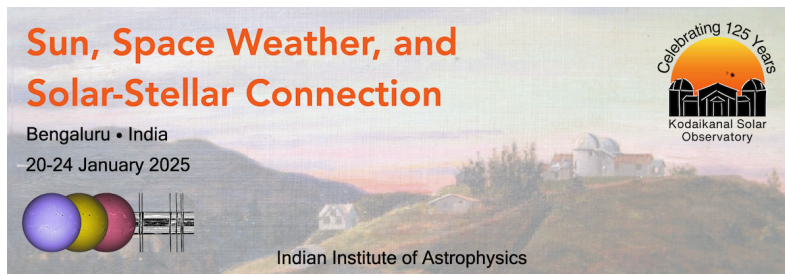


Sun, Space Weather, and Solar-Stellar Connection



Contribution ID: 69

Type: **Contributed talk**

Surmounting the Solar Grand Minima: A Quantification of the Polar Flux Threshold

Monday, January 20, 2025 2:40 PM (15 minutes)

The 11-year sunspot cycles undergo amplitude modulation over longer timescales. As a part of this long-term modulation in solar activity, the decennial rhythm occasionally breaks, and sunspots disappear from the solar surface for multiple decades, leading to a period of magnetic quiescence on the Sun –known as the solar grand minimum. Observation of solar magnetic activity proxies suggest that the solar polar fields reach a minimum during such episodes, with a temporary halt in the polar field reversal. Eventually, with the accumulation of sufficient polar fluxes, the polarity reversal resumes, revitalizing regular sunspot cycles. Using multi-millennial dynamo simulations, we quantify the threshold of polar flux necessary to restart the polarity reversal and surmount the grand minimum phase. We also find that the duration of a grand minimum is independent of the onset rate and does not affect the recovery rate. These results may help forecast the Sun's recovery once it enters a grand minimum.

Contribution Type

Theme

Solar Magnetism over Long-Time Scales

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Session Classification: Dynamo Models and Observations