Sunspot Occurrence Dashboard

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Abstract

Solar activity may seem far from daily life here on Earth, but it can have several real-world implications. High levels of solar activity can interfere with satellite communications and power systems leading it to be a topic of interest for members of those industries. Sunspots are considered to be an indicator of high solar activity and thus a sunspot dashboard can be utilized well to understand solar activity trends.

This sunspot dashboard portrays three different visualizations of the sunspots using the plotly and dash imports within python. The first visualization and the most impactful is a line chart demonstrating the yearly count of sunspots. There are two lines on this chart - the first is the yearly counts plotted with the count of sunspots on the y-axis and the year of occurrence on the x-axis and the second is the similar, but with month instead of year as a smoothing value. The monthly line chart is adjustable for the user with a slider allowing variability in the number of months to smooth by (with a higher number month producing a more smooth line[1]). In addition, the user is able to set a specific year range using a range slider that adjusts the entire line chart.

The second visualization is a scatter plot showing distributions of sunspots depending on various year cycles. The user can again use a slider to adjust the cycle length and explore to find the cycle length that produces the correct distribution. Through completing the project I have learned that 11 years is the proper distribution for a sunspot cycle[2].

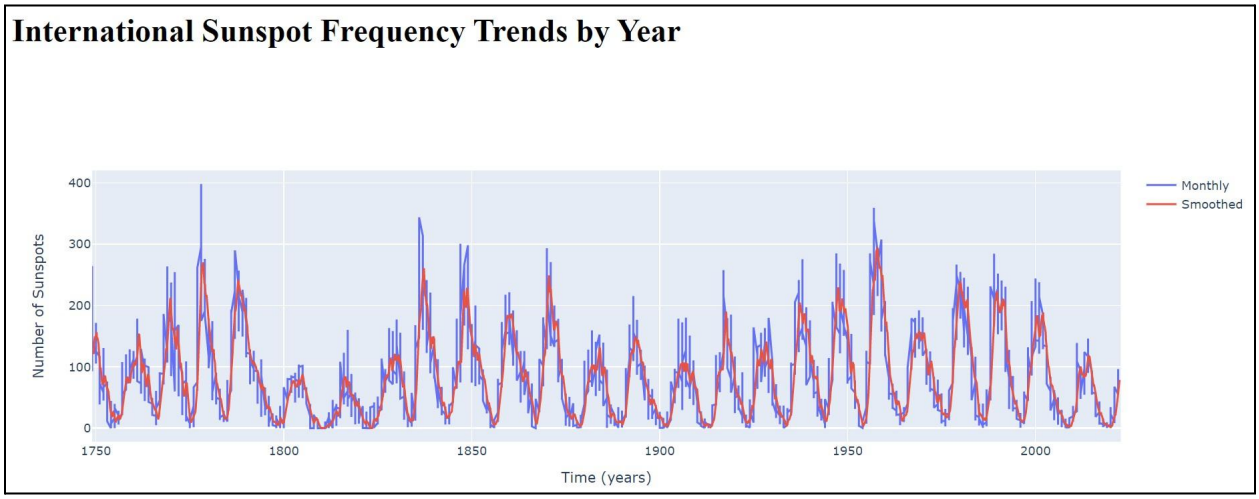
[1] See Figures 1 & 2
[2] See Figure 3

Finally, the third visualization is a constantly updating animated gif of the sun's activity over the previous three months. The view uses an animated gif from NASA[3] that comes from their Extreme ultraviolet Imaging Telescope (EIT) where the brighter sections demonstrate higher temperatures with the highest being from 60,000 - 80,000 degrees Kelvin[4]. I chose the animated view of the sun to allow users to see how the sun has progressed and changed over the last three months as opposed to a singular view with no comparison.

Hopefully this dashboard is a resource that could be used to better understand and predict sunspot and solar activity behavior before it happens.

Figures

Figure 1 - Line chart with a monthly smoothing of nine months



[3] "Soho Real Time GIF Movies." *NASA*, NASA, https://soho.nascom.nasa.gov/data/realtime/gif/.
[4] See Figure 4

Figure 2 - Line chart with a monthly smoothing of 37 months

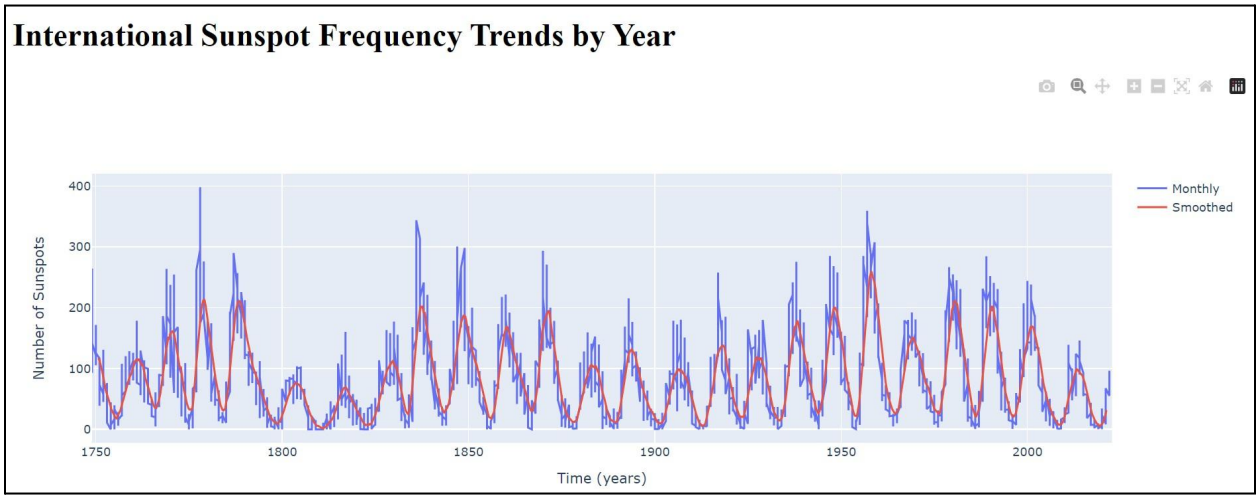


Figure 3 - Scatter plot with 11 month cycle

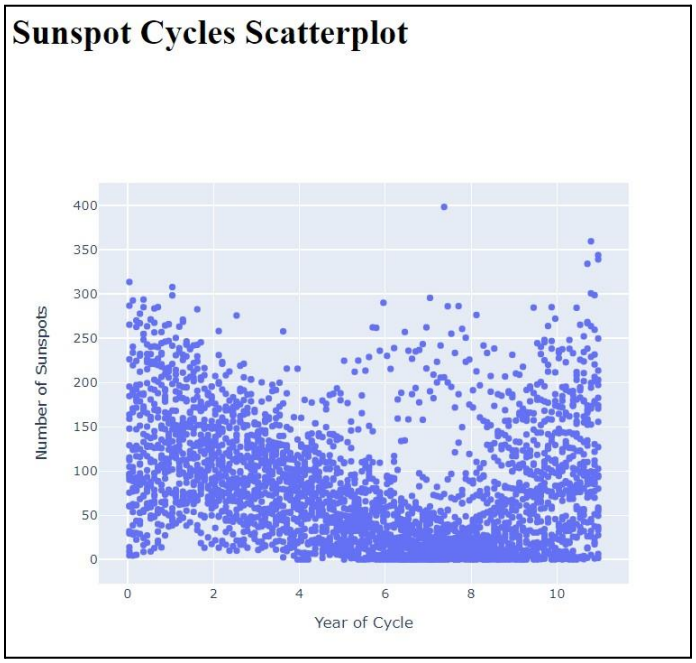
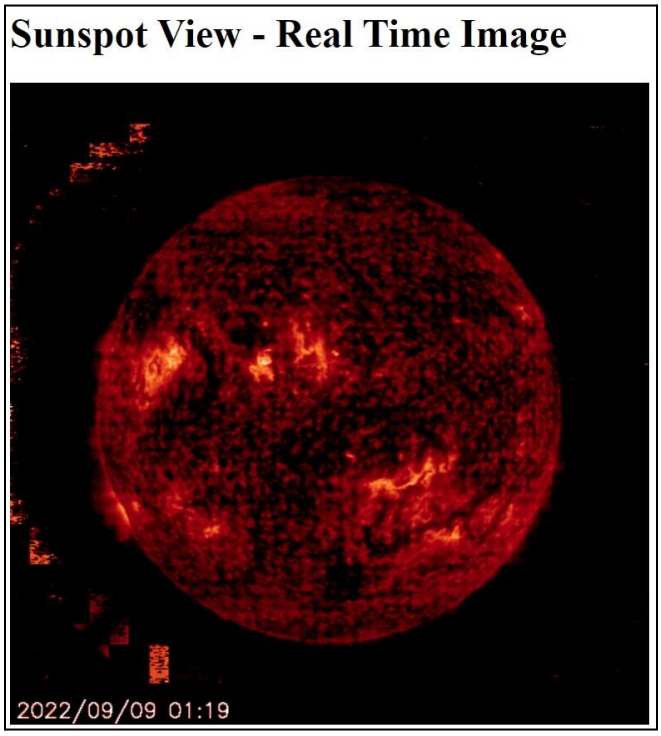


Figure 4 - Real time animated gif of sunspots over the last three months



References

"Soho Real Time GIF Movies." *NASA*, NASA, https://soho.nascom.nasa.gov/data/realtime/gif/.

"Sunspot Number: Silso." *Sunspot Number | SILSO*, WDC-SILSO, Royal Observatory of Belgium, Brussels, https://www.sidc.be/silso/datafiles.