**SURGE 2024**

**MID – TERM EVALUATION**

**Exploring Earthquake Precursor to establish a universal law using machine learning.**

**Keywords**: Lithosphere Atmosphere Ionosphere Coupling, ARIMA Model, Total Electron Content

**Abstract**

Recent advancements have introduced various earthquake precursors, such as ionospheric perturbations, electromagnetic emissions, magnetic anomalies, infrared emissions, and peroxy defects. However, most studies tend to focus on one or two precursors at a time, and the integration of diverse precursors has yet to be fully realized. Here, we plan to use NASA-provided ionospheric data, which features a spatial resolution of 2.5° latitude by 5° longitude, covering 71 by 73 grid points. The data is resolved hourly, focusing on fluctuations in Total Electron Content (TEC) at the nearest grid point. Anomalies are identified by comparing observed TEC values to upper and lower bounds defined by a 15-day running median ± 1.34 times the standard deviation. The ARIMA model will be employed for time-series forecasting, offering a robust method for analyzing and predicting temporal earthquake data. The primary objective is to identify scalable precursors across both time and space. Similar anomaly detection methodologies will be applied to atmospheric temperature and relative humidity data. Exploring how these precursors interact and correlate with each other could provide deeper insights into earthquake forecasting and early warning systems. These approaches collectively aim to discern anomalous patterns that may precede seismic events, contributing to earthquake mitigation strategies.

Gautam Kumar, Application no. 2430303

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