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DS3500: HW2 Monitoring Solar Activity
Professor John Rachlin

Sunspot Trends: 1749 - Present

Authors and Affiliation
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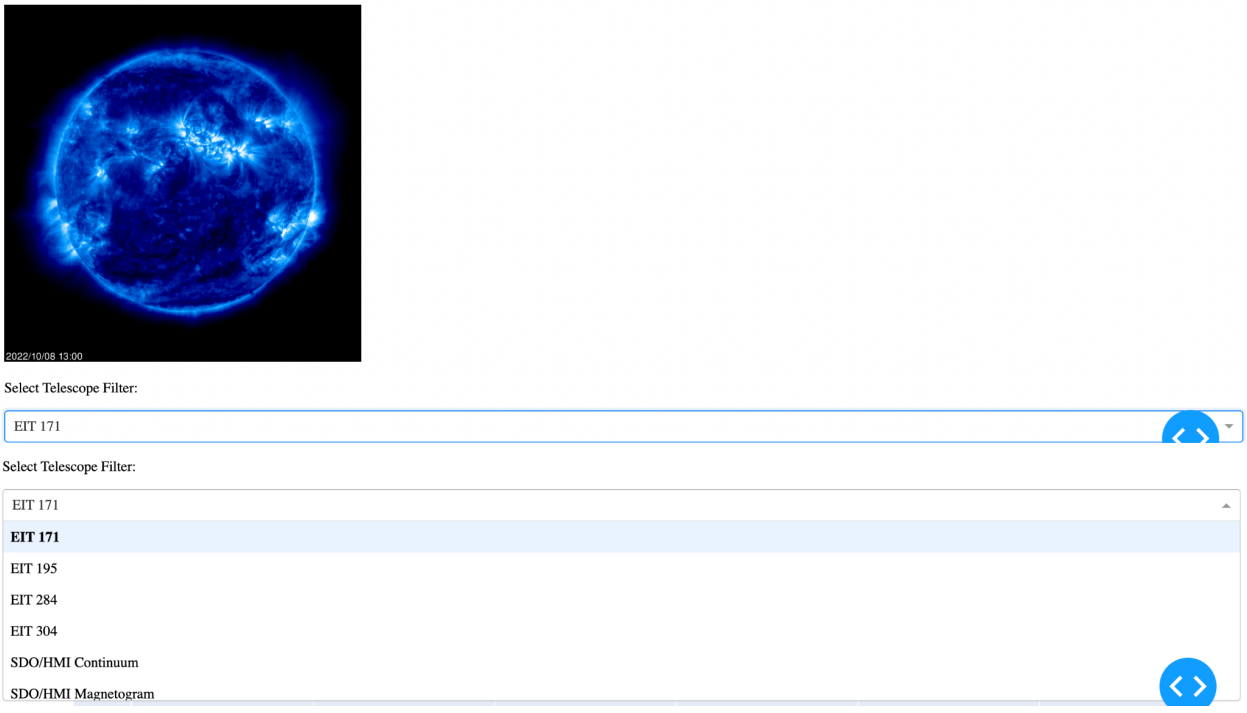
Extended Abstract
Sunspots are occurrences on the sun's photosphere in which a specific area has temporarily darker coloration. Sunspot numbers are indicative of high solar activity, which can cause power and satellite communication issues. The authors created a dashboard to analyze historical data on sunspot frequency.
The dashboard includes three sections. The first section contains live images of the sun. There is a drop down menu for the user to select which telescope filter they wish to see the sun through.

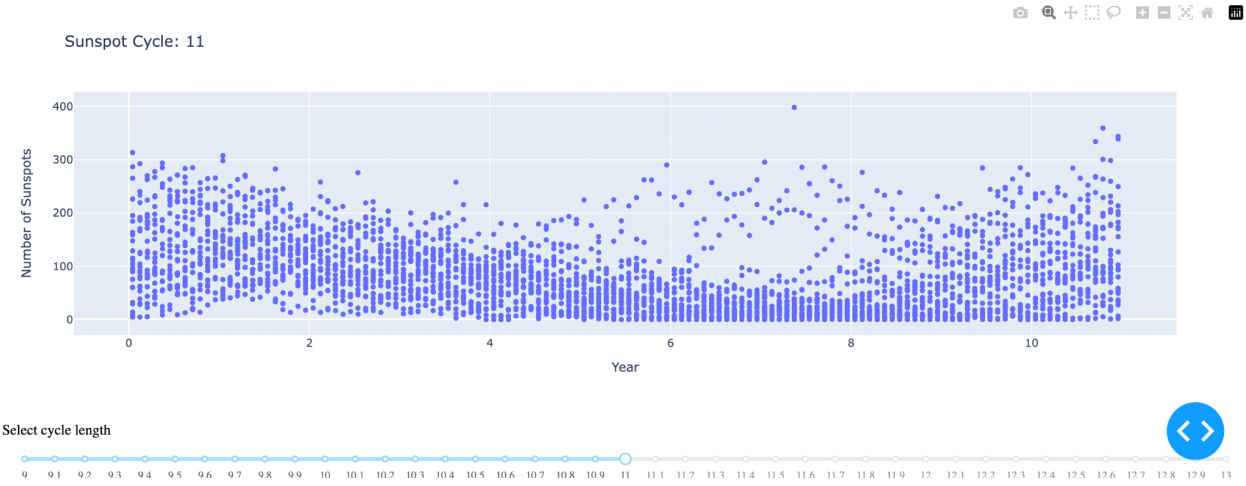
Live Image of the Sun



The second section contains a graph that displays the variability of sunspots within a sunspot cycle. By changing the sunspot cycle length among values between 9 and 13, the variability of sunspots can be seen through different given cycle lengths. There is a slider that the user can

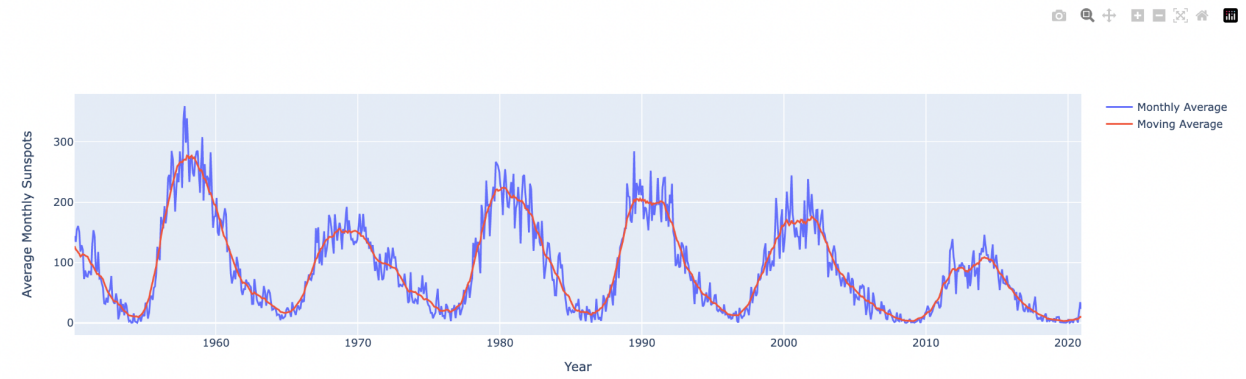
adjust to select the cycle length. If the user selects an accurate cycle length, the variability for a given year will be minimal, and there will be a relatively clear cyclical pattern to the data. However, if the user selects an inaccurate cycle length, there will be a lot of variability and no clear pattern to the data.

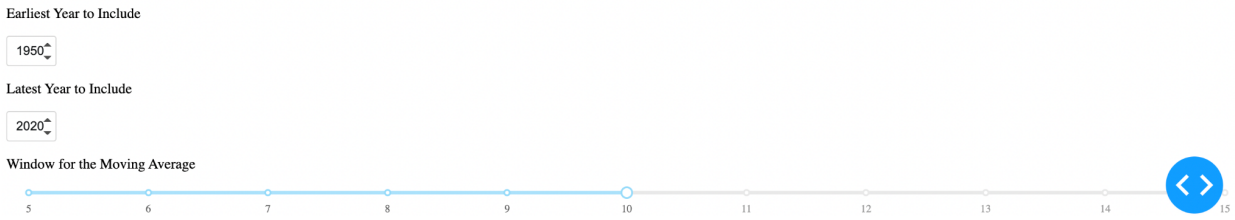
Sunspot Variability



The third section shows the frequency of sunspots throughout the years. There are two lines on the graph: one that depicts the monthly average number of sunspots and another that creates a smoothed moving average number of sunspots. The window of the moving average can be adjusted through user input. A larger window creates a smoother line by using a greater number of observations when calculating the moving average. The window can be adjusted with a slider. In addition, the range of years depicted in the graph can be adjusted via text input from the user through the “Earliest year to include” and “Latest year to include” inputs.

Sunspot Frequency





Author Contributions

Claudia implemented Goal #1 through the moving_avg(), full_plot(), smooth_plot(), and update_fig() functions. Christina implemented Goal #2 through the plot_variability() and update_variability() functions.

Christina set up the format for the divisions among the separate outputs for the homework. We collectively figured out how to incorporate both graphs into separate divisions in the dashboard. While Claudia mainly created the functions for goal #1, Christina helped debug and problem solve in order to implement the user interface.

For the extra credit, we both conceptualized the overall idea together and Claudia implemented it. We were able to display various images of the sun, depending on the filter that the user desires.

References

"SILSO | World Data Center For The Production, Preservation And Dissemination Of The International Sunspot Number". *Sidc.Be*, 2022, https://sidc.be/silso/.