



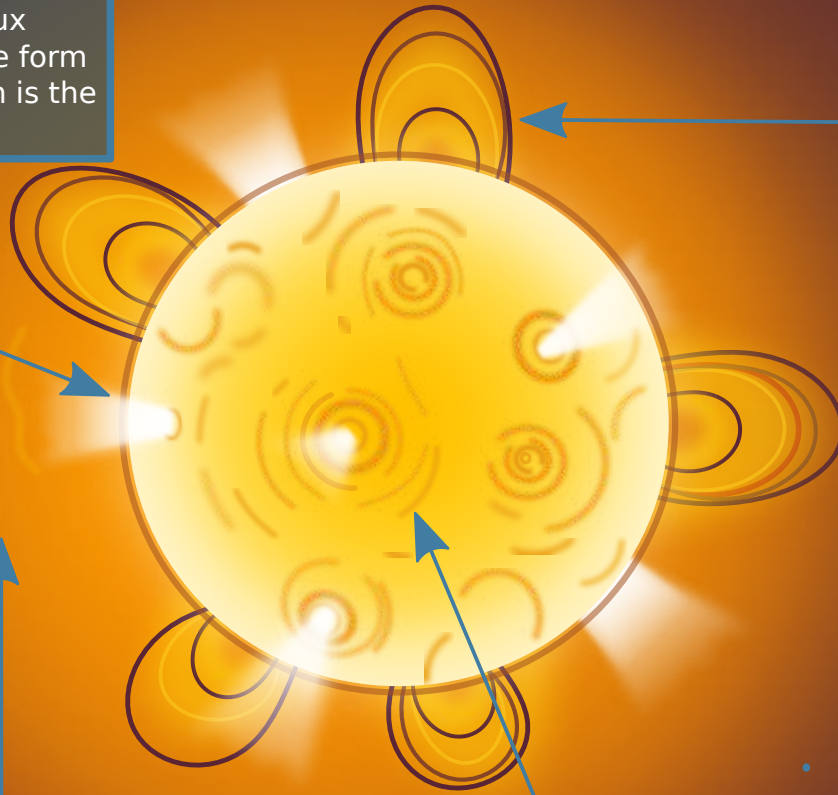
Our Sun is a colossal magnetic star, whose magnetic field is wholly responsible for everything from the Sunspots, Flares, Prominences, Coronal Mass Ejections to the Solar Winds.

What is TSI?

The total amount of energy flares radiate i.e. the total solar flux received from the Sun in the form of electromagnetic radiation is the Total Solar Irradiance (TSI),

What are Solar Flares?

The surface of the sun wobbles, dances and when the energy that has built up in its twisted magnetic field is suddenly released, Solar Flare occurs.



But, how is the magnetic field created in the sun? Plasma, the main constituent of the sun, a gas-like state of matter with a super-hot mix of charged particles. When charged particles move, they create magnetic fields. They are in the form of loops with roots as Sunspots.

What is a CME?

Solar Flares are typically accompanied by the explosive acceleration of plasma away from the Sun – the CME(Coronal Mass Ejection). CMEs are responsible for large-scale changes in the corona that have fundamental implications for the evolution of the magnetic flux of the Sun.

What are sunspots?

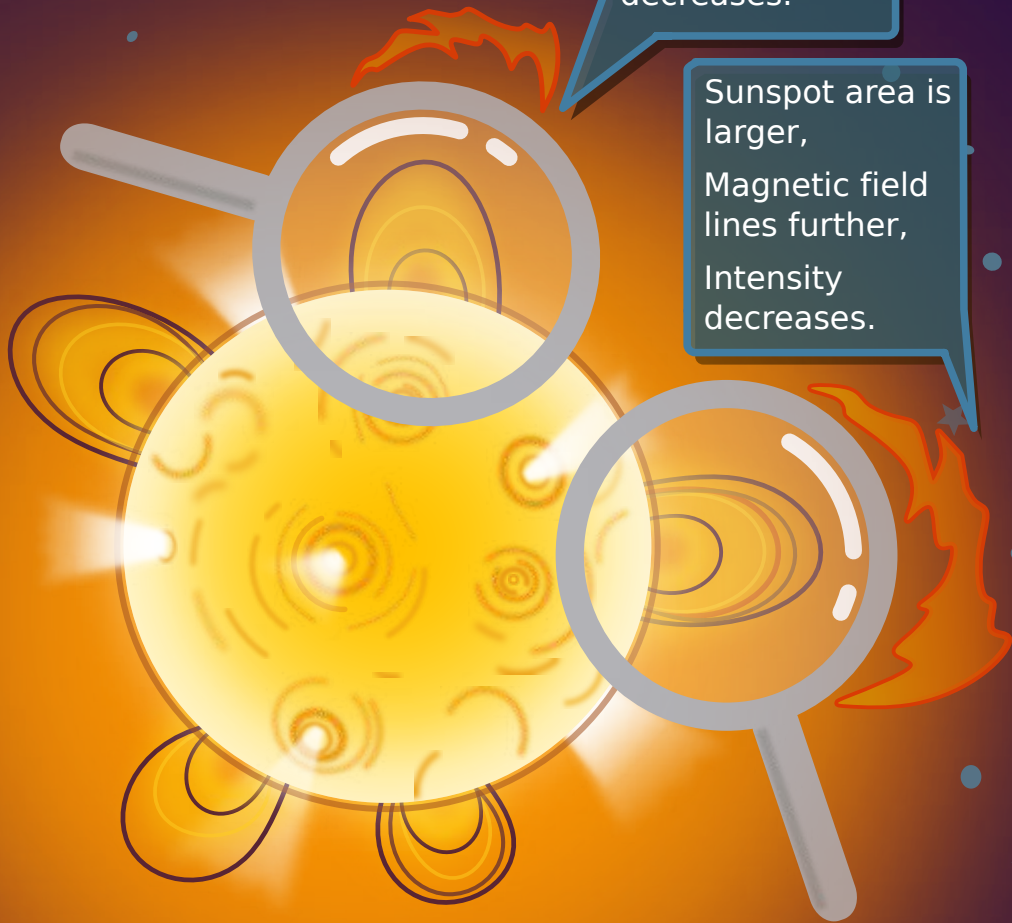
Sunspots are darker, relatively cooler and planet-sized active regions that appear on the surface of the sun, whose number varies according to the approximately 11-year solar cycle, where the Sun's magnetic field completely flips.

## Correlation between Sunspot Area and related parameters



Sunspot area is larger,  
Magnetic field lines further,  
Intensity decreases.

Sunspot area is larger,  
Magnetic field lines further,  
Intensity decreases.



# Hypothesis:

- ★ Solar activity is inversely proportional to Sunspot Area (SSA)
- ★ Magnetic strength is stronger where magnetic field lines are near each other.



# Methodology

Raw data was processed and then refined.

A 2 stage refining with the pre existing data was done, to obtain data corresponding to time periods with similar SSN and Magnetic Flux.

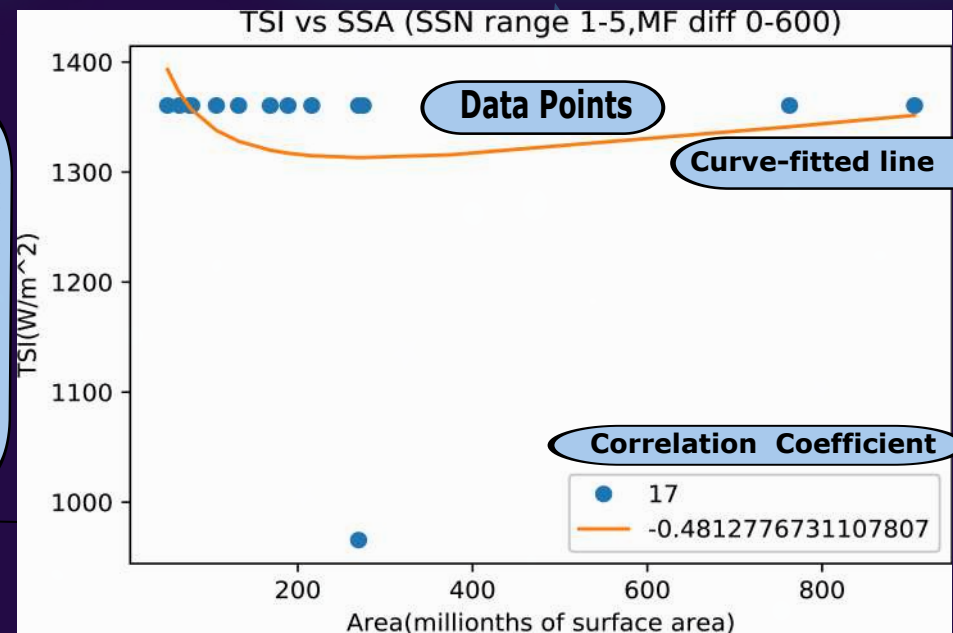
6 parameters( MFD, SSN, SSA, TSI, SFI and CME Width & Speed) were chosen and their respective data was collected.

We used a Python code to categorize all the epochs (time periods) which had SSN values in the ranges 1-5, 6-10 and 11-15.

Refined data vs SSA graphs were plotted and curve fitted for various MF differences and SSN ranges.

Spearman coefficient in the graphs helped us differentiate between Inverse and Direct Relations.

Obtained graphs were :





# Results, Conclusions and The Team

It is apparent that Magnetic Flux difference affects coefficient value radically as compared to SSN ranges.

- The table shows the variation of Spearman coefficient for various MF differences and SSN values where trends were observed. 10 out of 14 trends, upon extrapolating, the coefficient will decrease eventually yielding a negative value which strengthens our hypothesis. This gives an accuracy of 71.42%.

Linear speed			
	0-600	0-700	0-800
1-5	0.0775	0.0939	0.0939
6-10	-0.15853	-0.20548	-0.20548

Total Solar Irradiance			
	0-600	0-700	0-800
1-5	-0.48127	0.0366141	0.0366141
6-10	-0.535	-0.476	-0.4761

CME Width			
	0-600	0-700	0-800
1-5	-0.0404	-0.0933	-0.0933
6-10	0.0084	0.032	0.032

No. of Solar Flare			
	0-600	0-700	0-800
1-5	-0.117	-0.0572	0.093
6-10	0.1963	0.2155	0.2155

2 <sup>nd</sup> Order final speed			
	0-600	0-700	0-800
1-5	0.0439	0.0655	0.0655
6-10	-0.08403	-0.1006	-0.1006

2 <sup>nd</sup> Order Initial speed			
	0-600	0-700	0-800
1-5	0.0817224	0.0850	0.0850904
6-10	0.12605	0.0	0.0

Solar Flare Index			
	0-600	0-700	0-800
1-5	-0.169	0.0366141	0.182
6-10	-0.01834	0.0366141	0.0366141



**The Team : Prateek Boga, Adhitya Shreyas SP, Aparna Ravi, Arvinth E. Prasad, Anisha, Amaria Bonsi Navis, Megha Madhusudhan, Kritika Joshi, Priyanka Kasturia, V. Renuka**