Google Earth Engine: Using CHIRPS Data to Analyze Precipitation Training

Release 1.0.0

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May 24, 2016

Content

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Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS)

Why was it developed?

The CHIRPS is a 30+ year quasi-global rainfall dataset. By using google earth engine, people can access to CHIRPS data to analyze the precipitation information at different scales.

What can the tool be used for?

- Assessing precipitation at regional, national, and local scale

- Evaluating the seasonality of precipitation

- Identifying regions where precipitation have increased or decreased

- Monitoring Seasonal Drought

What can CHIRPS not be used for?

- Predicting precipitation in the coming season/year

- Investigating disasters caused by factors other than the distribution of precipitation.

1.1 Definition

Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) is a 30+ year quasi-global rainfall dataset. The "CHIRPS" tool is an interactive map using **google earth engine** that helps people display and analyze the rainfall variations in various time frames and spatial areas.

1.2 Interpretation

CHIRPS was created in collaboration with scientists at the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center in order to deliver reliable, up to date, and more complete datasets for a number of early warning objectives. Spanning 50°S-50°N (and all longitudes), starting in 1981 to Feb 2016, CHIRPS incorporates 0.05° resolution satellite imagery with in-situ station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring.

1.3 Access

The Google Earth Engine – CHIRPS precipitation tool can be modified to output a time-series of precipitation for a user-defined region. This user-defined region can whether be defined through use of the geometry tool or selected from a specific country.

The region is imported into the map through the following code: (user could draw their region of interest by the tool on the top left)

```
// Import region
var region = geometry;
```

Alternatively, a region can be selected using Google Fusion Tables. Specific countries can be accessed from the 'Countries.csv' Google Fusion Table available publicly at: https://www.google.com/fusiontables/data?docid=1tdSwUL7MVpOauSgRzqVTOwdfy17KDbw-1d9omPw#rows:id=1. The code below selects Brazil from this file. Other data layers can be uploaded to Google Fusion Tables and accessed similarly, or public tables can be searched at: https://research.google.com/tables.

```
//Identify country
var Brazil =
ee.FeatureCollection('ft:1tdSwUL7MVpOauSgRzqVTOwdfy17KDbw-
1d9omPw').filterMetadata('Country', 'equals', 'Brazil');
Map.addLayer(Brazil);
```

Next, load the CHIRPS data.

```
var CHIRPS= ee.ImageCollection('UCSB-CHG/CHIRPS/PENTAD');
```

The CHIRPS data is from 1981-01-01 to 2016-02-27

```
var precip = CHIRPS.filterDate('1981-01-01', '2016-02-27');
```

Chart the "Full Precipitation Time Series"

```
var TS5 = Chart.image.series(precip, Brazil, ee.Reducer.mean(),1000,
'system:time_start').setOptions({
    title: 'Precipitation Full Time Series',
    vAxis: {title: 'mm/pentad'},
});
print(TS5);
```

Charts One Year

```
var precip1year=CHIRPS.filterDate('2015-01-01', '2015-12-31');
var TS1 = Chart.image.series(precip1year, Brazil, ee.Reducer.mean(),1000,
'system:time_start').setOptions({
    title: 'Precipitation 1-Year Time Series',
    vAxis: {title: 'mm/pentad'},
});
print(TS1);
```

Map out results

```
var BrazilPrecip = precip1year.mean().clip(Brazil);
var BrazilPrecip=precip.mean().clip(Brazil);

Map.addLayer(BrazilPrecip, {'min': 0, 'max': 40, 'palette':"CCFFCC,00CC66,006600"});
Map.addLayer(BrazilPrecip1, {'min': 0, 'max': 40, 'palette':"CCFFCC,00CC66,006600"});
```

You could find the whole code here.
https://code.earthengine.google.com/3519385b889cc2ee8b8cf56186acf2e4

1.4 Analyses

Users can choose to map and calculate average precipitation over a 1-year or multi-year period, or any time period they specify. The user can also choose to chart time series for mean precipitation over any specified time periods.

1.5 Case study – Brazil

Taking Brazil for example, this tool shows the potential to analyze precipitation in various time frames. The first chart and map shows the mean pentad precipitation amount averaging over the full time series.
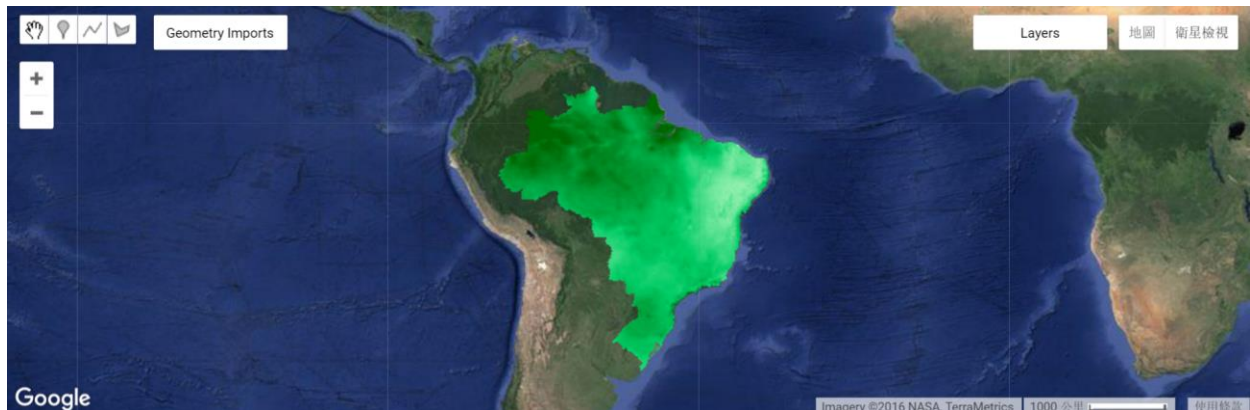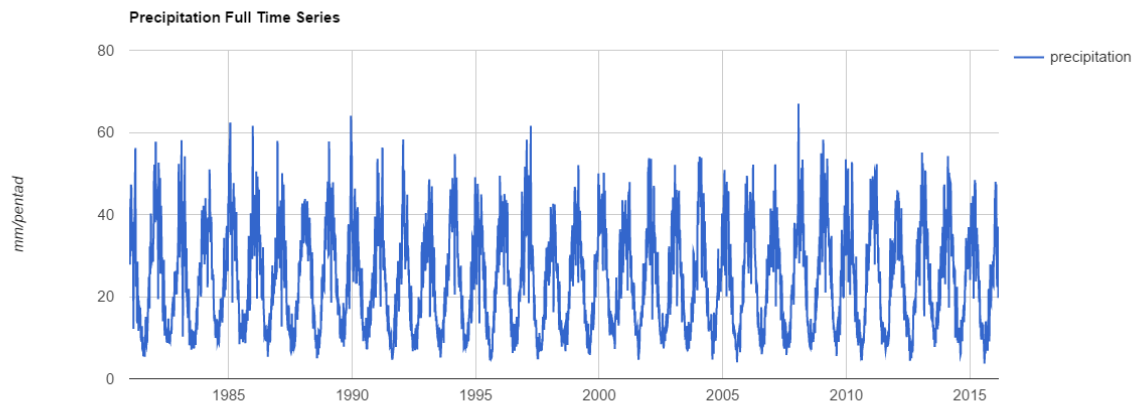
The second chart and map show the mean pentad precipitation amount averaging over 2015 period.
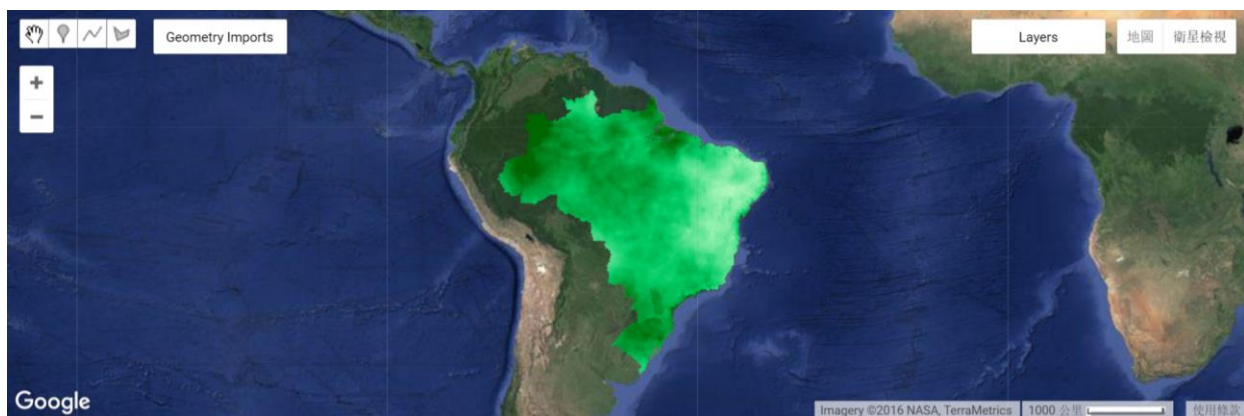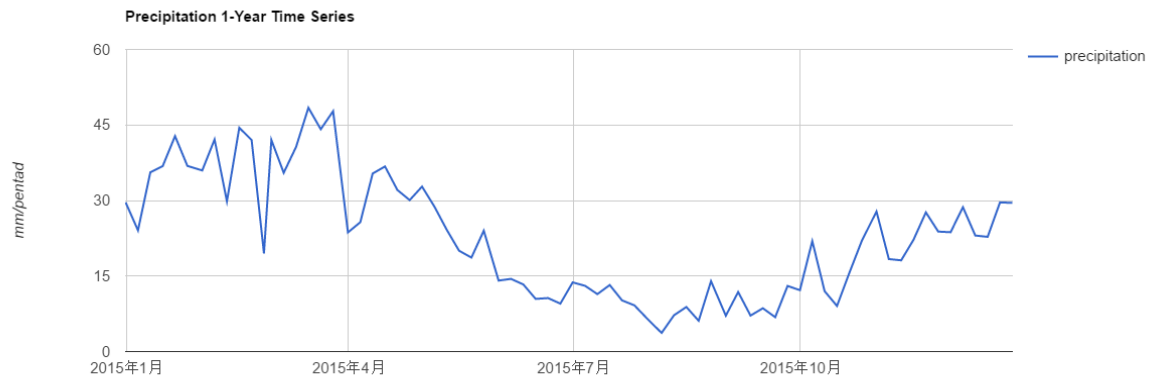
1.6 Exercise

Estimating rainfall variations in space and time is an important aspect in drought monitoring and in creating vector-borne diseases early warning systems. Disaster and health managers in Brazil would like to assess the seasonality of precipitation in order to take early action before drought or flood event occurs. Back in 2015, when was the dry season? How about the wet season?

Answer: The dry season was from July to October with around 5-15mm/pentad precipitations. On the other hand, the wet season was from January to April with around 25-50 mm/pentad precipitations.

1.7 Summary

The Google Earth Engine: CHIRPS Data code is to be used in assessment of historical precipitations and monitoring about potential drought and favorable conditions that leads to the development of vectors that transmit diseases. It allows the user to access precipitation data on the time scale between Jan 1, 1981 to Feb 27, 2016 and at any location either input by a point, geometrical selection of a region or a country.

1.8 Reference

Funk, C.C., Peterson, P.J., Landsfeld, M.F., Pedreros, D.H., Verdin, J.P., Rowland, J.D., Romero, B.E., Husak, G.J., Michaelsen, J.C., and Verdin, A.P., 2014, A quasi-global precipitation time series for drought monitoring: *U.S. Geological Survey Data Series* 832, 4 p., http://dx.doi.org/10.3133/ds832

http://chg.geog.ucsb.edu/data/chirps/