The study of factors affecting CME

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Abstract

This project is to study the relationship between the intensity of Coronal Mass Ejection (CME) and various factors such as the speed of solar wind, Number of sunspot, Size of sunspot and the magnetic field between planets (IMF) in 2014. I found that when all the factors increase, the intensity of Coronal Mass Ejection (CME) will also increase. Then, I find The Simple Linear Regression that shows the relationship between Coronal Mass Ejection and all the factors and I also use that Linear Regression to predict the intensity of Coronal Mass Ejection in another year.

INTRODUCTION

Coronal Mass Ejection (CME) is a significant release of plasma along with magnetic field from the solar corona. They often follow solar flares and are normally presented during a solar prominence eruption. The plasma is released into the solar wind. Coronal mass ejections are often associated with other forms of solar activity and most of them often originate from active regions on the Sun's surface, such as groupings of sunspots associated with frequent flares.

METHODS

1 Collect data on Kp-index, speed of solar wind, number of sunspot, size of sunspot and IMF.

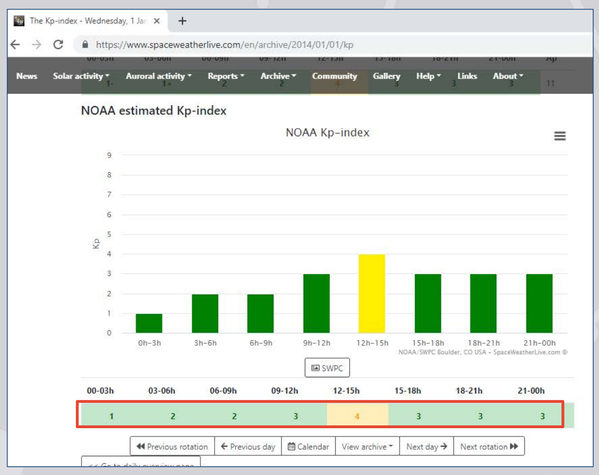


Figure 1: Collect data from database online on http://www.spaceweatherlive.com.

2 Create a graph showing the Kp-index value with various factors relative to time.

3 Correlate each quantity by analyzing Correlation coefficient.

4 Calculate the Simple Linear Regression to show the relationship model of each data set.

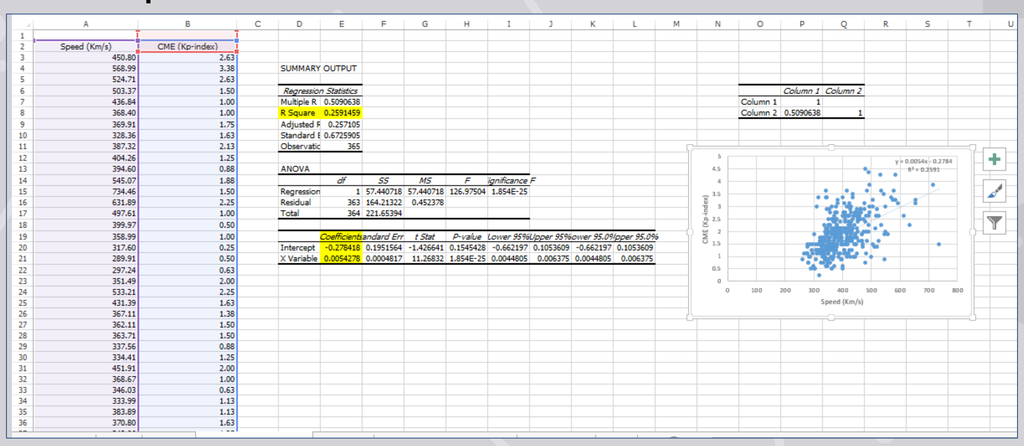
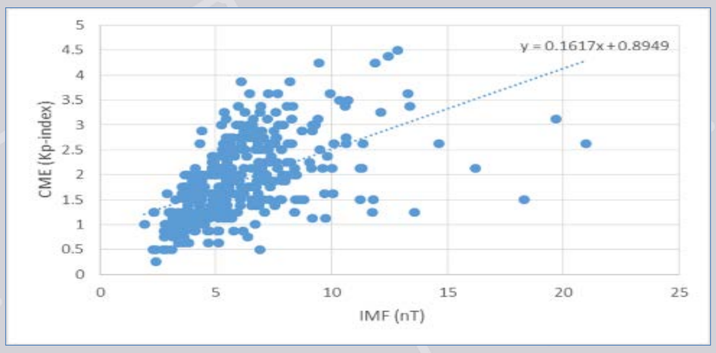
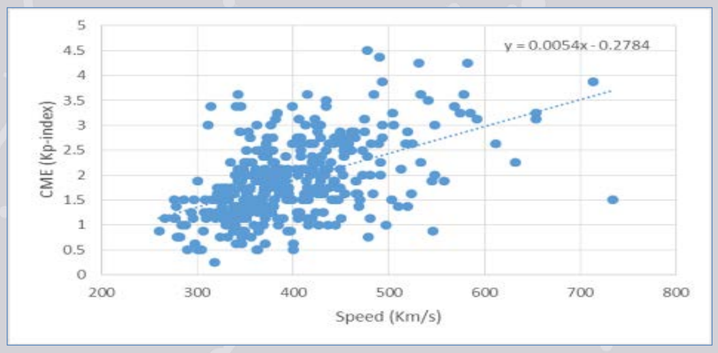


Figure 2: Using Microsoft Excel for Calculate the Simple Linear Regression.

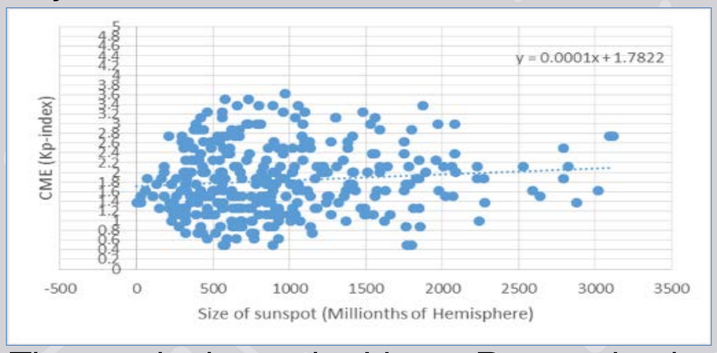
RESULTS



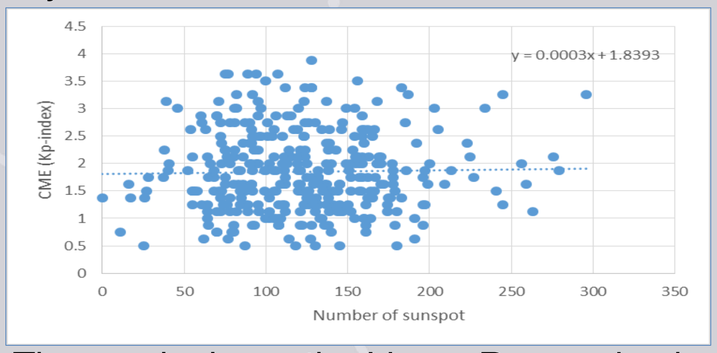
The graph shows the Linear Regression between Kp-index and IMF in 2014 is y = 0.1617x + 0.8949.



The graph shows the Linear Regression between Kp-index and speed of solar wind in 2014 is y = 0.0054x - 0.2784.



The graph shows the Linear Regression between Kp-index delaying 4 days and Size of sunspot in 2014 is y = 0.0001x + 1.7822.



The graph shows the Linear Regression between Kp-index delaying 4 days and Number of sunspot in 2014 is y = 0.0003x + 1.8393.

CONCLUSIONS

The severity of CME (Kp index) and various factors in 2014 have been related to direct variation. For the correlation model, I calculate the Simple Linear Regression between the Kp-index and the speed of solar wind is y = 0.0054x - 0.2784. The Simple Linear Regression between the Kp-index and the magnetic field between the stars (IMF) is y = 0.1617x + 0.8949.The Simple Linear Regression between the Kp-index and the number of sunspot is y = 0.0003x + 1.8393 and the Simple Linear Regression between the Kp-index and the size of sunspot is y = 0.0001x + 1.7822.