

STATISTICAL EVALUATION OF SOLAR INDICES USING PRINCIPAL COMPONENT ANALYSIS

Space weather, defined as the variable conditions in space driven by the sun, significantly impacts the performance of both terrestrial and space-based technologies. To mitigate these adverse effects, it is essential to develop accurate storm-time space weather models. Since the sun is the primary driver of these models, solar indices like SSN and F10.7 are crucial for creating these models. However, different solar indices can lead to varying predictions. This study conducted a statistical evaluation using three metrics to determine which solar index among F10.7, F10.781, F10.7p, SSN and R12, best represents solar activity. The evaluation's core principle was to correlate these indices with the ionospheric TEC and then compare the model predictions with actual observations. PCA was utilized to perform this task and the results of the study has revealed that the F10.7p index is a superior indicator of ionospheric conditions compared to other indices. This finding is crucial for enhancing the accuracy of the space weather predictions, thereby helping to protect and optimize the functionality of technological systems affected by solar activities.

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