

**Ministry of Science & Technology**  
**Directorate Space & Communications**  
**Center for Atmospheric and Space Sciences**

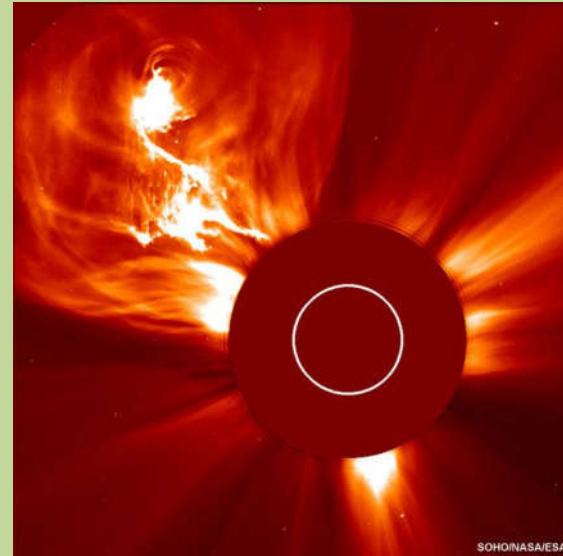
**Comparison between the position central angle of  
coronal mass ejections (CME) and its angular  
width for maximum and minimum solar activity**

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## CORONAL MASS EJECTIONS

Coronal mass ejections (CMEs) are huge bubbles of gas threaded with magnetic field lines, ejected from the sun over several hours.

These are the most important solar phenomena as far as space weather is concerned. Coronal mass ejections occur at all periods of the cycle. observations appear to have shown that they happen nearer to the equator when solar activity is at its lowest and then over ever-increasing latitudes until they reach  $\pm 60^\circ$ .



- **Solar eruptive phenomena embrace a variety of eruptions, including : flares, solar energetic particles, and radio bursts.**
- **Since the vast majority of these are connected with the eruption, development, and evolution of coronal mass ejections (CMEs)**
- **we focus on CME observations in this study. CMEs are a key aspect of coronal and interplanetary dynamics.**
- **Through it inject large quantities of mass and magnetic flux into the heliosphere, causing major transient disturbances.**
- **which means they can produce severe impact on Earth's magnetosphere .**

**The data was obtained from the Solar and Heliospheric Observatory (SOHO) for the period of maximum and minimum solar**

## Position central angle PA

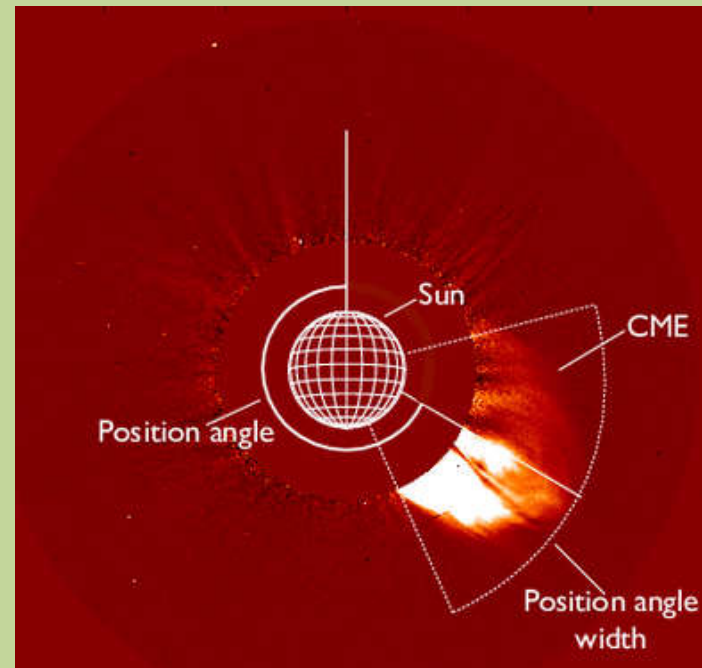
Position central angle PA is measured from solar north at  $0^\circ$  to the east—left side in a solar image—at  $90^\circ$ , south at  $180^\circ$  and west at  $270^\circ$

The severe geomagnetic effects of solar storms or coronal mass ejections (CMEs) are to a large degree determined by their propagation direction with respect to Earth

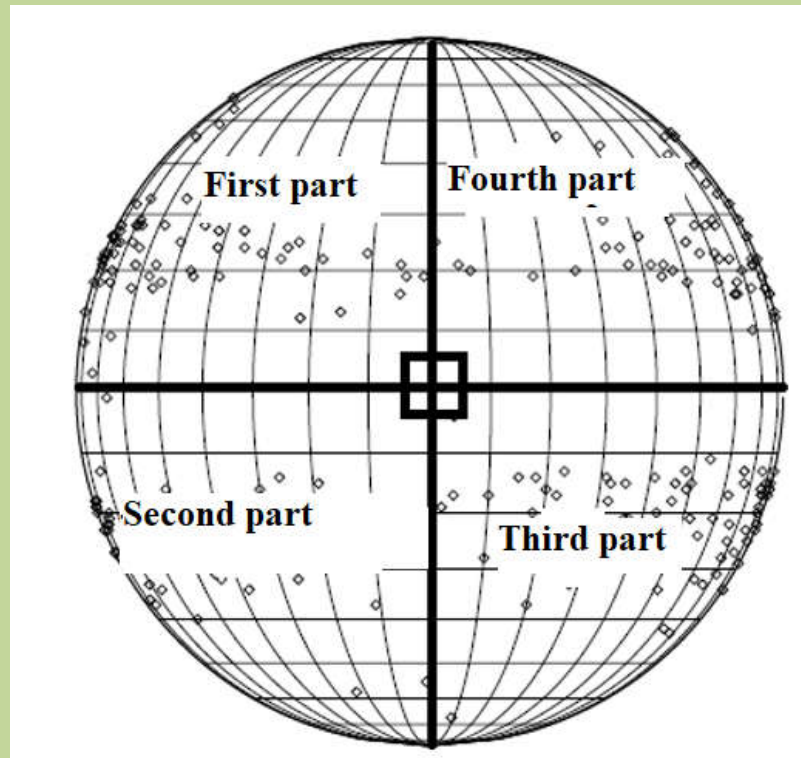
## Angular width

The angular width of CMEs typically refers to their projected, apparent span, in degree.

The angular width of CMEs projected in the plane of the sky ranges from  $\sim 2^\circ$  to  $360^\circ$



## Dividing the disk of the sun into four parts



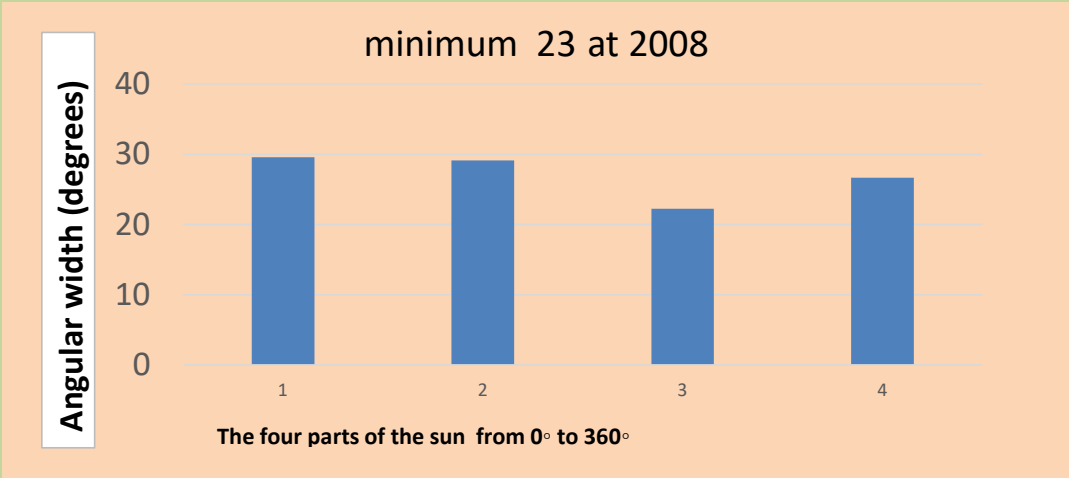
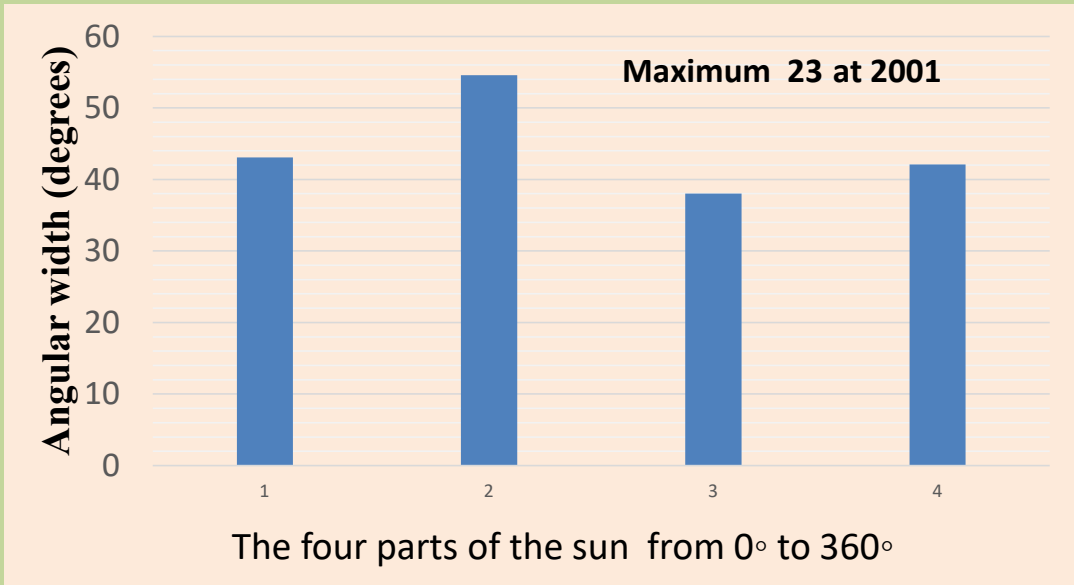
The sun disk was divided into four parts, The vertical or y-axis represents the solar polar angle running from  $0^\circ$  to  $360^\circ$  starting from the north pole and increasing counterclockwise



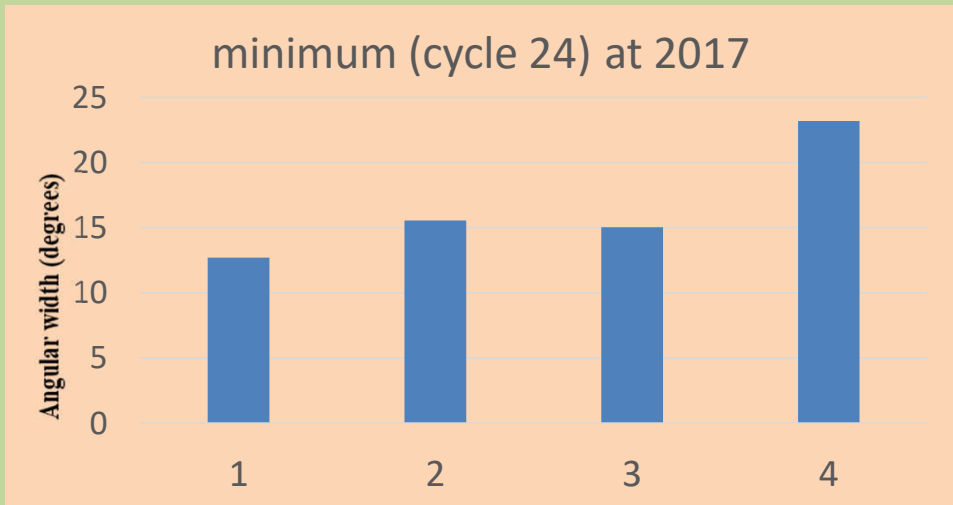
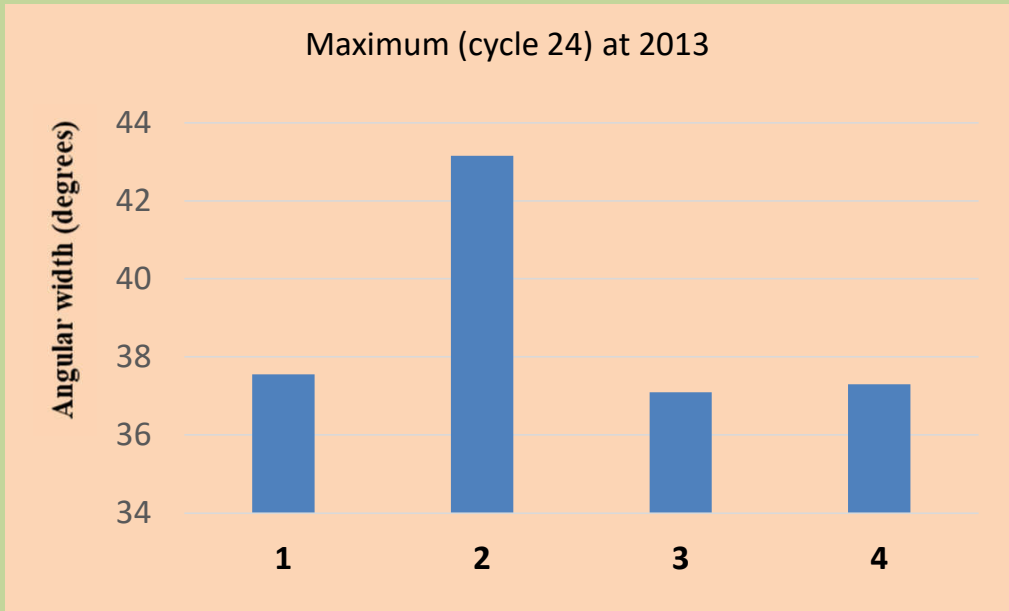
**The total number of coronal mass ejections that occurred since 1997 to 2018**

The Parts	P1	P2	P3	P4
<b>cycle 23 maximum</b>				
2001	330	292	357	291
2002	307	384	367	290
Sum	637	676	724	581
<b>cycle 23 minimum</b>				
2008	59	62	49	46
2009	62	38	42	55
Sum	121	100	91	101
<b>cycle 24 maximum</b>				
2013	416	455	500	414
2014	504	454	415	479
Sum	920	909	915	893
<b>cycle 24 minimum</b>				
2017	40	26	32	30
2018	6	2	0	8
Sum	46	28	32	38

**Total number for CME per Part during high and low solar activity**

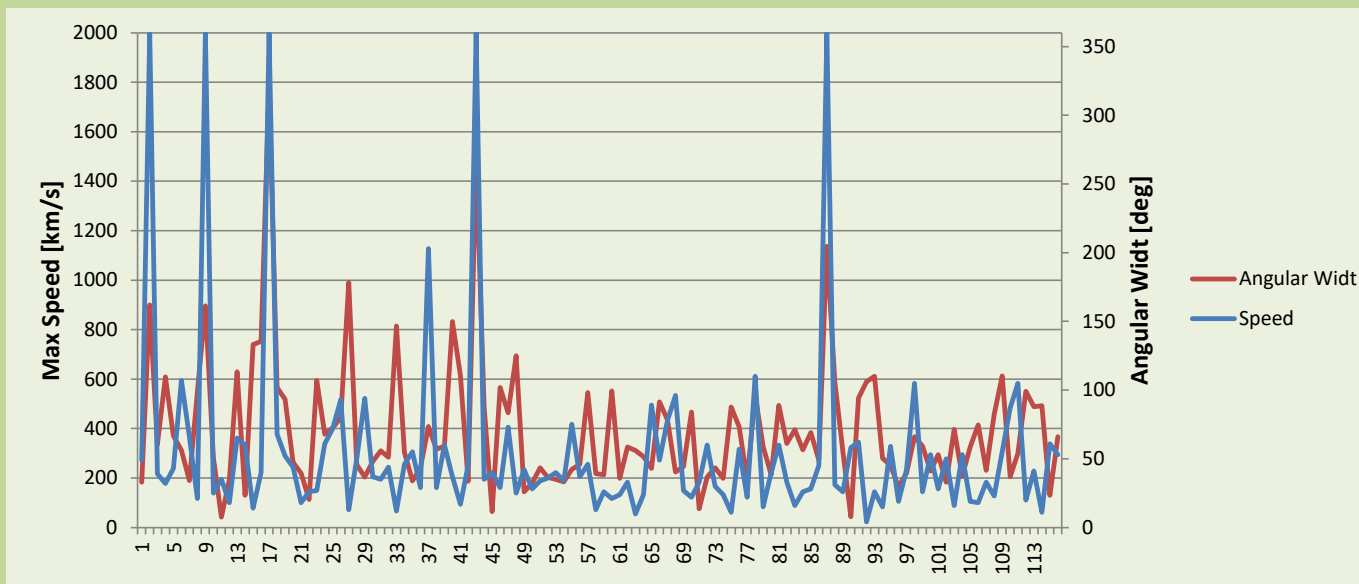




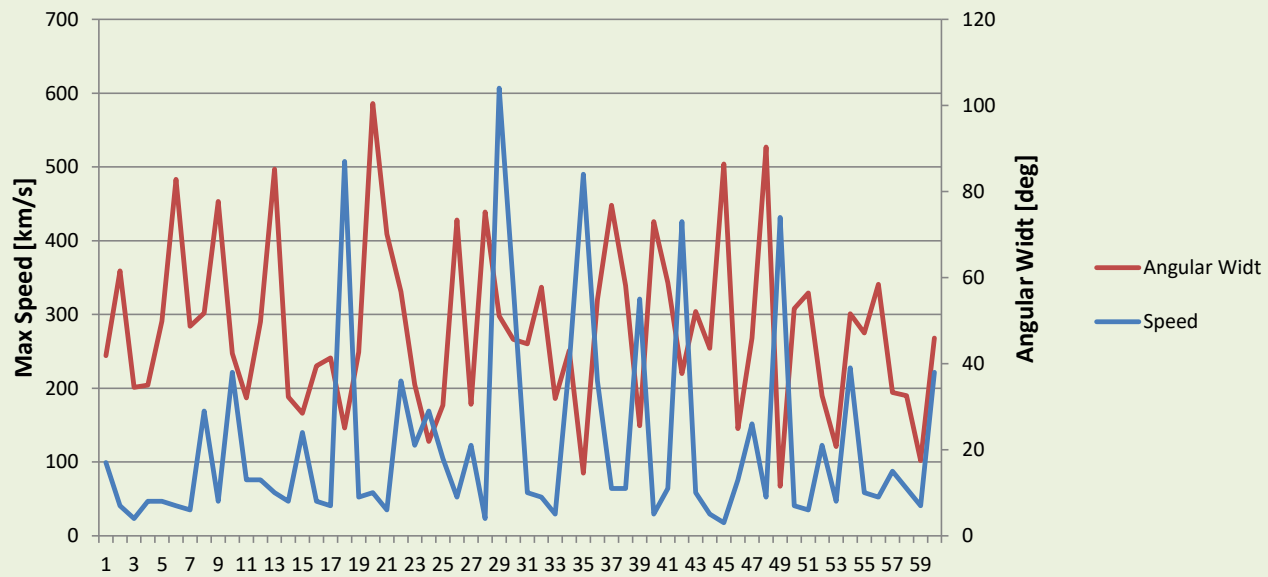


## The relationship between Angular Width and Max Speed for CME at high solar activity

The Angular Width of CMEs is large during high solar activity compared with low activity



## The relationship between Angular Width and Max Speed for CME at the Minimum solar activity



## **Conclusions**

**The total number of coronal mass emissions was greater in the first and third parts**

**Angular width in All parts in solar cycle 23 is greater than Angular width in cycle 24 In the case of maximum and minimum solar activity**

**The transverse Angular width of a coronal mass ejection is often associated with its velocity**

## REFERENCES

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**Thank You**