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EM Earthquake Precursor Detection Associated with Fluid Injection for Hydraulic Fracturing and Tectonic Sources

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Many attempts have been made to determine an earthquake forecasting method and warn the public in turn. Presently, the animal kingdom leads the precursor list alluding to a transmission related source. By applying the animal-based model to an electromagnetic wave model, various hypotheses were formed, but only two seemed to take shape with the most interesting one requiring a magnetometer of a unique design. To date, numerous, high-end magnetometers have been in use in close proximity to fault zones for potential earthquake forecasting; however, results have had wide variability and problems still reside with what exactly is forecastable and the investigative direction of a true precursor.

After a number of custom rock experiments, the two hypotheses were thoroughly tested to correlate the EM wave model. The first hypothesis involved sufficient and continuous electron movement either by surface or penetrative flow, and the second regarded a novel approach to radio wave generation. The second hypothesis resulted best with highly reproducible data, radio wave generation and detection, and worked numerous times with each laboratory test administered. In addition, internally introduced force on a small scale stressed a number of select rock types to emit radio waves well before catastrophic failure, and failure always went to completion. Comparatively, at a larger scale, highly detailed studies were procured to establish legitimate wave guides from potential hypocenters to epicenters and map the results, accordingly.

Field testing in Southern California from 2006 to 2011 and outside the NE Texas town of Timpson in February, 2013 was conducted for detecting similar, laboratory generated, radio wave sources. At the Southern California field sites, signals were detected in numerous directions with varying amplitudes; therefore, a reactive approach was investigated in hopes of detecting possible aftershocks from large, tectonically related M5.0+ earthquakes. At the Timpson, Texas field sites, a proactive detection approach was taken, due to the heavy presence of hydraulic fracturing activity for regional hydrocarbon extraction, which appeared to be causing several rare M4.0+ earthquakes.

As a result, detailed Southern California and Timpson, Texas field studies led to the improved design of two newer, prototype antennae and the first ever earthquake epicenter map. With more antennae and continuous monitoring, more fracture cycles can be established well ahead of the next earthquake. In addition, field data could be ascertained longer by the proper authorities and lead to significantly improved earthquake forecasting. The EM precursor determined by this method appears to surpass all prior precursor claims, and the general public may finally receive long overdue forecasting.