Using Google Earth Engine for Geological Remote Sensing

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June 4^{th}, 2024

Googe EarthEngine (1)

Google EarthEngine (2)

Google Earth

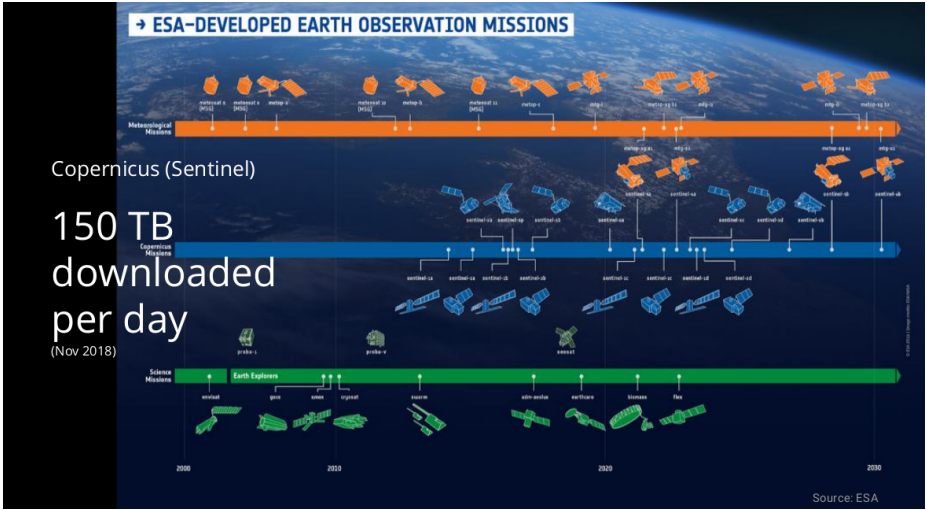
3-D Globe
Visualization

Earth Engine

Geospatial
Analysis

Data volume of NASA

Data volume of ESA



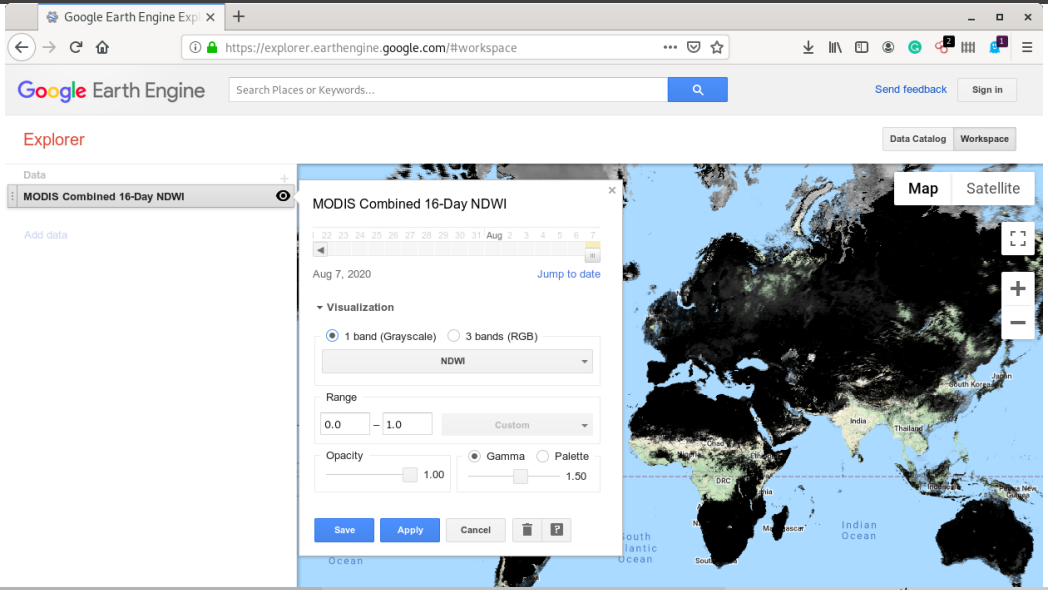
Copernicus (Sentinel)

150 TB downloaded per day

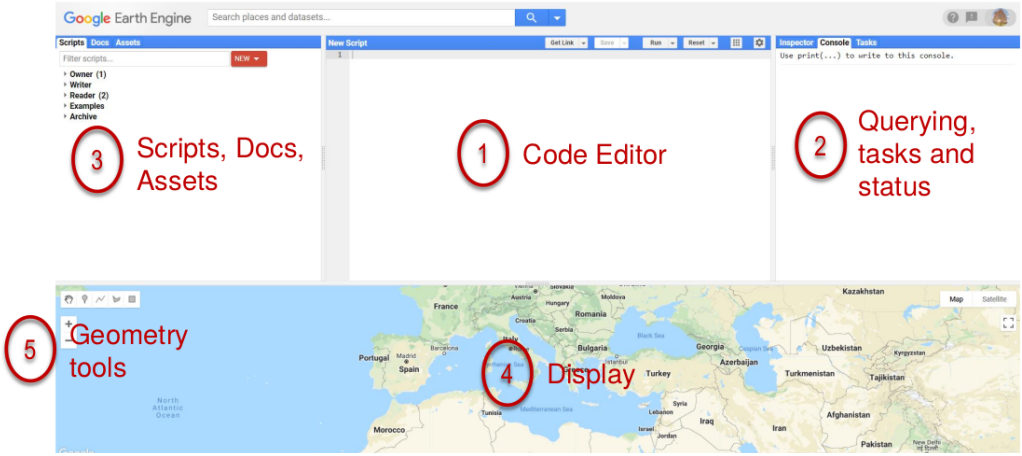
(Nov 2018)

Bring processing power to the data

User Interface: Explorer Interface



User Interface: Programmable Interfaces

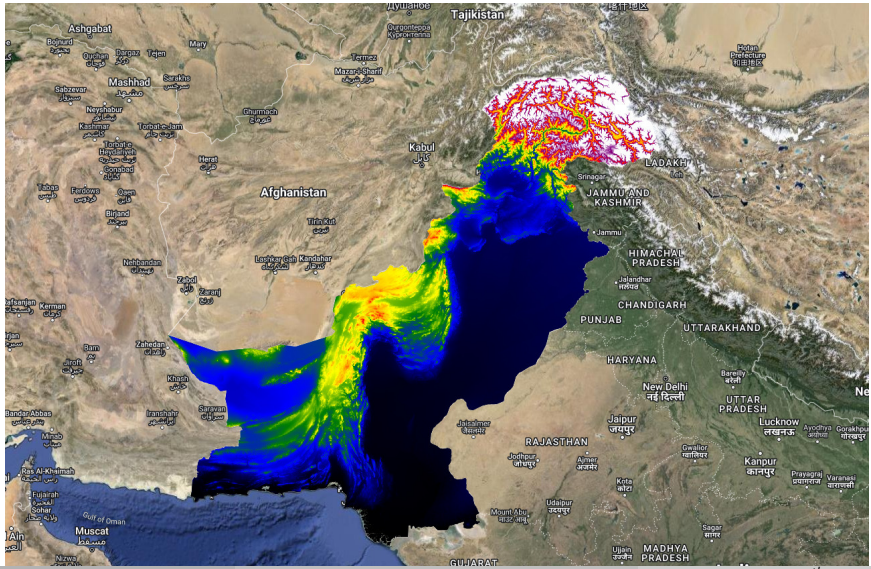


Code editor: Javascript

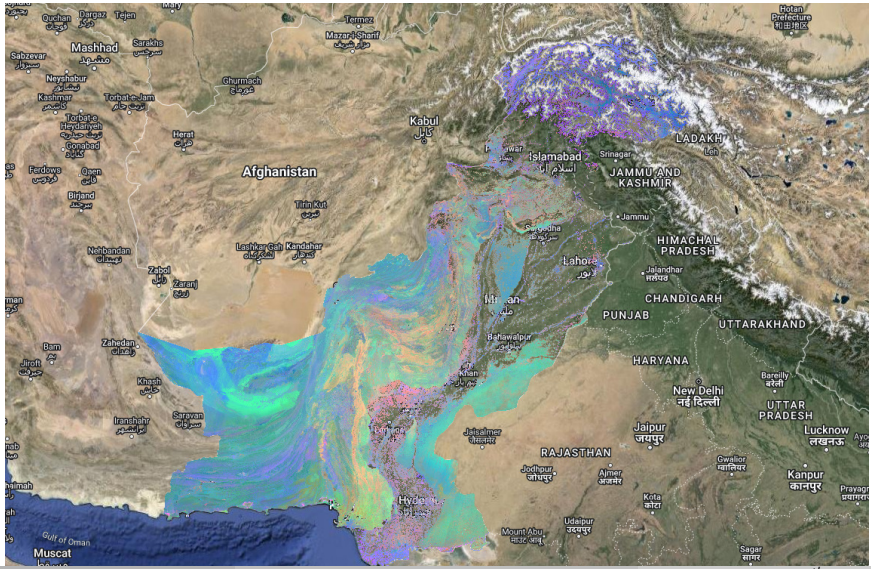
esp2024 — Get Link | Save | Run | Reset | Apps

```
/**
 * 20240603 @ harald.vanderwerff@utwente.nl
 * Display Sentinel-2 FCC & SRTM DEM of Pakistan
 */

// get location data
var POI = ee.FeatureCollection('USDOS/LSIB_SIMPLE/2017')
    .filter("country_na == 'Pakistan'").union().first().geometry();

// Center basemap to area of interest
Map.centerObject(POI,6);

// set base map to satellite+roads
Map.setOptions('Hybrid', {});

// get SRTM elevation data covering the POI
var dem = ee.Image('CGIAR/SRTM90_V4').clip(POI);

// Stretch the data to a sensible data range
Map.addLayer(dem, {min: 0, max: 4500}, 'SRTM DEM');

// Add a custom color palette to the greyscale values
var demVis = {min: 0, max: 4500, palette: ['black','blue','green','yellow','orange','red','purple','white']};
Map.addLayer(dem, demVis, 'SRTM DEM (colored)');


```

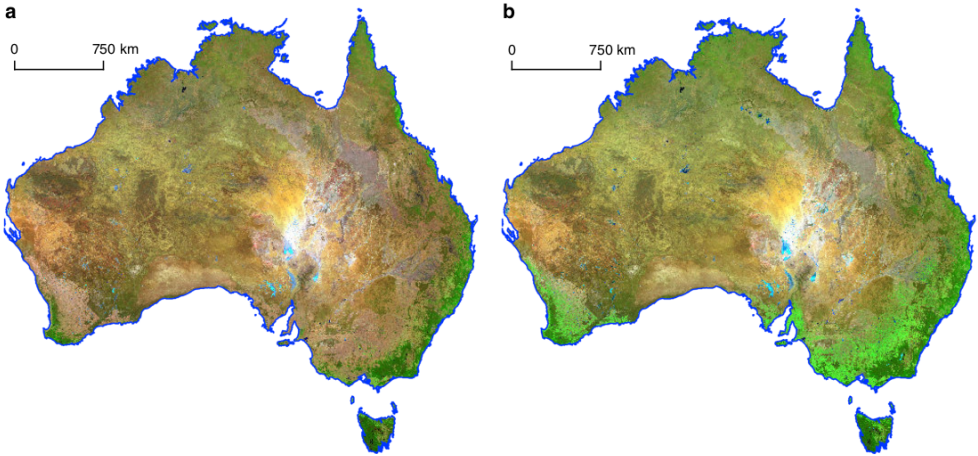
Mosaic of an elevation model



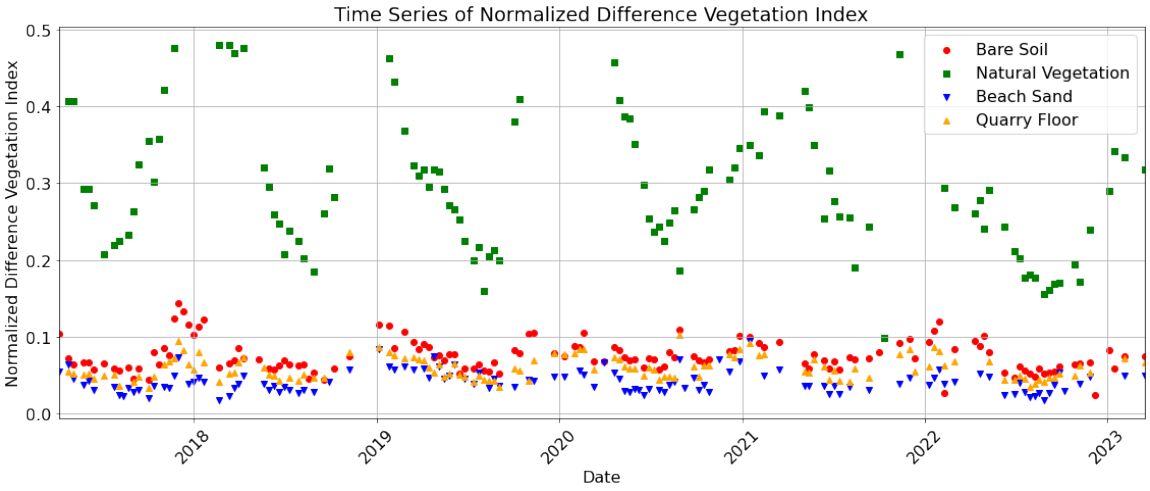
Mosaic of geological indices



Mosaicking by optimal pixel selection

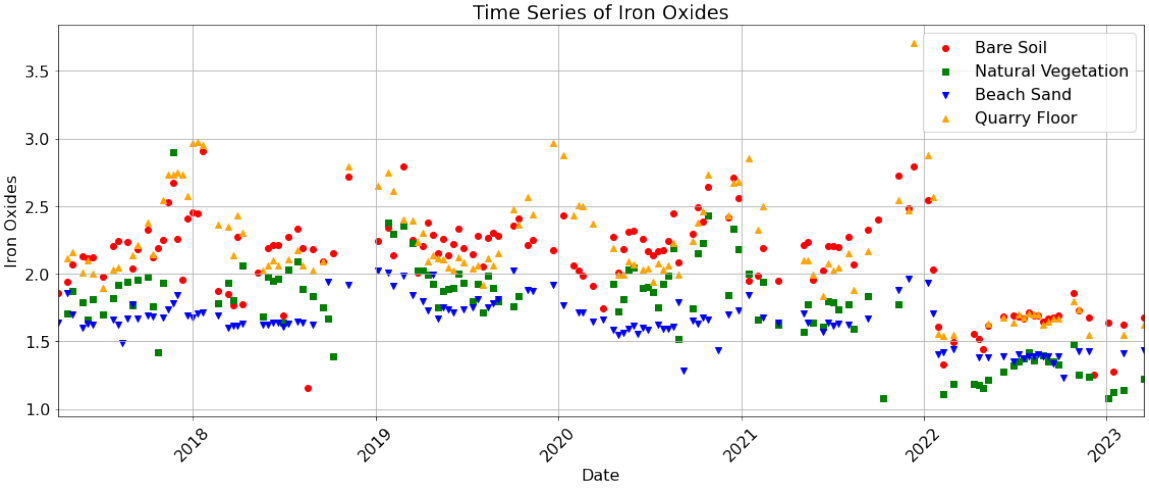


Time-series: Vegetation index



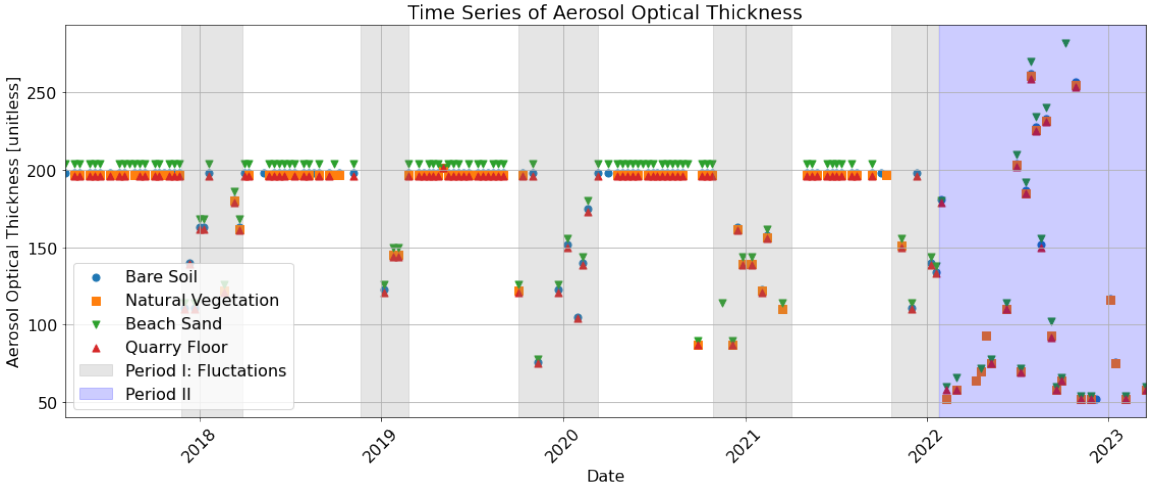
band 8 (842 nm) & band 4 (665 nm)

Time-series: Iron oxide index

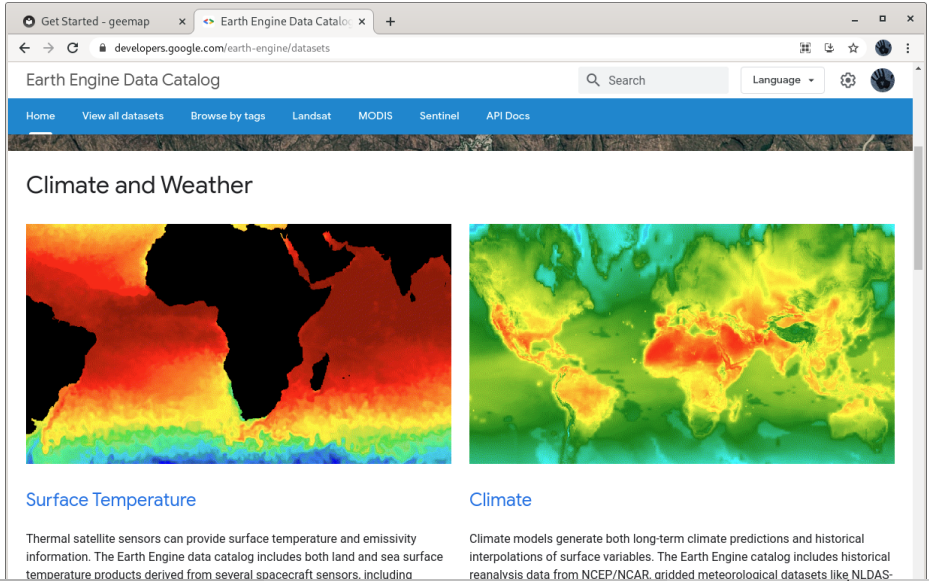


band 4 (665 nm) / band 2 (490 nm)

Time-series: Atmospheric parameters



Data catalog: Also climate and vector data



Pro's and con's

Of course, there are some considerations on using GEE:

- Free as in "free beer" (so payment happens in other ways...);
- Not free as in "free speech", the scripts are but the environment is not;
- Service is commercial and falls under US legislation;

But the pro's are huge:

- Google Earth Engine is most advanced at the moment;
- The only way to manage "big" earth data;
- Climate, census and remote sensing data.

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