CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
S1804

Project Title
Sunspot Cycles

Abstract

Objectives/Goals
Using a statistical significance test, the objective of the experiment is to determine the type of time trend sunspot cycles make over a period of almost 300 years. The goal is to find the probability of the fact that onset times and decay times are the same in value.

Methods/Materials
Some materials involved in the project include a computer, internet access, spreadsheet Program (Excel), and a graphing calculator. To begin, cross-referenced data was gathered from multiple sources. From the data, onset time and decay time was found from each of the 22 cycles. The hypothesis was tested through a Significance Test. Two statistical hypotheses were made to test the experimental hypothesis. The Null Hypothesis says that the average rise times and decay times are the same and that if there were any differences, they would happen by chance (μO-μD=0). The Alternative Hypothesis says that average onset times occur faster than decay times (μO<μD). Significance Levels decided which statistical hypothesis is correct. In my case, my significance level is α=.01 or 1%. The statistical formula was used to find the test statistic, and using the test statistic value, the probability of the null hypothesis was found.

Results
Using the formula of a 2-Sample T-Test, the test statistic value was -5.38 standard deviations from the mean of the samples. Graphing the test statistic value on a normal distribution curve, the probability of the null hypothesis was 1.699x10-6.

Conclusions/Discussion
According to the P-Value, the null hypothesis was rejected and the alternative hypothesis was accepted at α=.01. The probability value we have reached provides powerful evidence to show that onset times occur faster than decay times, proving my experimental hypothesis as correct, because they both represent the same statement. Astronomers are allowed use this information to determine an overall sunspot activity trend. Sunspots give out billions of radioactive ions, and this radiation only takes days to reach Earth#s Ozone Layer, causing imbalances in Earth#s magnetic fields, geomagnetic storms, and even communication satellites. Astronauts in space are greatly harmed from this radiation. Sunspots are also affecting farmers' crops, so this information can be used to predict solar activity. This project is a foundation for many projects to come, and its results can serve as a basis for different types of astronomical research projects.

Summary Statement
My project's goal is to determine is sunspot cycles undergo faster onset times and slower decay times.

Help Received
General help received from father such as arranging board.