

We are getting hotter!!
It's not your imagination, world is getting
warmer.

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<http://jcmendez.gkudos.com/midterm/>

Description

- Use visualization to get a better understanding of global temperature change.
- Dataset Title:
 - GISS Surface Temperature Analysis (GISTEMP)
 - Url <https://data.giss.nasa.gov/gistemp/>
 - Source: NASA
 - Files:
 - Global-mean monthly, seasonal, and annual means, 1880-present, updated through most recent month (GLB.Ts+dSST)
 - Zonal annual means, 1880-present, updated through most recent complete year (ZonAnn.Ts+dSST)

Main Datasets

- Dataset Name: GLB.Ts+dSST
 - Dataset Type: Table, Static
 - Attributes:
 - *year*: quantitative, ordered, sequential
 - Months (Jan,Feb,Mar...): categorical, ordered, cyclic
 - temperature: quantitative, ordered, diverging
- Dataset Name: ZonAnn.Ts+dSST
 - Dataset Type: Table, Static
 - Attributes:
 - *year*: quantitative, ordered, sequential
 - Zones (*64N-90N* *44N-64N* *24N-44N..*): categorical, ordered, diverging
 - temperature: quantitative, ordered, diverging

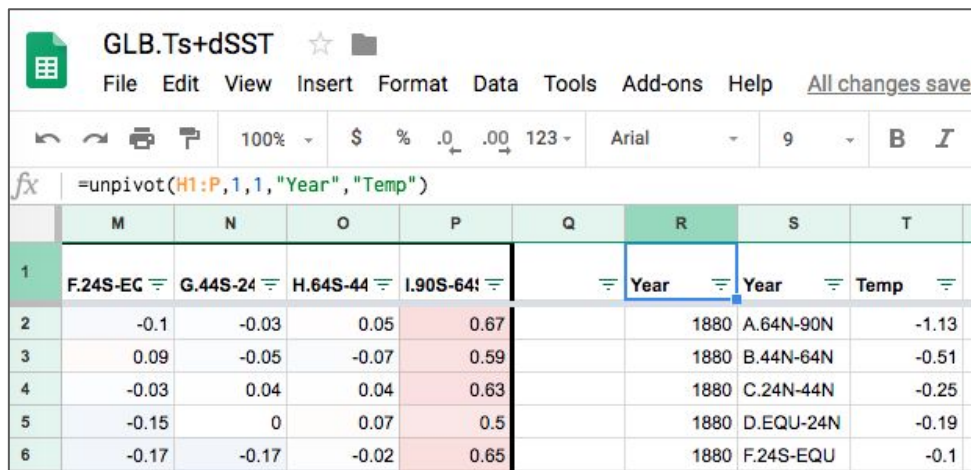
Derived Datasets

- Dataset Name: Moving Averages by Year / Month
- Dataset Type: Table, Static
- Attributes:
 - year-month: date, ordered, sequential
 - temperature: quantitative, ordered, diverging
 - Temperature Moving averages (6 months: *tma_6*, 60 months: *tma_60*, 11 years: *tma_132*): quantitative, ordered, diverging
- Derivation: Moving average of temperaturer

```
SELECT month_temp AS "month",  
       temp AS "temp",  
       AVG(temp) OVER (ORDER BY month_temp ROWS  
                       BETWEEN 132 PRECEDING AND 0 FOLLOWING)::FLOAT AS "132-month Moving Average"  
FROM kudosg.glb_ts_dsst_yearmonth_all  
ORDER BY 1 DESC
```

Derived Datasets

- Dataset Name: Zones
- Dataset Type: Table, Static
- Attributes:
 - year-month: date, ordered, sequential
 - zone: qualitative, ordered, diverging
 - Temperature: quantitative, ordered, diverging
- Derivation: “*unpivoting*” zones



	M	N	O	P	Q	R	S	T
1	F.24S-EC	G.44S-24	H.64S-44	I.90S-64		Year	Year	Temp
2	-0.1	-0.03	0.05	0.67		1880	A.64N-90N	-1.13
3	0.09	-0.05	-0.07	0.59		1880	B.44N-64N	-0.51
4	-0.03	0.04	0.04	0.63		1880	C.24N-44N	-0.25
5	-0.15	0	0.07	0.5		1880	D.EQU-24N	-0.19
6	-0.17	-0.17	-0.02	0.65		1880	F.24S-EQU	-0.1

Derived Datasets

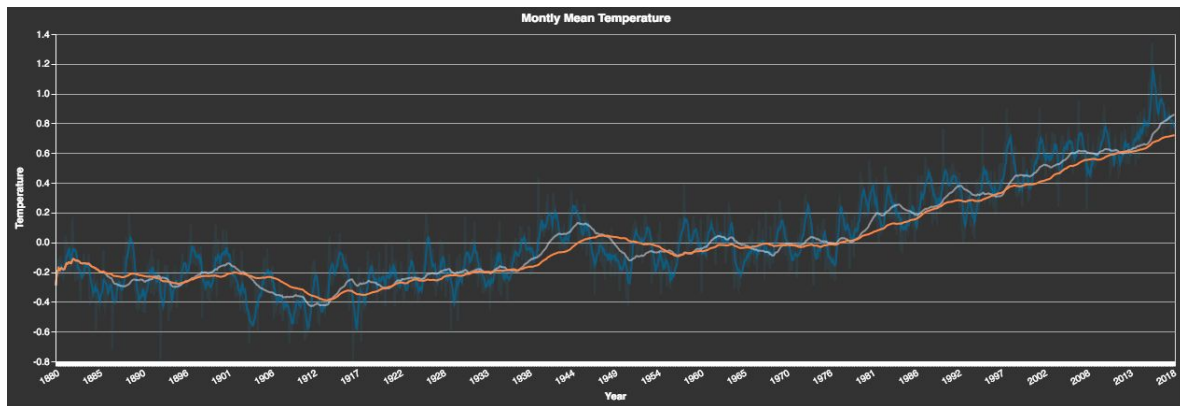
- Dataset Name: Decade
- Dataset Type: Table, Static
- Attributes:
 - decade date, ordered, sequential
 - avg: quantitative, ordered, diverging
 - change: quantitative, ordered, diverging
- Derivation: average per decade, rate change from decade to decade

Tasks

1. **Discover Trends** in temperature change
2. **Present Features** of temperature change by decade
3. **Compare Trends** between year / months
4. **Compare Trends** between zones

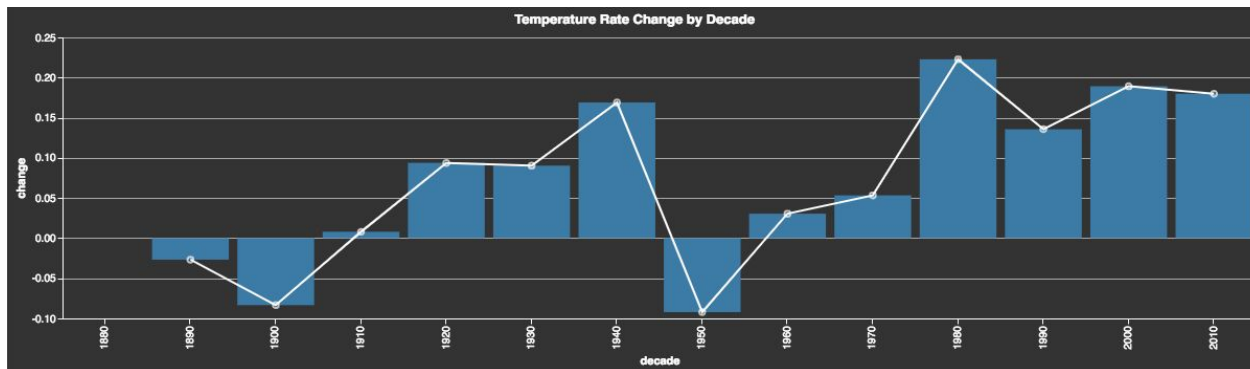
Abstractions

- Idioms: Line Chart
 - Mark: line
 - Attributes:
 - Year / Month
 - Temperature, Avg temperature, moving average of temperature
 - Channels:
 - Position on a common scale, X position, Y Position, color hue



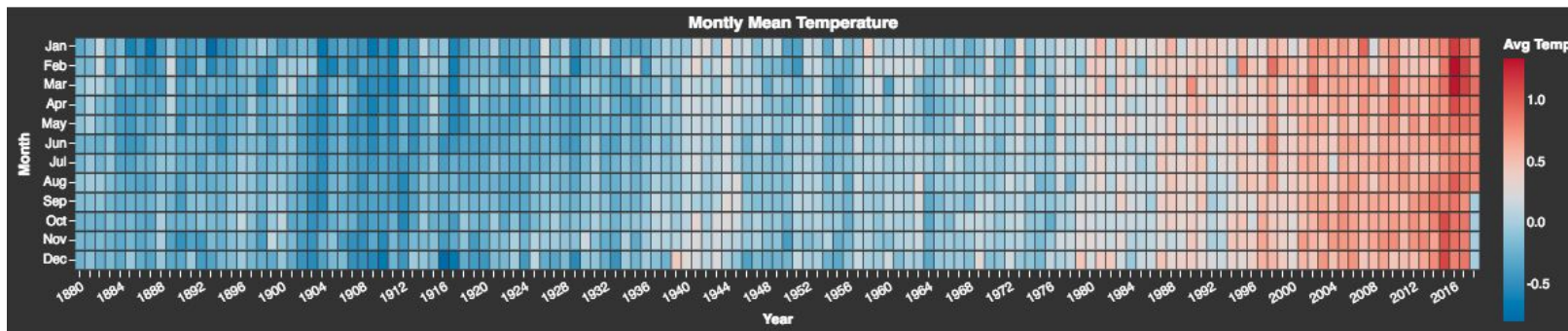
Abstractions

- Idioms: Bar Chart
 - Mark: Area
 - Attributes:
 - Decade
 - Avg temperature
 - Channels:
 - Position on a common scale, X position, Y Position



Abstractions

- Idioms: Heatmap
 - Mark: Area
 - Attributes:
 - Year / Month
 - Avg temperature
 - Channels:
 - Position on a common scale, X position, Y Position, spatial region, color saturation



Abstractions

- Idioms: Map
 - Mark: Line
 - Attributes:
 - Zone
 - Channels:
 - Position on a common scale, X position, Y Position



Demo

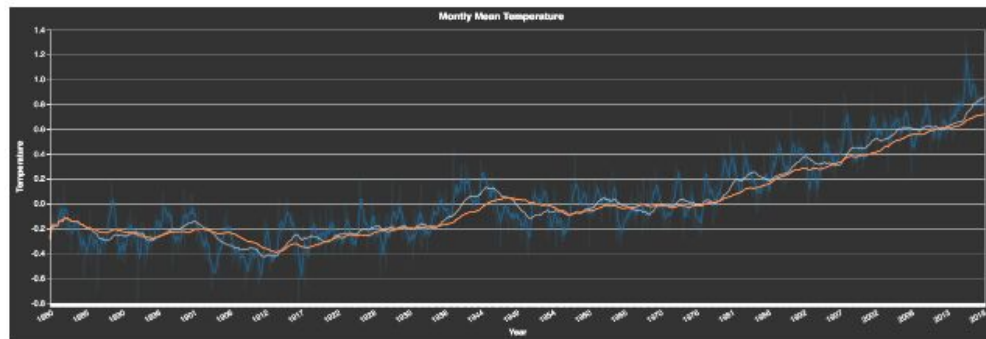
We are getting hotter!!

It's not your imagination, world is getting warmer.

Juan Carlos Méndez (jc.mendez[at~]uniandes.edu.co, juan[at~]gkudos.com)

Scientists have measured global temperatures for over a hundred years and see that the Earth is getting hotter. The trend can be best visualized by comparing each year's average temperature with the long-term average.

The orange line in the following graphic shows the trend of Earth's heating up using a moving average of 11 years for temperature value.

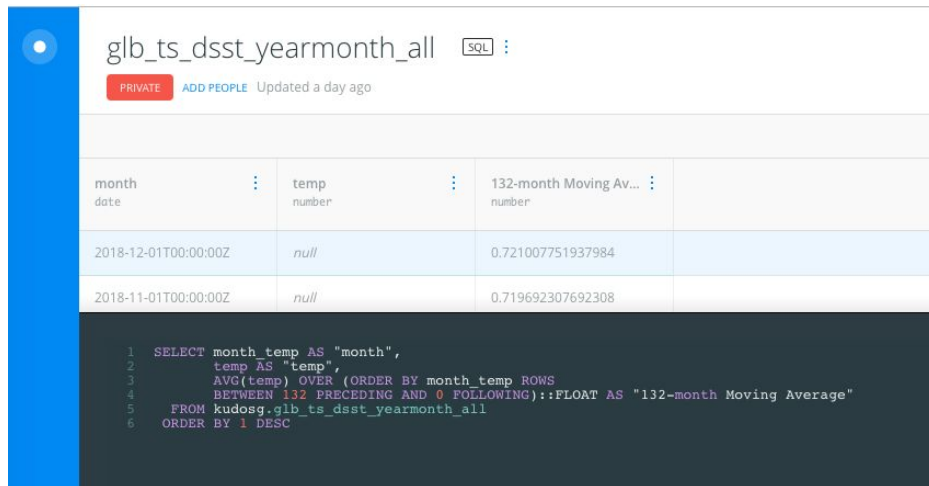


Looks like between 70's and 80's we not only got a *Saturday Night Fever* ...

According to an ongoing temperature analysis conducted by scientists at NASA's Goddard Institute for Space Studies (GISS)...the average global temperature on Earth has increased by about 0.8°Celsius (1.4°Fahrenheit) since 1880. Two-thirds of the warming has occurred since 1975, at a rate of roughly 0.15-0.20°C per decade.

Technologies

- Pre-processing:
 - Google Sheets, Postgresql (Carto)
- Client:
 - D3 v5.7.0
 - Vega Lite
 - Carto (Map)
 - Gulp
 - Bootstrap
 - CSS



The screenshot shows a web interface for a database query. At the top, the table name 'glb_ts_dsst_yearmonth_all' is displayed with a 'SQL' icon and a status bar indicating 'PRIVATE' and 'Updated a day ago'. Below this is a table with three columns: 'month date', 'temp number', and '132-month Moving Av... number'. The table contains two rows of data. Below the table, a SQL query is shown in a dark-themed editor.

month date	temp number	132-month Moving Av... number
2018-12-01T00:00:00Z	null	0.721007751937984
2018-11-01T00:00:00Z	null	0.719692307692308

```
1 SELECT month_temp AS "month",
2        temp AS "temp",
3        AVG(temp) OVER (ORDER BY month_temp ROWS
4        BETWEEN 132 PRECEDING AND 0 FOLLOWING)::FLOAT AS "132-month Moving Average"
5 FROM kudosg.glb_ts_dsst_yearmonth_all
6 ORDER BY 1 DESC
```

Insights

- There was a dramatic change in temperature between 70's and 80's
- Top and bottom zones are changing faster
- January to March of 2016 was the hottest period on history until now

Difficulties

- Few expertise in time series analysis
- netCdf files are hard (raster data is hard....)



Meet Earth Engine

Google Earth Engine combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities and makes it available for scientists, researchers, and developers to detect changes, map trends, and quantify differences on the Earth's surface.

Achievements

- Learn a new technology (Vega Lite)
- Build a *useful* visualization in a *few* time