The Case for QuakeFinder®

Earthquakes kill and injure thousands of people every year. The numbers vary wildly depending on how buildings are constructed in the affected regions, but no matter where they strike and how many are killed, the impact is devastating.

Imagine if we knew when one was coming. Many believe that because earthquakes are unpredictable, we will never have the ability to forecast them. Consider other examples of apparent truths that were eventually proved wrong: the earth is the center of the universe; the world is flat; you can't predict the weather.

"We will never forecast the weather" was conventional wisdom just 100 years ago. But as in the other famous examples, a few dedicated people persevered to find the truth because they believed the conventional wisdom to be wrong, and they changed the world.

Weather forecasting became viable when the right instruments were put in the right places and integrated with the right software. It became accurate as scientists gained an understanding of the data captured by those instruments and built that into their forecasting models.

We believe the same will be true for earthquake forecasting. By placing enough instruments in seismically active areas, we will eventually capture enough data to give us a clear understanding of how electromagnetic signals produced by the earth's geological processes relate to impending earthquakes.

We must not allow earthquakes to strike without warning forever. They are simply too costly to ignore the possibility of reliable forecasting. It is hard work figuring out what instruments to use and where to put them, operating the networks, gathering the data, analyzing the signals, and building the forecasting models, and it will take a long time. But it is clearly a job that mankind must undertake.

Today's methods are inadequate. They only suggest where earthquakes are likely over the long term, which helps planning of such things as building codes and construction practices that prevent buildings from collapsing. This certainly saves live, but they provide no actionable information that let people adjust near-term activities.

Several days' warning would allow many effective responses: governments could pre-position emergency supplies and personnel; businesses could alter shipping and manufacturing schedules; families could ensure they have stocks of food, water, and other supplies; individuals could avoid visiting risky places such as old buildings and bridges. Such actions will reduce death, injury, and property loss – just as they do today when warnings of hurricanes and tornadoes are heeded.

Aerospace engineering firm Stellar Solutions provides primary financial support and operates QuakeFinder as its Humanitarian R&D division as part of its community service commitment. The goal is to find a way to forecast earthquakes based on sound scientific practice.

QuakeFinder focuses on magnetic and electronic signals believed to be earthquake precursors. Initially motivated by reports of earthquake lights, radio interference, and animal behavior prior to quakes around the world, the work gained impetus when after the 1989 Loma Prieta quake rocked San Francisco, it was reported that Stanford University researcher Tony Fraser-Smith had found a strong pattern in magnetometer data starting two weeks before the quake.

QuakeFinder has detected indicators in the days preceding major earthquakes in California and in Peru. Similar indicators have been found in laboratory and field experiments. These results have been published in peer-reviewed scientific journals. Designing and deploying increasingly sensitive instruments, and applying ever more types of analysis, QuakeFinder intends to confirm the signature signal pattern by capturing and analyzing more quakes.

The current focus is to expand the network of instruments as rapidly as possible in order to double the pace of earthquake signal capture and analysis. It took 10 years to obtain data for three earthquakes; the team wants to analyze three more within five years in order to confirm – or modify – its understanding of how its observations relate to the subsequent earthquakes. To increase the likelihood of reaching this goal, QuakeFinder intends to install 100 instruments per year for the next five years.

This work requires financial support. Stellar Solutions provides funding to operate the instrument network, data center, and web site on which collected and analyzed data is made available to the public. However, it cannot provide all the money needed to expand the network at the pace described above. Additional funding is most likely to come from private sources; US federal funding is unlikely in the near term.

The government is not actively supporting earthquake forecasting. The United States Geological Survey is the branch of the federal government responsible studying earthquakes; it focuses on seismic activity and movement of the earth's crust. Although these important areas of research give us long-range (decades) hazard awareness and will provide very-short-term (seconds) warning when the ground actually starts to shake, they do not lead to actionable short-term earthquake forecasts.

NASA has provided some support for QuakeFinder and other electromagnetic researchers through its ROSES initiative. And like NASA's approach to future space exploration, earthquake precursor research is a perfect opportunity for private/public partnership.

People and organizations that hope to save the lives of earthquake victims should consider contributing to the cause of earthquake forecasting research. Foundations, companies, and individuals channel millions of dollars to earthquake relief efforts every year. The need for such massive responses can be reduced. QuakeFinder has the team, technology, and backing to continue the quest. **Your support will accelerate the pace.**

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