**Analysis of variations in Solar and Geomagnetic Parameters for Solar Cycle 24 using Analysis of variance (ANOVA) method**

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**Abstract:**

The analysis of plages and spots on the photosphere is critical to understanding the sun's magnetic field. These dynamic processes have an impact on the Earth's and other planets' magnetic fields. To analyze the characteristics of these variations, one must first investigate the appropriate parameter linked with solar activity, which entails examining the time variation in various solar activity metrics as well as their cyclic variation. Solar activity parameters are related with certain solar phenomena and presented in a simple numerical format. Solar activity parameters are separated into two categories: basic physical parameters and derived parameters. Basic parameters or indices are observed and measured directly, and they indicate numerical properties of solar activity such as sunspot number, sunspot area, flare brightness, and so on. On the other hand, derived parameters are derived from basic indices or combinations of them, such as the wolf number, flare indices, fluctuation indices, and so on. In this study, we used the statistical ANOVA method to examine the number of sunspots and their relationship to other solar activity characteristics. The identified anomalies in the link between SSN and other solar activity parameters have also been addressed. Create a suitable regression-based model to describe the many long-term features of solar activity.

**Keywords:** ANOVA, fluctuation indices and Solar activity