

Possible Causes of Waxing and Waning of the Sun's Activity in Conditions Like Maunder Minimum

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The first aspect pertains to the gradual decrease of the high – latitude zone boundaries of unipolar magnetic field at the minimum sunspot activity. We suggest that the causes of the waxing and waning of the Sun's activity like in the Maunder Minimum are connected with pole ward and equator ward migration of the conical blades, where $\delta_r\omega = 0$. The deep minima of solar activity may occur when these conical blades reach extreme latitudes [1]. The second aspect pertains to the rate of pole ward migration of the magnetic neutral lines depending on “the strength of the solar cycle” and polar magnetic field reversal. We found the rate of polar drift at the times of low sunspot activity about 2 m s^{-1} . If the magnetic neutral lines were to migrate all the time at this low speed, it would take almost 20 years. Such low pole ward velocities might have been a characteristic of the Maunder Minimum [2]. The third aspect pertains to “the strength of the solar cycle” that decides the maximum latitude to which the magnetic neutral lines can reach during the cycle. The polar magnetic field reversal of the Sun requires minimum activity corresponding to the value of $W_{\text{max}} \approx 40$ [3]. Possible scenarios of the polar magnetic field reversal in Maunder Minimum will be discussed.

References

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