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Study of Solar and Interplanetary Parameters Along with Geomagnetic Indices During The Ascending Phase of Solar Cycle 25

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Abstract: We study the manner in which solar and interplanetary characteristics correlate with geomagnetic indices during solar cycle 25's ascending phase. Solar cycle 25's ascending phase's sunspot number, interplanetary magnetic field, and geomagnetic indices are all related to that of cycles 22, 23, and 24. There is a periodic in the sunspot number, geomagnetic parameters, and interplanetary parameters (IMF). However, during solar cycle 25's ascending phase, the IMF and geomagnetic parameter values differ. We determined that all of the geomagnetic parameters, IMF, and sunspot number were in good agreement. This phase has unique minimum and maximum durations. Compared to the ascending phase of solar cycle 25, the cosmic ray intensity magnitude was lower during this ascending phase. We discovered that the geomagnetic indices, sunspot number, and IMF all show larger spectrum fluctuations than at the start and finish of the cycle. These factors have a continuous spectrum energy of medium to week magnitude, according to our analysis & three different neutron monitor Oulu, Moscow and Athens **are** observed the highest peak down in year of 2020 in the ascending phase of Solar Cycle 25. We propose that solar activity plays a role for the unique circumstances of solar and interplanetary parameters as well as geomagnetic indices.

Key words: Sunspot number, interplanetary parameters (IMF), geomagnetic index.

I. INTRODUCTION

The Sun's gases are constantly flowing, creating mass, elasticity, and rotation, creating a magnetic field. This movement creates intense activity on the Sun's surface, called solar activity. Sometimes, the Sun's surface is extremely active. Solar activity varies over periods ranging from days to thousands of years. Sunspots are deep magnetic fields formed in the Sun's interior. They are constantly monitored on the solar surface. Sunspots are also the most reliable parameter for correlating cosmic ray occurrence, the interplanetary medium, and the geomagnetic index. Cosmic rays and their propagation are studied under the influence of the large-scale structure of the interplanetary medium. Correlation of cosmic ray intensity variations measured through neutron monitor intensity with variations in near-Earth sunspot number, geomagnetic index, and interplanetary magnetic field (B) over the duration of ascending phase of solar cycle 25.

II. DATA SOURCE AND METHODOLOGY

We use corrected daily data pressures (neutron counts) of cosmic ray intensity from the Oulu Neutron Monitor (NM), where short-term variations have been removed from the data by trend correction. Days with cosmic ray declines have also been removed from the analysis to avoid their influence on cosmic ray variation. Interplanetary magnetic field and geomagnetic index data are taken from the Omni Web dataset and /https://www.nmdb.eu/nest/https://omniweb.gsfc.nasa.gov/.

Table: Solar Parameters at the ascending phase of solar cycle 25:

YEAR	CRI	SSN	IMF	Dst	Ap
2019	6687.87	69.78	6.67	-6.55	19.7
2020	6749.57	39.82	6.02	-53.88	7.33

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2021	6684.51	21.81	5.24	-48.7	10.6
2022	6660.19	7.0	4.65	-59	14.66
2023	6202.67	3.58	4.5	-53	20.5
2024	5809.01	155.01	6.9	-12	12
2025	5711.11	128.1	7.7	-13	15

III. RESULTS AND DISCUSSION

The table shows the solar activity, solar interplanetary and geomagnetic indices year wise during ascending phase of solar cycle 25. The sunspot number (*Rz*), interplanetary magnetic field and geomagnetic indices indicate the inclination of such parameters. Sunspot number (*Rz*), IMF (Bz) and geomagnetic indices are shown periodically during this period. We found a positive correlation between sunspot number (*Rz*), IMF (Bz) and geomagnetic indices and all the analyses are shown in the graphs and different neutron monitor Oulu, Moscow and Athens are observed the highest peak down in starting cycle of solar activity in the ascending phase of Solar Cycle 25.

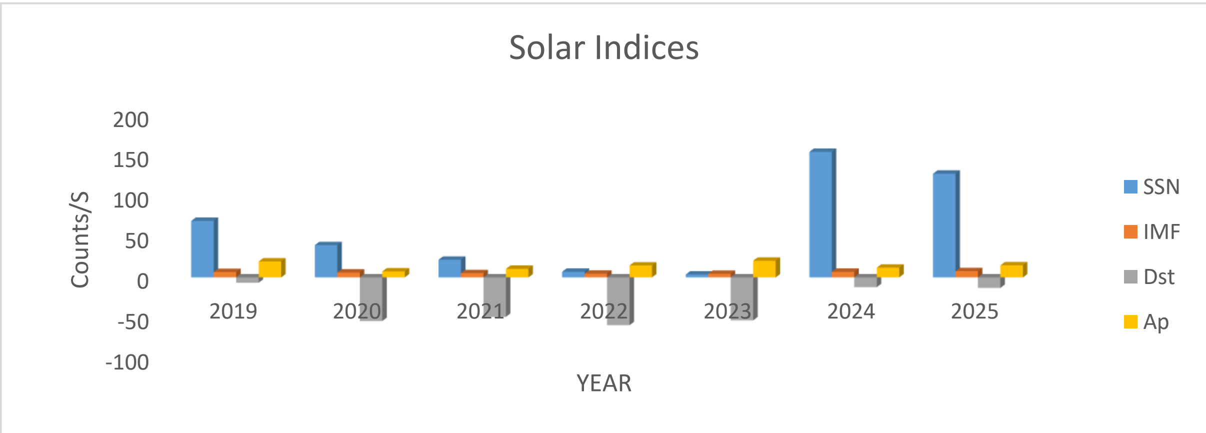

Figure 1. shows trends the solar indies SSN,IMF,Dst,Ap at the ascending phase of Solar Cycle 25

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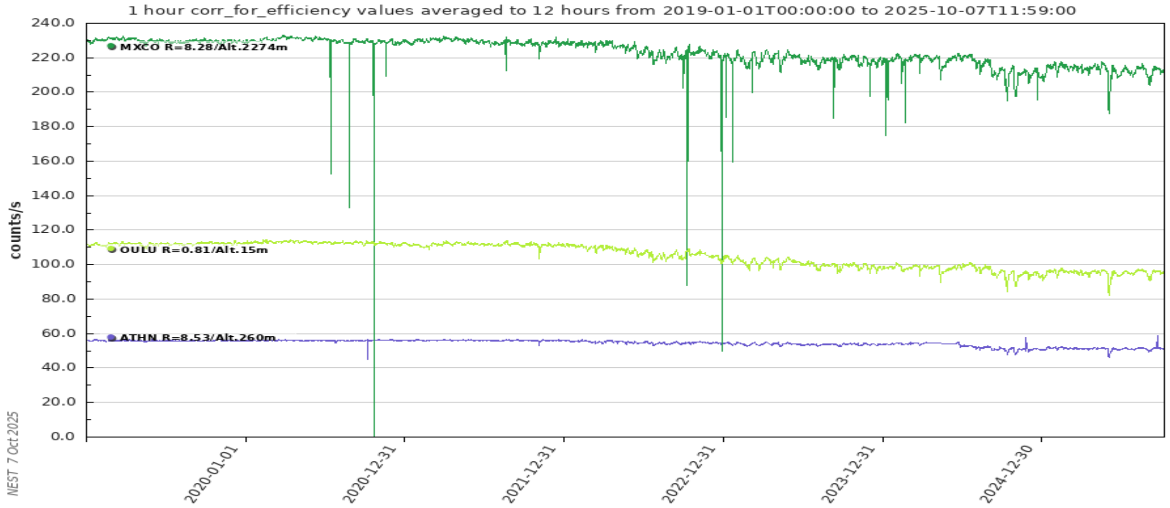

Figure 2 shows different neutron monitor the highest peak down in year of 2020 in the ascending phase of Solar Cycle 25

IV. CONCLUSION

Our observations of the trends in solar activity, solar interplanetary, and geomagnetic indices during of ascending phase of Solar Cycle 25 are as follows:

1. Sunspot number (*R*z), interplanetary magnetic field, and geomagnetic index indicate a trend during previous Solar Cycle.
2. In the ascending phase of Solar Cycle 25, sunspot number (*R*z), IMF (Bz), and geomagnetic index exhibit a periodic nature.
3. We found a positive correlation between sunspot number (*R*z), IMF (Bz), and geomagnetic indices. This means that there is a large difference between the maximum and minimum during this ascending phase period.
4. Shows figure- 2 different neutron monitor oulu, mascow and anthes are observed the highest peak down in year of 2020 in the ascending phase of Solar Cycle 25.
5. The cosmic ray magnitude was smaller in ascending phase of Solar Cycle 24 than in current cycles. Through continuous wavelet transform, we found that IMF, sunspot number, and indices all have the highest spectral variability from the beginning of the cycle to the end of the cycle.

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