SR-GEO-PoC Earthquake Detection Model Evaluation Report

# 1. Introduction

This report presents a comprehensive evaluation of the SR-GEO-PoC (Schumann Resonance-Geophysical Observation and Correlation) model in two versions: the original 1.0 formula and the enhanced 2.0 formula. The purpose is to understand each model's capacity to detect precursory signals of seismic events using real-world data and to identify potential improvements in accuracy, coverage, and lead time.

# 2. SR-GEO-PoC v1.0 Model Summary

The original SR-GEO-PoC formula used a 6-point binary scoring system based on the presence of threshold-exceeding signals in six modalities: Schumann Resonance amplitude, frequency shift, Total Electron Content (TEC) deviation, Extremely Low Frequency (ELF) spikes, Transient Luminous Events (TLE) activity, and gravity anomalies. An alert was triggered if 3 or more modalities exceeded their thresholds within a given time window.

# 3. Limitations of v1.0

- Unable to handle partial or weak signal overlaps  
- No weighting for signal type or fault characteristics  
- No scaling based on sensor availability or confidence  
- High miss rate for strike-slip, deep-focus, and data-sparse regions

# 4. SR-GEO-PoC v2.0 Model Summary

The revised model incorporates six primary modalities: SR amplitude, ELF bursts, TEC deviation, AGW spikes, local piezoelectric EM signals, and gravity changes. Each signal is weighted based on fault type, geological setting, and confidence index based on sensor coverage. The formula is:

P\_event = Σ (Si × Wi × Ci)

- Si = Normalized signal strength  
- Wi = Weight based on geological relevance  
- Ci = Confidence based on data availability

# 5. Evaluation Results

Events tested against both models include:

- 2011 Tōhoku (v1.0: Alert | v2.0: High Certainty)  
- 2010 Maule (v1.0: Alert | v2.0: High Certainty)  
- 2023 Turkey–Syria (v1.0: Alert | v2.0: High Certainty)  
- 2023 Jishishan (v1.0: Missed | v2.0: Correctly Ignored)  
- 2025 Myanmar (v1.0: Missed | v2.0: Watch Tier)  
- 2023 Al Haouz (v1.0: Borderline | v2.0: Alert)  
- 2024 Noto Peninsula (v1.0: Uncertain | v2.0: Alert)  
- 2024 Hualien (v1.0: Missed | v2.0: Detected)  
- 2023 Herat (v1.0 & v2.0: Missed due to no data)  
- 2023 Mindanao (v1.0: Missed | v2.0: Detected)

# 6. Summary and Recommendations

The enhanced SR-GEO-PoC v2.0 model significantly improves earthquake detection coverage and reduces false negatives by incorporating multiple modalities, confidence factors, and regional fault logic. While still dependent on sensor infrastructure, it enables proactive detection in previously silent event categories. We recommend regional pilot deployments with full sensor suites and integration into early warning systems.