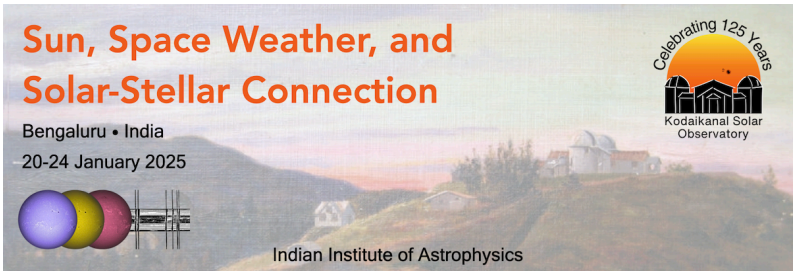

Contribution ID: **177** Type: **Poster**

Nonlinear Time Series Analysis at Different Amounts of Dynamo Supercriticality suggest Solar Dynamo is Not Highly Supercritical

The toroidal to poloidal part of the solar dynamo mechanism involves some nonlinearity and stochasticity, which disturb the dynamo loop. Hence, the memory of the polar field decreases in every cycle. On the other hand, the dynamo
efficiency and, thus, the supercriticality of the dynamo decreases with the Sun's age. Previous studies indicate that the memory of the polar field decreases as the dynamo supercriticality increases. This work employs prominent time series
analysis techniques and computes Higuchi's fractal dimension, Hurst exponent, and Multifractal Detrended Fluctuation Analysis to the amplitude of the solar cycle obtained from dynamo models operating at near-critical and supercritical
regimes. We show that the magnetic field in the near-critical regime exhibits strong memory, less stochasticity, intermittency, and breakdown of self-similarity. Conversely, the magnetic field in the supercritical regime has less memory, strong
stochasticity, and good amount of self-similarity. Furthermore, applying these analysis techniques to the reconstructed sunspot data of 85 cycles and comparing these results with the model, we conclude that the solar dynamo likely operates
near the critical regime rather than the highly supercritical regime.

Contribution Type

Poster

Theme

Solar Magnetism over Long-Time Scales

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