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Editorial

Statistical Framework for the Evaluation of Earthquake Forecasting

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EDITORIAL

Observational evidence is increasing that several geophysical anomalies occur before major earthquakes. However, the accuracy of these anomalies in earthquake forecasting is debatable, necessitating a more uniform assessment of predicting abilities. Before global earthquakes, a methodology for exploring pre-seismic anomaly identification utilising fundamental statistical indicators is provided. This framework was built using surface temperature (ST) data from the Atmospheric Infrared Sounder (AIRS) sensor. The statistical characteristics of forecasting capacity for three indicators (accuracy, missed detection, and false alarm) were calculated retrospectively and prospectively after seismic-related ST abnormalities were found. There were some aggregation effects in the ST anomalies. Negative anomalies were mostly discovered around epicentres and to the north, while positive anomalies were mostly found on the outskirts; neither was highly influenced by earthquake magnitude. For the period 2010–2018, the temporal evolution of predicting measures remained reasonably constant. 6.01 percent, 1.60 percent, and 92.39 percent, respectively, for accuracy, missed detection, and false alarm rates. The accuracy and missed detection ratios showed some geographic association and peaked in the same location (e.g., eastern Japan); nonetheless, the false alarm ratios were extremely high in most places. According to our findings, using AIRS ST data in conjunction with the Z-score anomaly detection system to predict short-term earthquakes is currently not feasible. The ability to forecast earthquakes using satellite thermal infrared readings is still a big issue. However, the effectiveness of this paradigm for statistically measuring earthquake forecasting abilities was supported by our findings.

The implementation of earthquake forecasting systems to limit the impact of earthquakes would be helpful, especially for countries along tectonic plate boundaries, in light of expanding global growth and urbanisation. Although there have been several successful cases of major earthquake prediction in the intermediate and long range, reliable and consistent short-term earthquake forecasting remains a challenge. Satellite remote sensing techniques potentially offer an effective approach to monitoring pre-seismic processes along active fault zones. Using a variety of anomaly analytical methodologies, many retrospective statistical studies have exploited global earthquakes to uncover statistically significant links between pre-seismic signals and forthcoming earthquakes. There has been much interest in the scientific community regarding the use of geophysical anomalies to forecast earthquakes. This study developed and implemented a statistical framework to assess earthquake forecasting ability; this framework is suitable for use with various geophysical parameters and anomaly detection methods, making consistent and quantitative assessment feasible.ST from AIRS data was critically investigated to analyze the statistical characteristics of global moderate–major earthquake from 2010 to 2018. The ST anomalies showed some aggregation effects around epicenters; negative anomalies were found to be more important than positive anomalies in terms of earthquake recognition.

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