PRIMS and the SEPAL Processing Platform

openforis.org/tools/sepal

Things we presume:

Canals and management activities are important indicators of peatland condition.

Soil moisture is an important indicator of peatland condition.

Vegetation changes can be indicative of some kinds of condition improvements / degradation.

Peatland conditions can be estimated through biophysical parameters detectable from remotely-sensed data.

SEPAL

openforis.org/tools/sepal

processing power
fast results
C-band, L-band RADAR
Landsat, Sentinel-2 Optical data
Soil moisture products

Feed existing systems for display, etc.

NOT a duplicate PRIMS

PRIMS will provide a ‘weight of evidence’ approach and consist of:

1. Dam detection with high-spatial resolution optical imagery
2. Time-series analysis of field-based observations
3. Time-series analysis of optical spectral indices
4. Radar-based surface soil moisture estimates and trends over time
5. Radar-based sub-soil moisture estimates and trends over time
6. Radar-based subsidence estimates (interferometry)

Peatland condition: 5 things to monitor

Existence and condition of dams / canals.

Analysis of field-based groundwater and soil moisture.

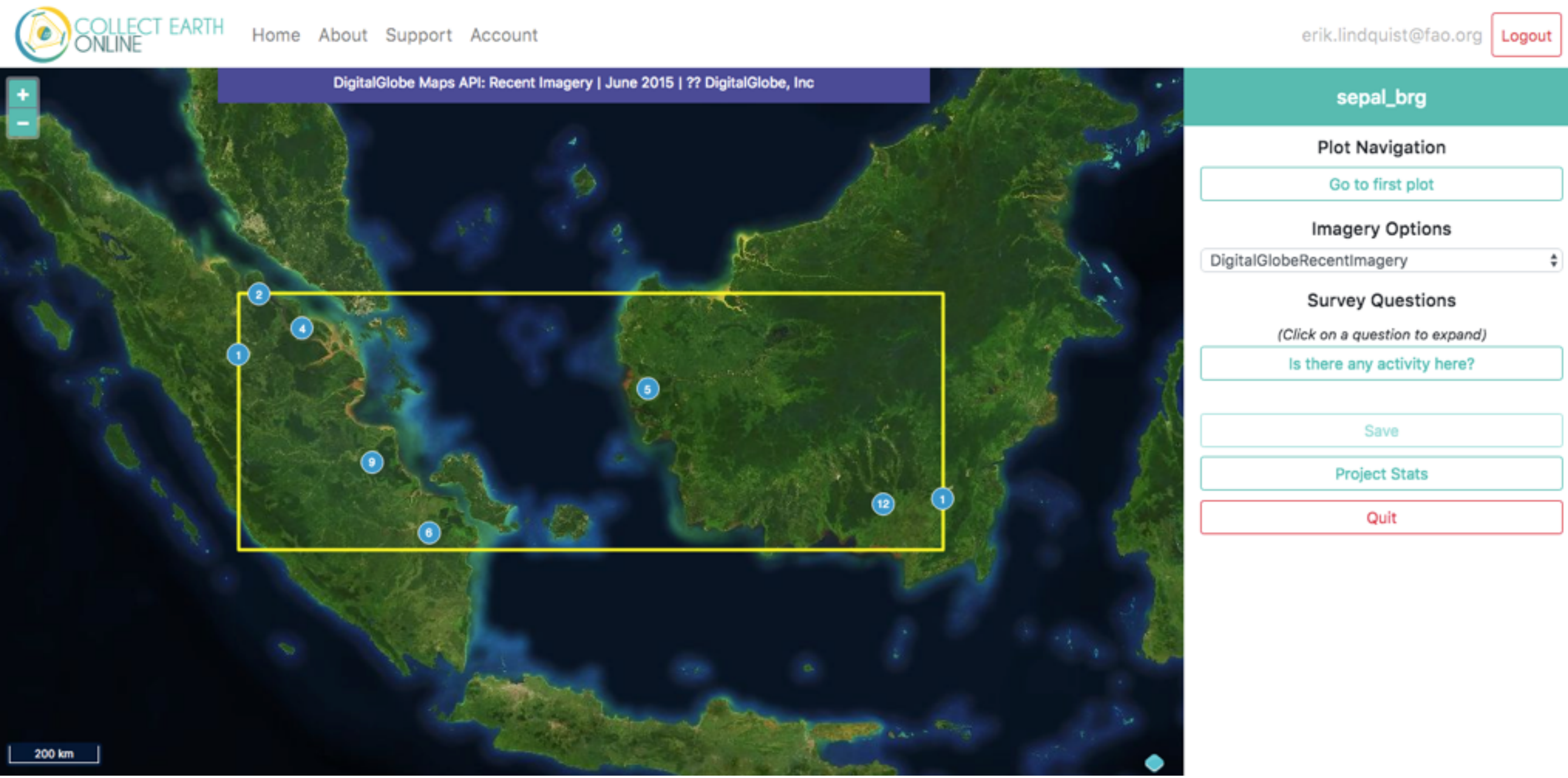
Analysis of remote sensing data for vegetation change.

Analysis of remote sensing data for soil moisture.

Analysis of remote sensing data for land subsidence.

Canal blocking status in SEPAL

Point analysis


COLLECT EARTH ONLINE
Home
About
Support
Account
erik.lindquist@fao.org
Logout
DigitalGlobe Maps API: Recent Imagery | June 2015 | ?? DigitalGlobe, Inc
sepal_brg
Plot Navigation
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DigitalGlobeRecentImagery
Survey Questions
(Click on a question to expand)
Is there any activity here?
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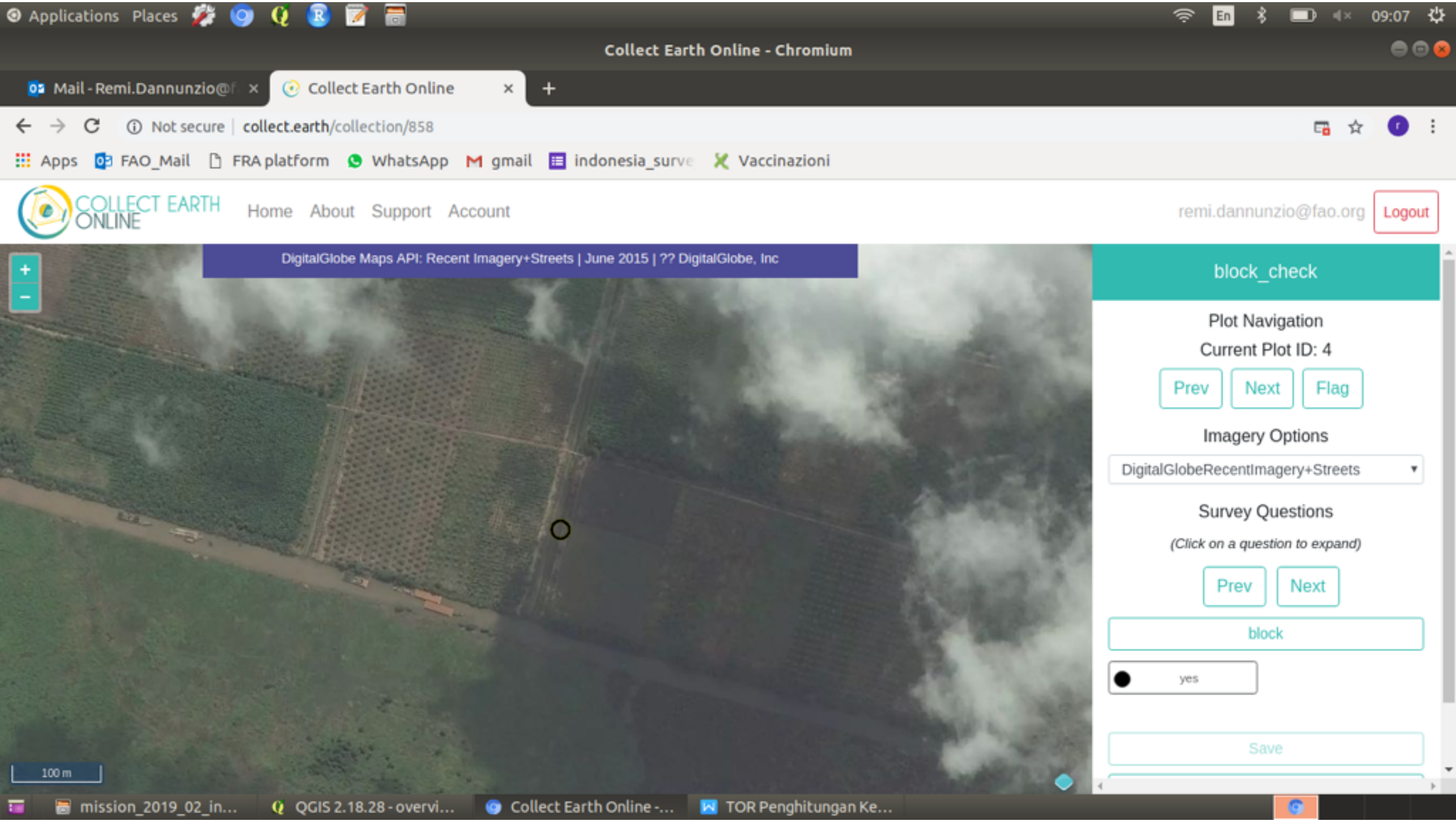
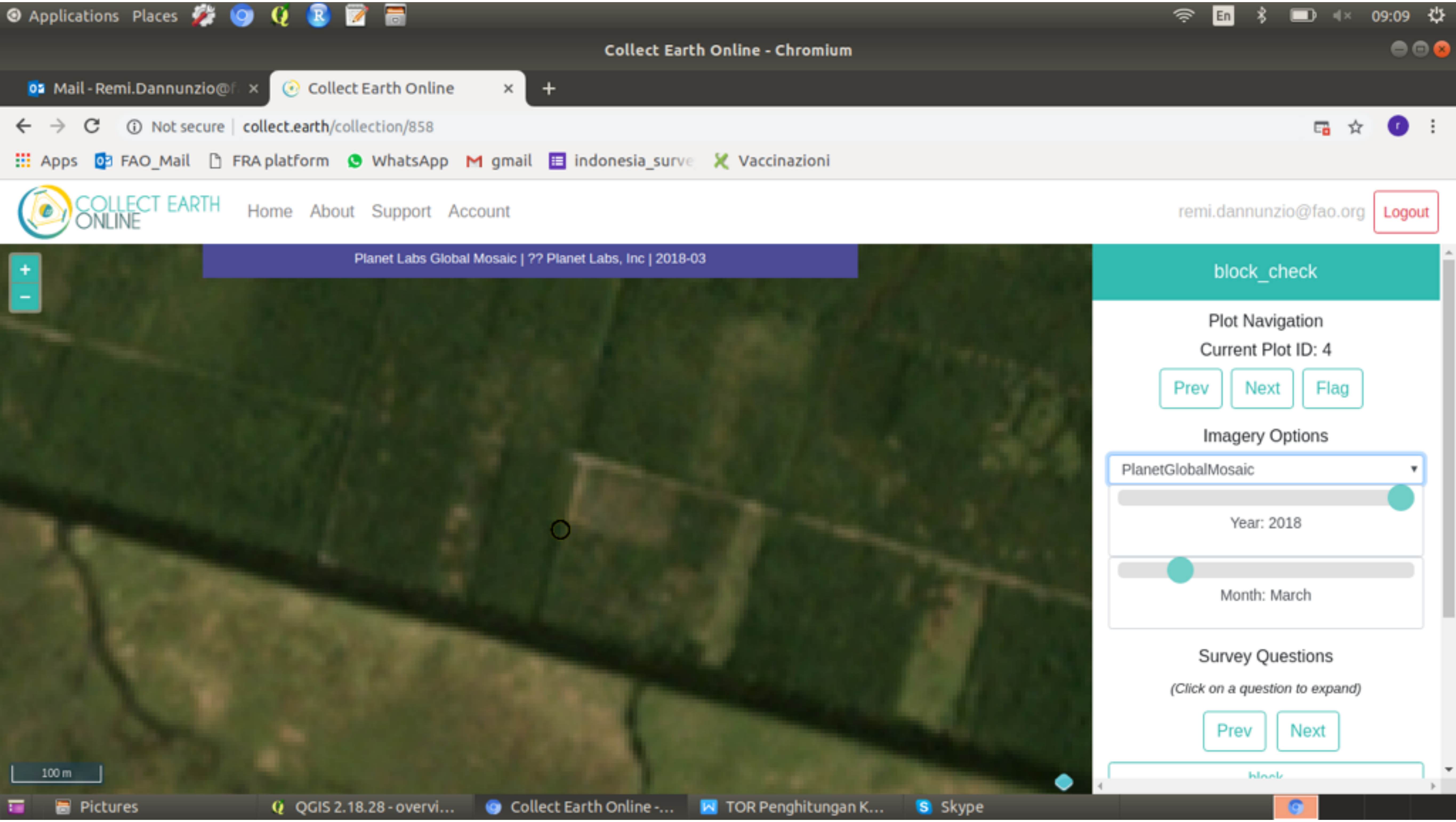
Project Stats
Quit
200 km



Digital Globe Imagery



PLANET Imagery

Analysis of field-based groundwater and soil moisture.

Time-series decomposition / Trend analysis jupyter smap_ts_analysis_py2 Last Checkpoint: 06/14/2018 (autosaved)

File Edit View Insert Cell Kernel Help Kernel starting, please wait... Trusted Python 2

Run Code

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pylab as plt
%matplotlib inline
from matplotlib.pylab import rcParams
rcParams['figure.figsize'] = 15, 6
```

In [2]:
```
data = pd.read_json('~/soil_moisture/test-data.json')
print data.head()
print '\n Data Types:'
print data.dtypes
```

```
   blue                    date  green   nir  pixel_qa  red  swir1  swir2  \
0   680 1988-05-30 02:42:07.938    925  4568        66  726   1569    601
1   786 1988-08-02 02:42:23.101    983  3704        66  845   1638    644
2   185 1989-05-17 02:40:07.268    425  3175        66  319   1167    427
3   398 1989-06-02 02:39:55.647    673  3489        66  532   1387    618
4   334 1989-08-05 02:38:36.022    552  3228        66  464   1321    521

   temp
0  2897
1  2897
2  2951
3  2855
4  2920

 Data Types:
blue                 int64
date        datetime64[ns]
green                int64
nir                  int64
pixel_qa             int64
red                  int64
swir1                int64
swir2                int64
temp                 int64
dtype: object
```

In [3]:
```
dateparse = lambda dates: pd.datetime.strptime(dates, '%Y-%m-%d %H:%M:%S')
data = pd.read_json('~/soil_moisture/test-data.json', convert_dates=['date'])
data.set_index('date',inplace=True)
print data.head()
```

```
                         blue  green   nir  pixel_qa  red  swir1  swir2  temp
date
1988-05-30 02:42:07.938   680    925  4568        66  726   1569    601  2897
1988-08-02 02:42:23.101   786    983  3704        66  845   1638    644  2897
1989-05-17 02:40:07.268   185    425  3175        66  319   1167    427  2951
1989-06-02 02:39:55.647   398    673  3489        66  532   1387    618  2855
1989-08-05 02:38:36.022   334    552  3228        66  464   1321    521  2920
```

jupyter smap_ts_analysis_py2 Last Checkpoint: 06/14/2018 (autosaved)

File Edit View Insert Cell Kernel Widgets Help Trusted Python 2

```
Critical Value (10%)          -2.578496e+00
dtype: float64
```

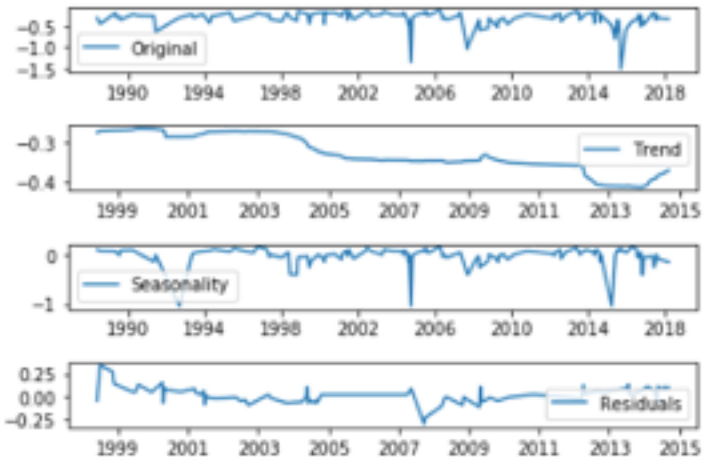
In [ ]:

In [24]:

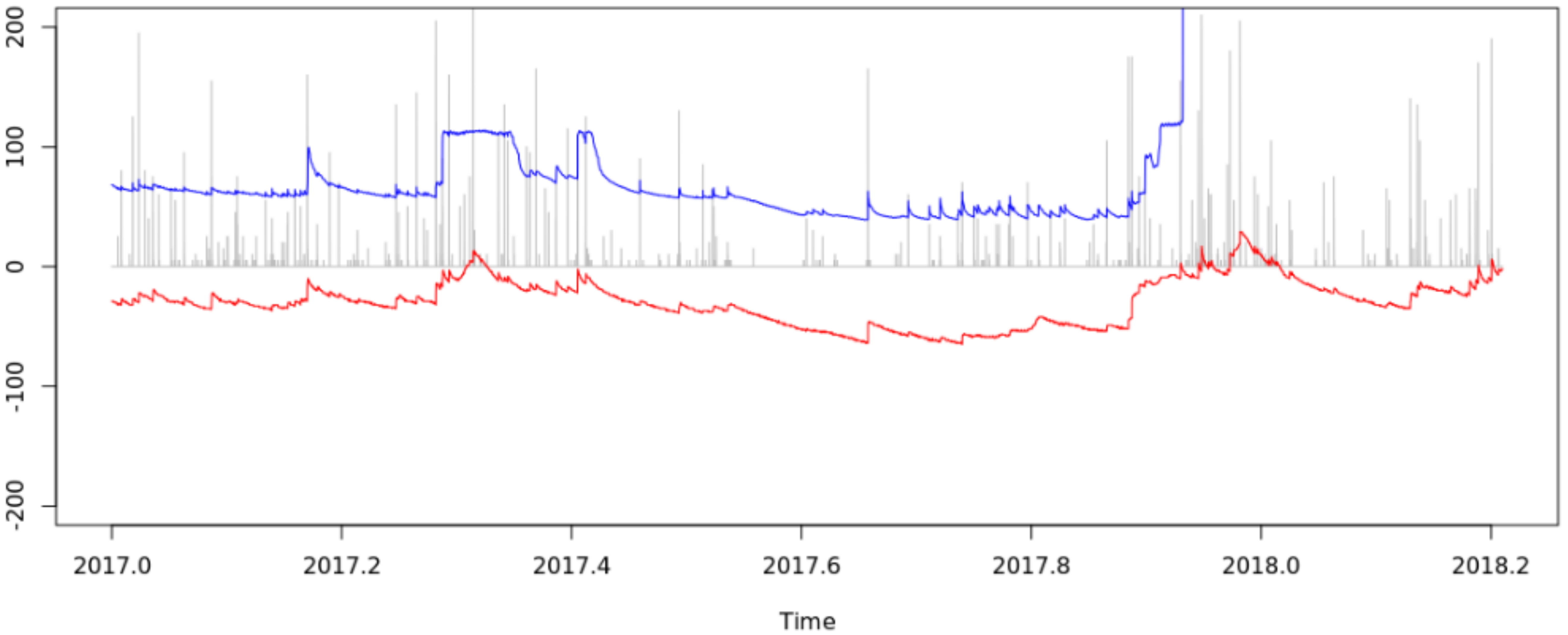
```
from statsmodels.tsa.seasonal import seasonal_decompose
decomposition = seasonal_decompose(ts_log, model='additive', freq=52)

trend = decomposition.trend
seasonal = decomposition.seasonal
residual = decomposition.resid

plt.subplot(411)
plt.plot(ts_log, label='Original')
plt.legend(loc='best')
plt.subplot(412)
plt.plot(trend, label='Trend')
plt.legend(loc='best')
plt.subplot(413)
plt.plot(seasonal,label='Seasonality')
plt.legend(loc='best')
plt.subplot(414)
plt.plot(residual, label='Residuals')
plt.legend(loc='best')
plt.tight_layout()
```



In [ ]:



200
100
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2017.0
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2017.6
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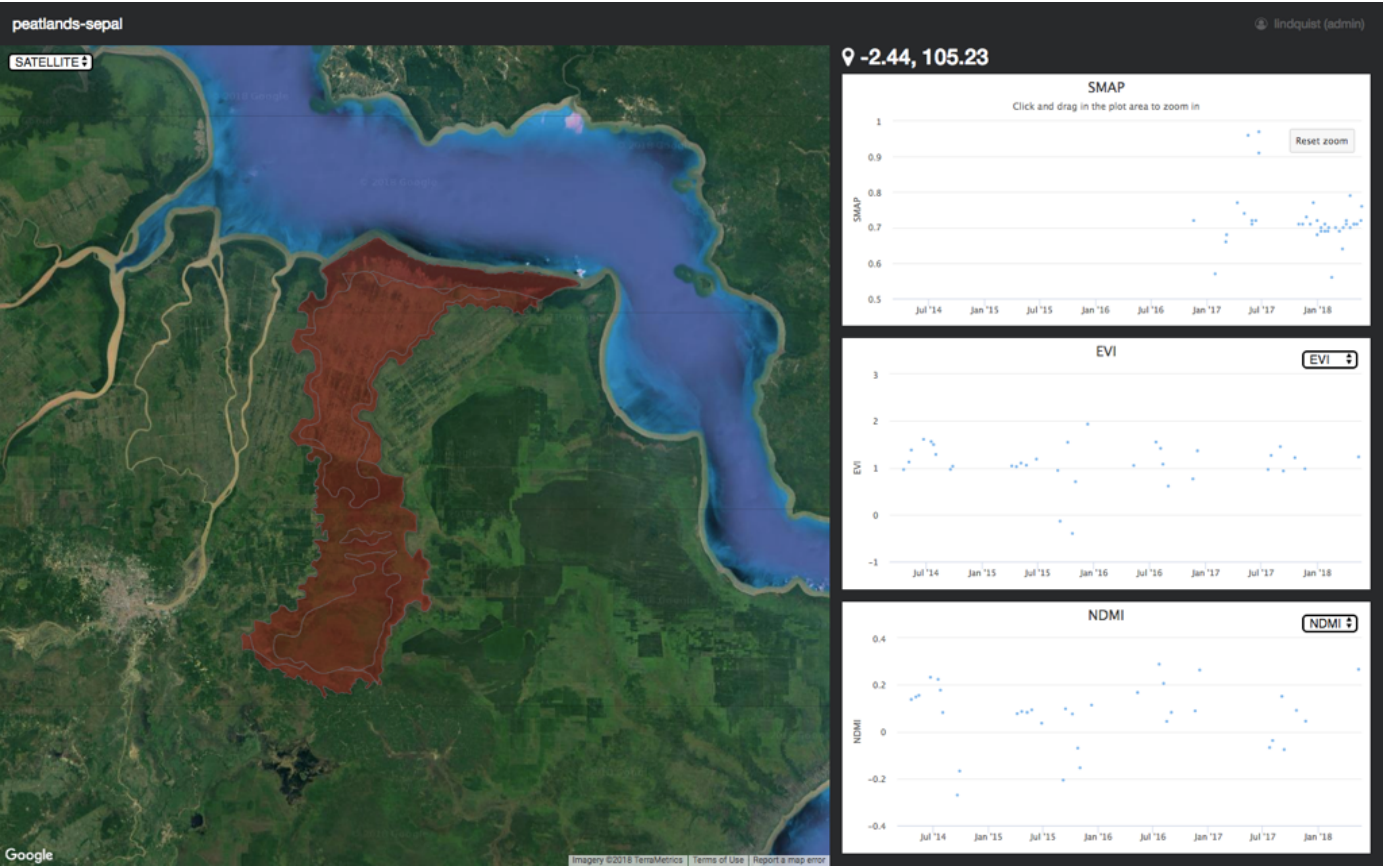
2018.0
2018.2
Time

Pilot Peatland Monitoring System:

Analysis of remote sensing groundwater and soil moisture.

Pilot Peatland Monitoring System:

SMAP downscaled data explorer



peatlands-sepal
lindquist (admin)
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SMAP
Click and drag in the plot area to zoom in
Reset zoom
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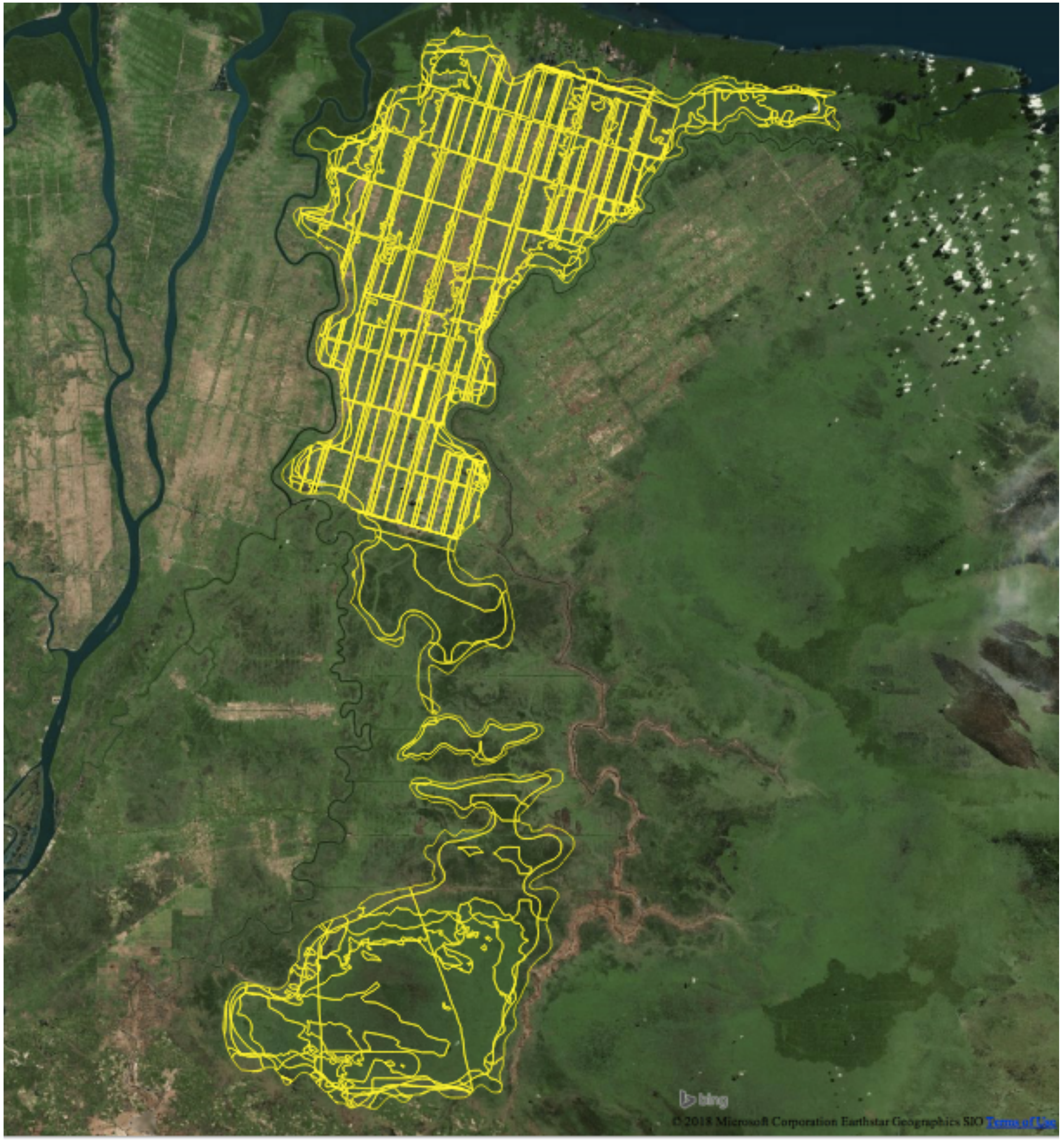
Pilot Peatland Monitoring System: SEPAL Sentinel-1 Processing

Soil Moisture Maps - 100 m spatial resolution

Down-scaling GLDAS soil moisture using Sentinel-1

GLDAS info here:

https://ldas.gsfc.nasa.gov/index.php



bing
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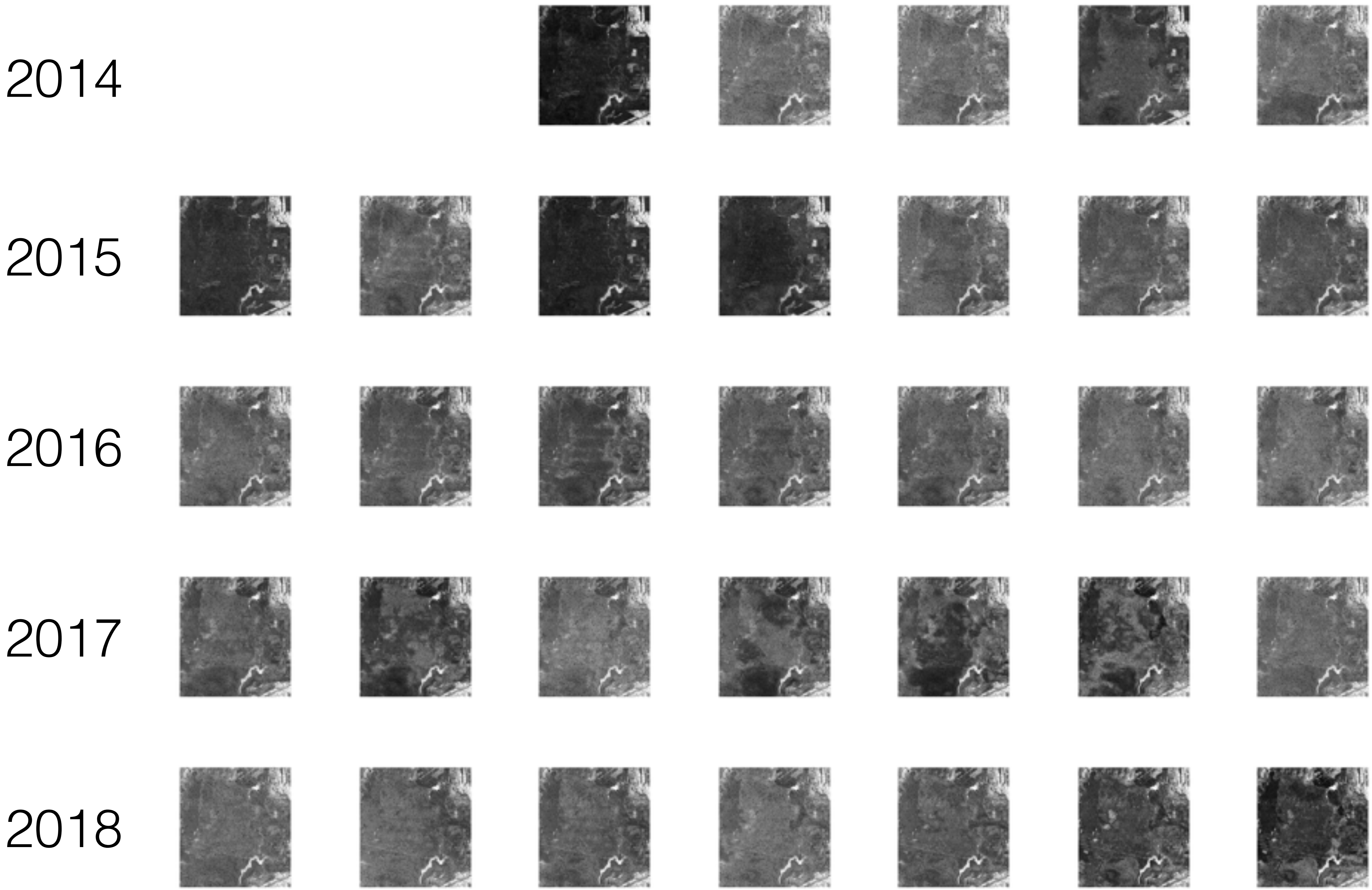
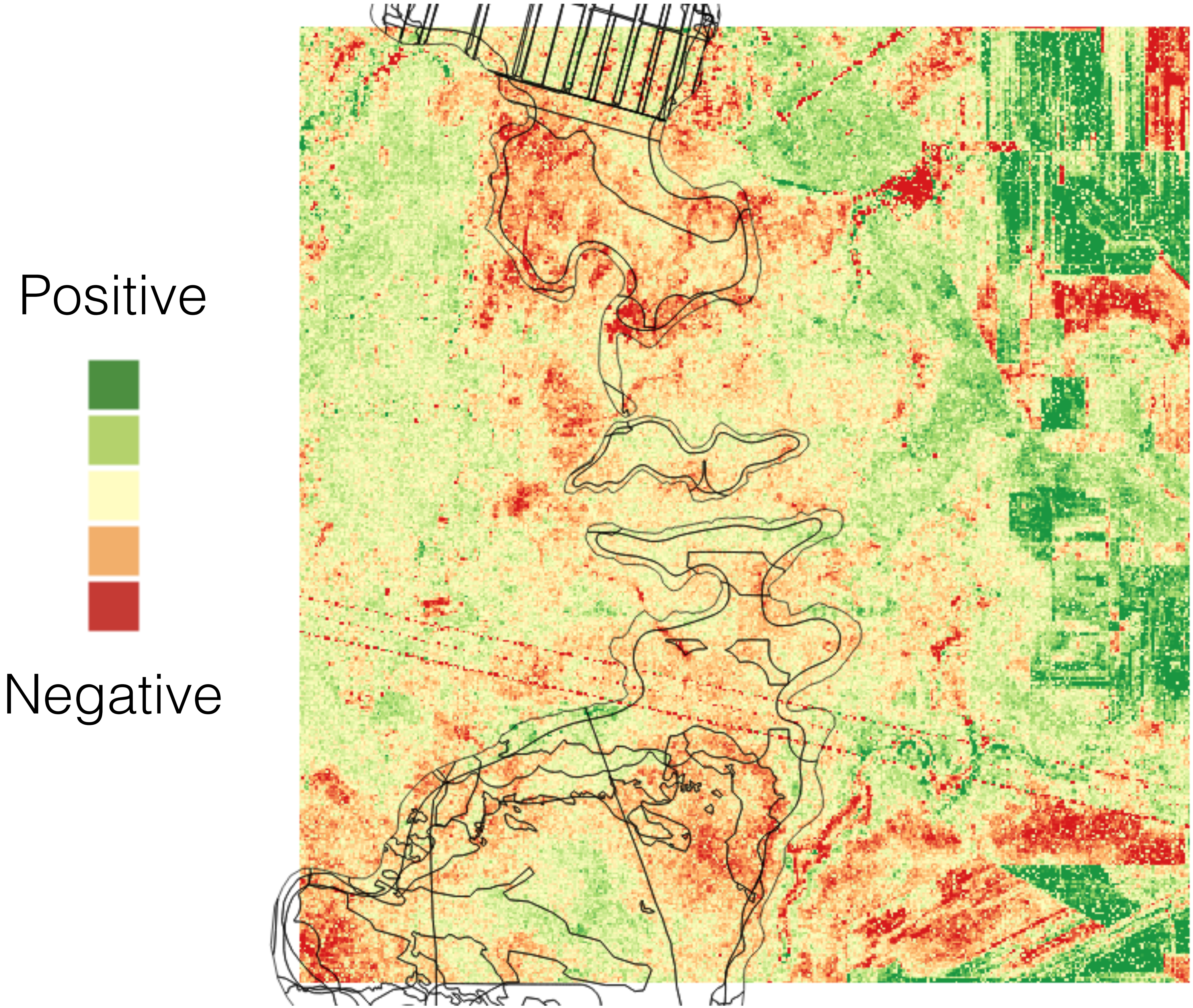
Surface Soil Moisture Maps - 2014 to 2018



Linear trend in surface soil moisture - 2014 to 2018



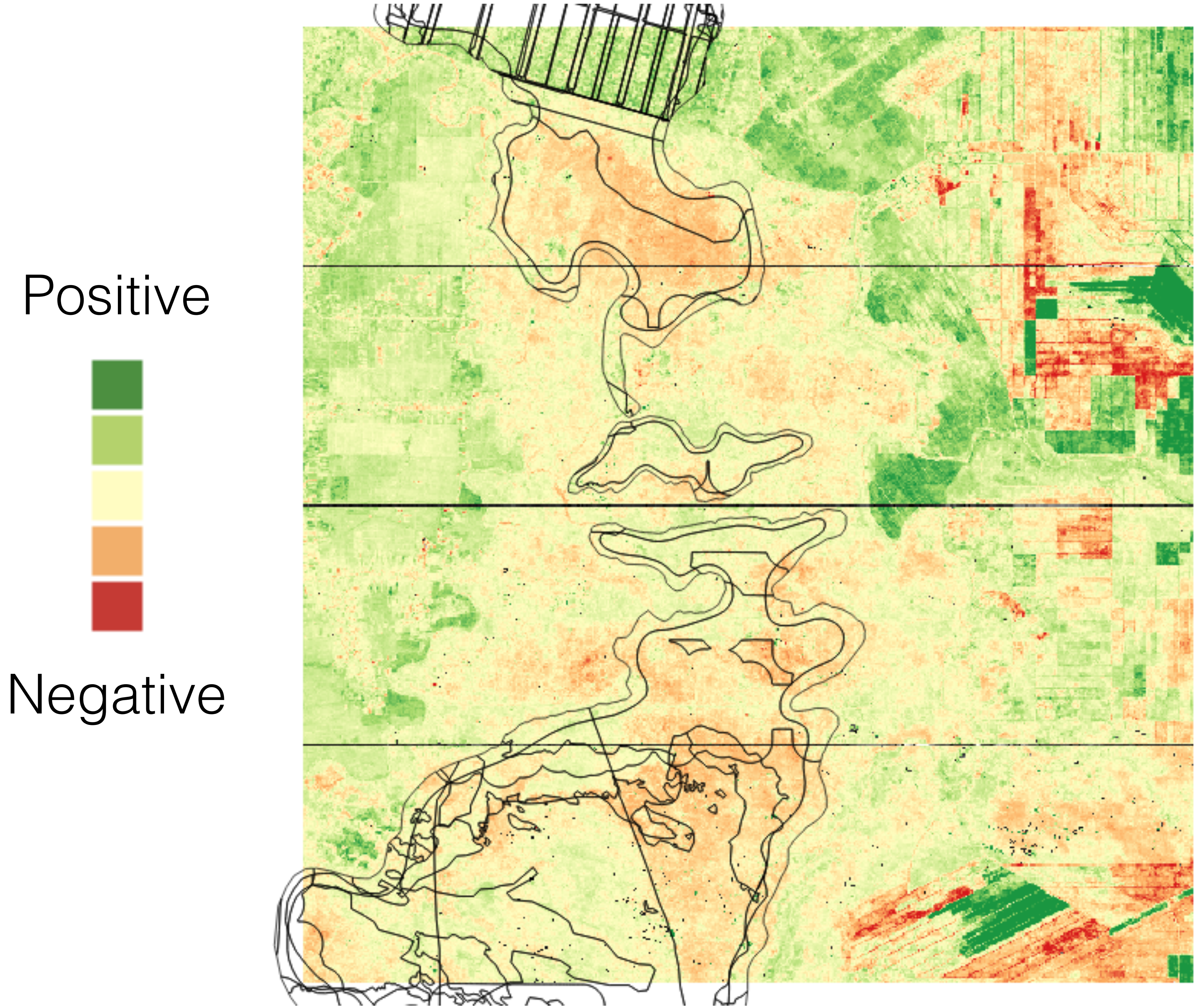
Time-series of vegetation moisture index

LSAT from 2010 - 2018

History period: 2010 - 2016

Monitoring: 2016 - 2018

BFAST magnitude of change NDMI - 2016 to 2018

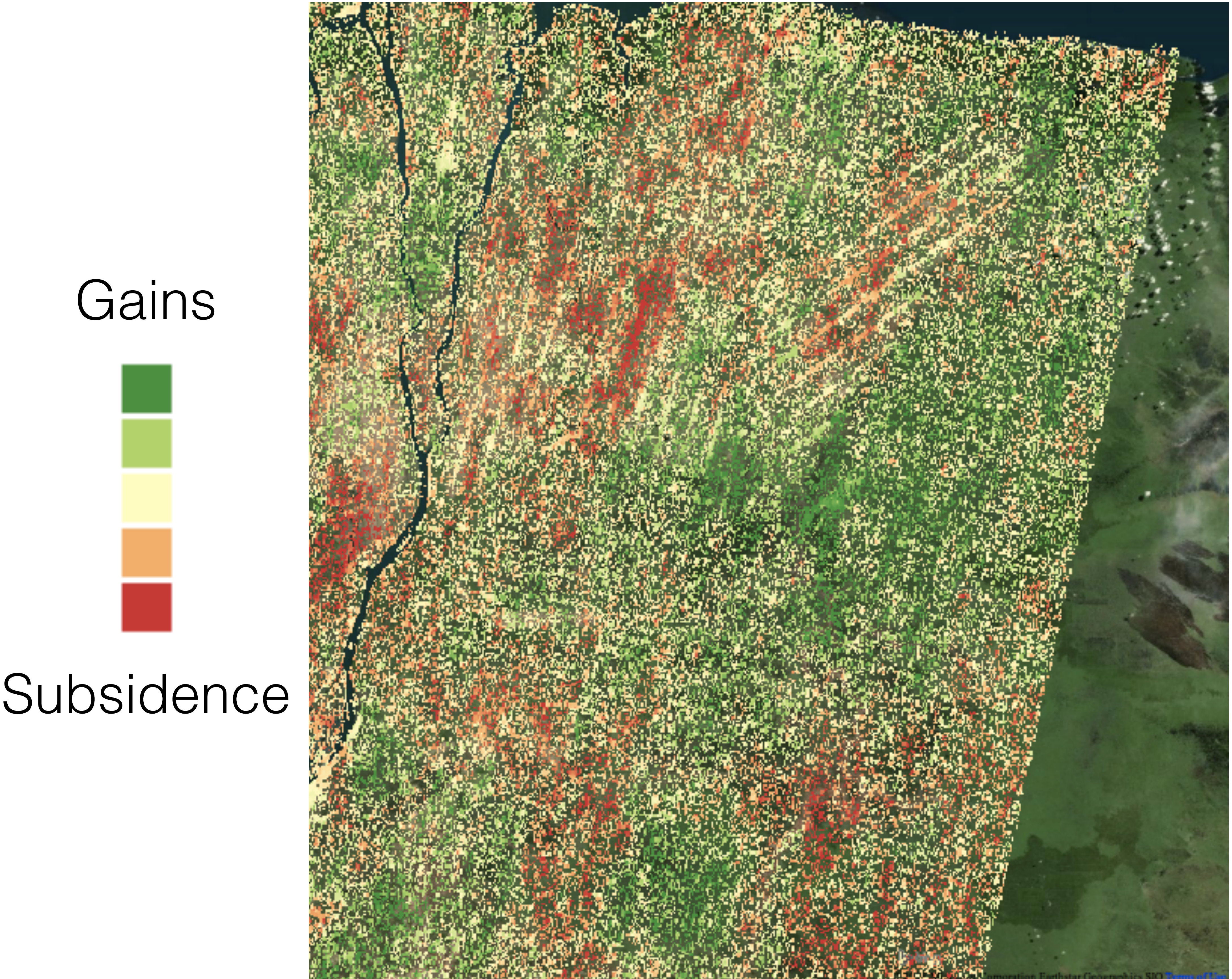


Sentinel-1 Interferometry

Measuring change in land surface elevation (mm)
2016 - 2018

Loss of ground water = surface subsidence
Restoration of ground water = less loss/no change/elev gain

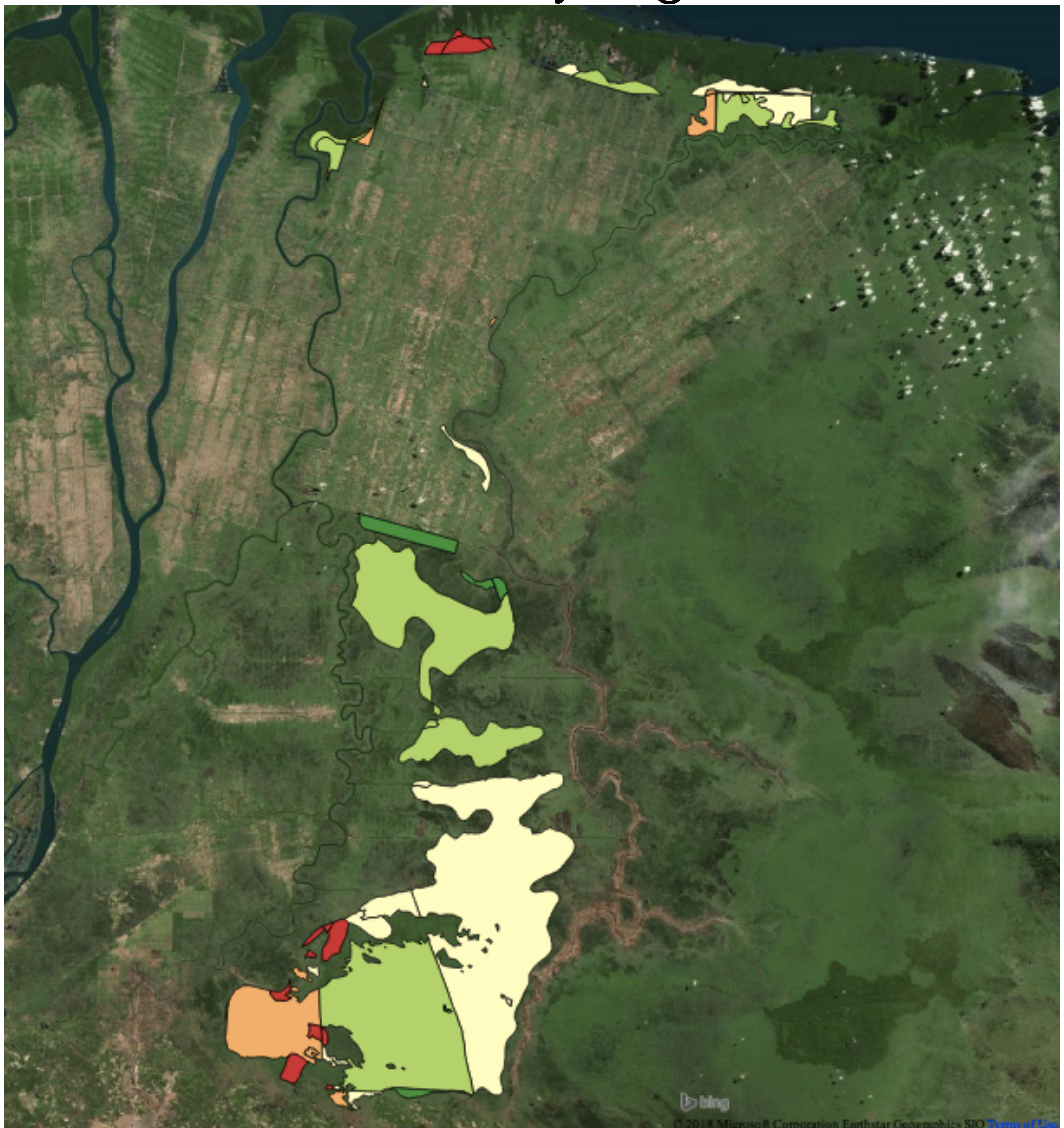
S-1 Interferometry Change in Elevation, 2016-2018



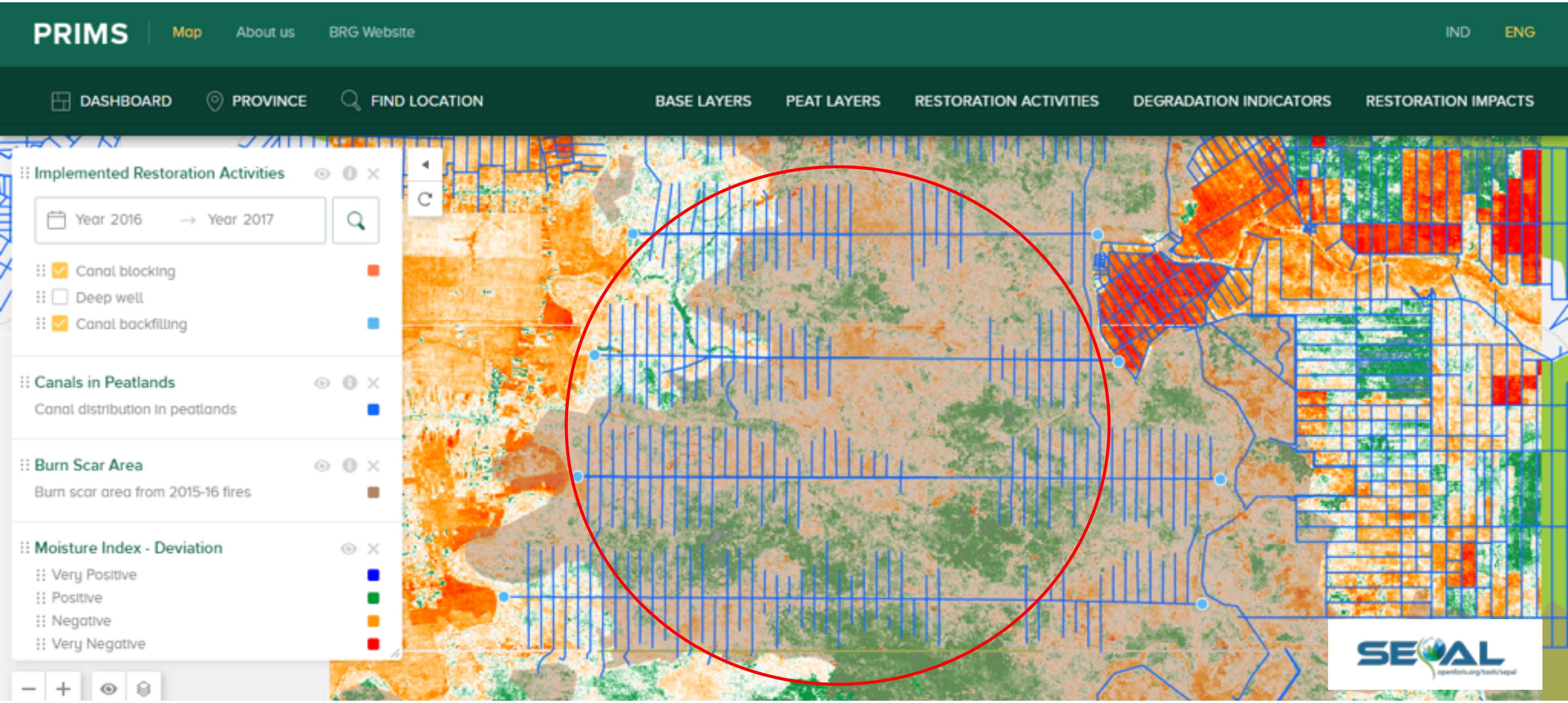
S-1 Mean Change in Elevation, 2016-2018
summarized by mgmt zone

Gains

Subsidence



SEPAL and PRIMS



This Week:

Peatland condition: 5 things to monitor

Existence and condition of dams / canals. TODAY

Analysis of field-based groundwater and soil moisture. TOMORROW

Analysis of remote sensing data for vegetation change. TOMORROW

Analysis of remote sensing data for soil moisture. THURSDAY and FRIDAY