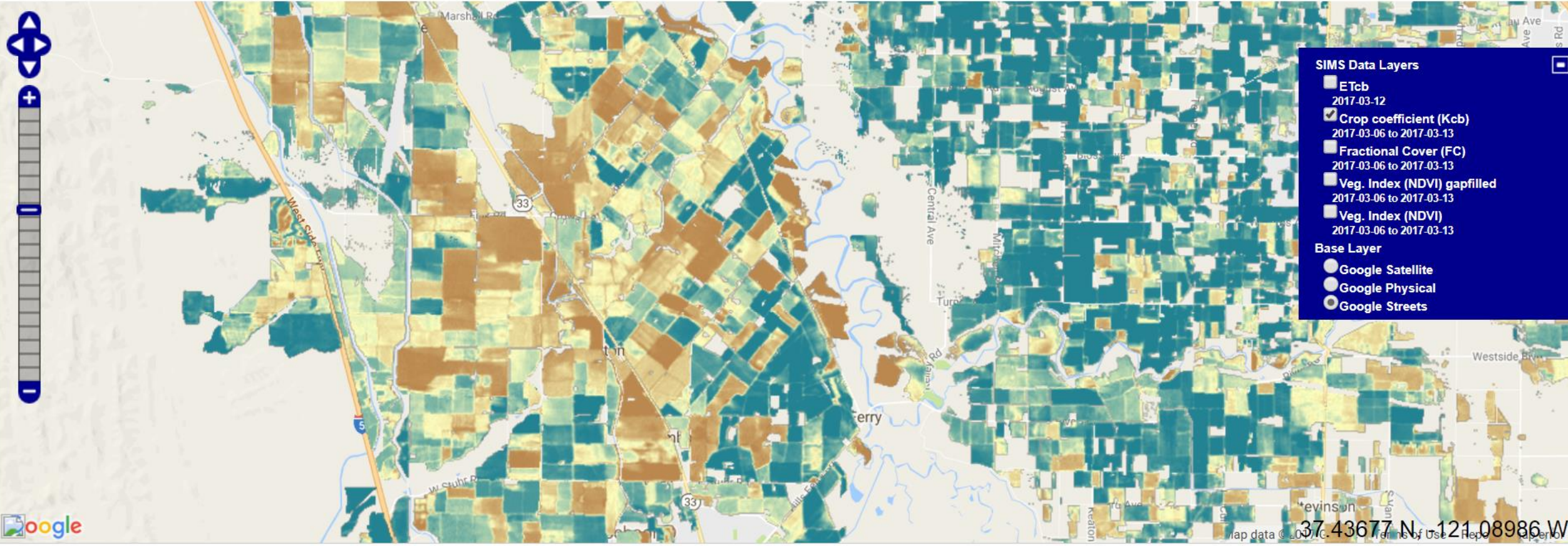
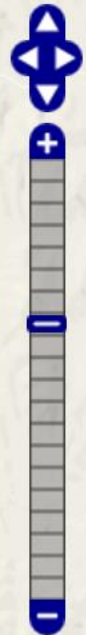
TOPS Satellite Irrigation Management Support

Welcome

Go to: Search

[About](#) [Help](#)

Select Date:



SIMS Data Layers

- ETcb
2017-03-12
- Crop coefficient (Kcb)
2017-03-06 to 2017-03-13
- Fractional Cover (FC)
2017-03-06 to 2017-03-13
- Veg. Index (NDVI) gapped
2017-03-06 to 2017-03-13
- Veg. Index (NDVI)
2017-03-06 to 2017-03-13

Base Layer

- Google Satellite
- Google Physical
- Google Streets



Map data © 2017 Google, Terms of Use, Report a Problem
37.43677 N, 121.08986 W

Google Earth Engine

Scripts Docs Assets

Filter scripts...

Owner (7)

- users/esavelye43/collec
- users/esavelye43/Demo
 - 1_Demo_Inspecting Te
 - 2_Demo_DEM
 - 3_Demo_Classificatio
 - 4_Demo_Chart NDVI c
 - 5_Demo_Center Pivot
 - 6_Demo_Elevation An
 - DEMO_Landsat
- users/esavelye43/ivanov

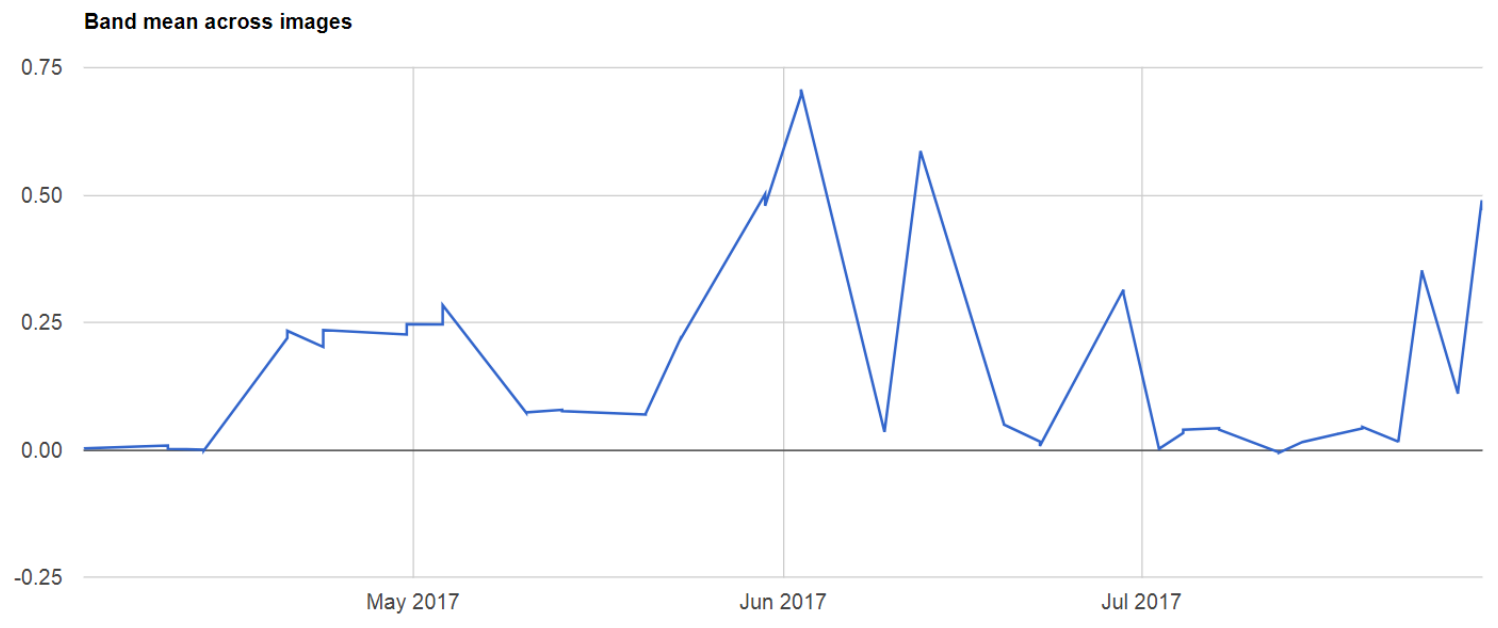
Geometry In

+

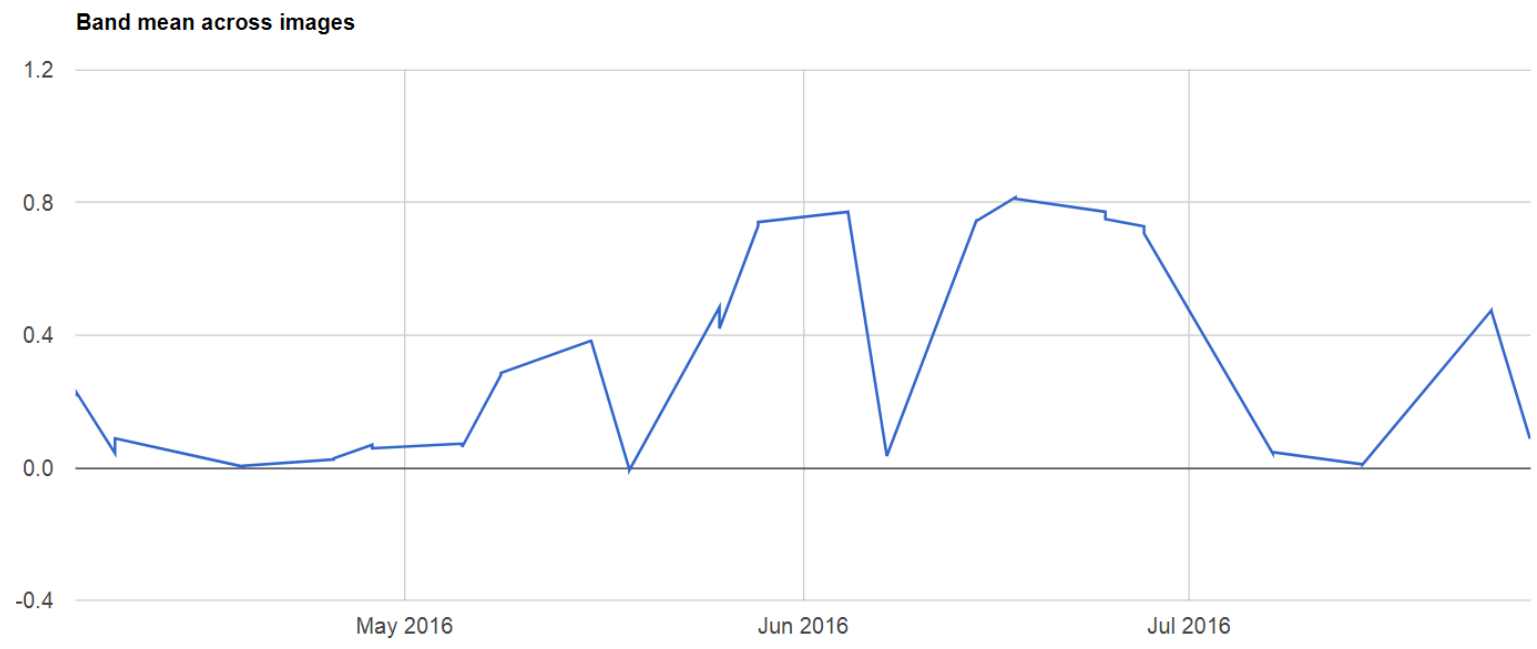
-

Google

Band mean



Band mean



Help esavelye43

Tasks

write to this console.

cross images

017 Jun 2017 Jul 2017

(labeled by system:time_start)

Layers Map Satellite

500 m

Terms of Use

Overgrown area detection

Based on: NDVI index

Expression: $(\text{NIR} - \text{Red}) / (\text{NIR} + \text{Red})$

The screenshot displays the Google Earth Engine web interface. The main map area shows a satellite view of a rural landscape with several irregularly shaped areas highlighted in red and green. A legend in the bottom-left corner of the map area identifies the red areas as 'overgrown area (> 60%)' and the green areas as 'overgrown area'. The map scale is indicated as 1:150 000. The interface includes a search bar at the top, a 'Scripts' panel on the left with a list of scripts including 'Two Chart Inspector', 'Where Operator', 'Zoom Box', and '_Chart NDVI over Time (agro)', and a 'Console' panel on the right with a 'Run' button and a 'Reset' dropdown. The bottom of the interface shows map navigation controls and a scale bar.

Water content assessment

Based on: The Normalized Difference Water Index (NDWI)

Expression: $(NIR - MidIR) / (NIR + MidIR)$

The screenshot displays the Google Earth Engine interface. On the left, a sidebar lists scripts under the name 'ndwi', with the owner 'esavelye43' and a selected script 'NDWI'. The main area is split into two map views. The left map shows a grayscale NDWI visualization with a legend indicating a range from High (1) to Low (0). The right map shows a color-coded NDWI visualization with a legend indicating 'dry' (pink) and 'wet' (green) areas. A 'Layers' panel on the right shows the 'NDWI visualization parameters' dialog, which is currently set to 1 band (Grayscale) with a range of -0.4098 to 0.08221. The interface also includes a search bar, navigation controls, and a console window.

Google Earth Engine

Search places and datasets...

Help esavelye43

Scripts Docs Assets

ndwi

Owner (6)

- users/esavelye43/collection (expand to see)
- users/esavelye43/Demo (no matches)
- users/esavelye43/Landsat_work (expand to see)
- users/esavelye43/script_ex (filtered)
- NDWI
- users/esavelye43/scripts (no matches)
- users/esavelye43/test (no matches)

Writer

No accessible repositories.

Reader (4)

- users/allieber/geomed2017 (no matches)
- users/davethau/EE101 (no matches)

Legend

NDWI

High : 1

Low : 0

1:100 000

Legend

dry

wet

1:100 000

Layers Map Satellite

NDWI visualization parameters

1 band (Grayscale) 3 bands (RGB)

NDWI

Range

-0.4098 - 0.08221 Custom

Opacity

Gamma Palette

Import Apply Close

Map data ©2018 Google 1 km Terms of Use Report a map error

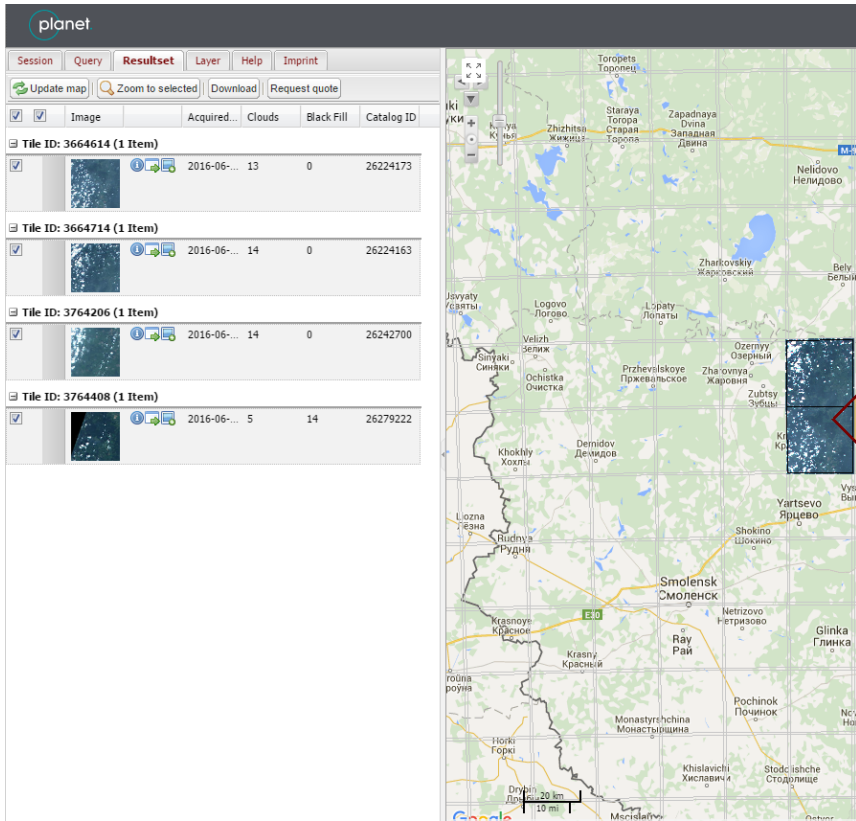
Chlorophyll content assessment

Data: RapidEye

Source: <http://eyefind.rapideye.com/>

Based on: Improved Modified Chlorophyll Absorption Ratio Index (MCARI)

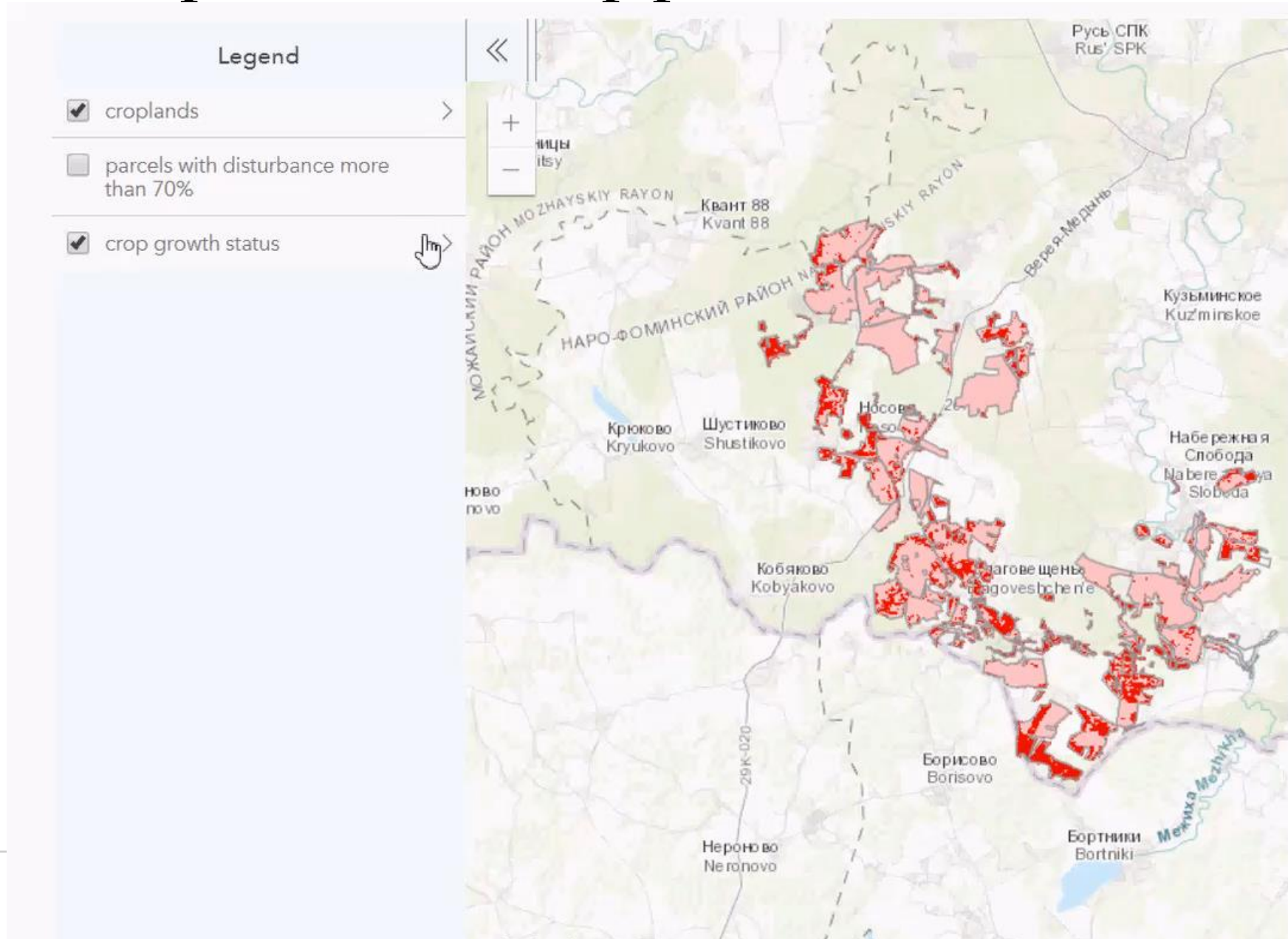
Expression: $(1.5 * (2.5 * (\text{NIR} - \text{RedEdge}) - 1.3 * (\text{NIR} - \text{Green}))) / \text{SQRT}((2 * \text{NIR} + 1)^2 - (6 * \text{NIR} - 5 * \text{SQRT}(\text{RedEdge})) - 0.5)$



High  Low

Relative chlorophyll maps. May and June, 2015

Identification of problematic crop parcels



An aerial photograph of a river delta, likely the Wax Lake Delta, showing a complex network of waterways and land. The text 'THANK YOU' is overlaid in a large, dark blue, serif font across the center of the image. The background is a semi-transparent light blue overlay.

*Wax Lake
Outlet*

*Wax Lake
Riv*

THANK YOU

es.khazieva@gmail.com