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Identified EM Earthquake Precursors

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Many attempts have been made to determine a sound forecasting method regarding earthquakes 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 (EM) wave model, various hypotheses were formed, but the most interesting one required the use of a magnetometer with a differing design and geometry. To date, numerous, high-end magnetometers have been in use in close proximity to fault zones for potential earthquake forecasting; however, something is still amiss. The problem still resides with what exactly is forecastable and the investigating direction of EM.

After a number of custom rock experiments, two hypotheses were formed which could answer the EM wave model. The first hypothesis concerned a sufficient and continuous electron movement either by surface or penetrative flow, and the second regarded a novel approach to radio transmission. Electron flow along fracture surfaces was determined to be inadequate in creating strong EM fields, because rock has a very high electrical resistance making it a high quality insulator. Penetrative flow could not be corroborated as well, because it was discovered that rock was absorbing and confining electrons to a very thin skin depth. Radio wave transmission and detection worked with every single test administered. This hypothesis was reviewed for propagating, long-wave generation with sufficient amplitude, and the capability of penetrating solid rock. Additionally, fracture spaces, either air or ion-filled, can facilitate this concept from great depths and allow for surficial detection.

A few propagating precursor signals have been detected in the field occurring with associated phases using custom-built loop antennae. Field testing was conducted in Southern California from 2006-2011, and outside the NE Texas town of Timpson in February, 2013. The antennae have mobility and observations were noted for recurrence, duration, and frequency response. At the Southern California field sites, one loop antenna was positioned for omni-directional reception and also detected a strong First Schumann Resonance; however, additional Schumann Resonances were absent. At the Timpson, TX field sites, loop antennae were positioned for directional reception, due to earthquake-induced, hydraulic fracturing activity currently conducted by the oil and gas industry. Two strong signals, one moderately strong signal, and approximately 6-8 weaker signals were detected in the immediate vicinity. The three stronger signals were mapped by a biangulation technique, followed by a triangulation technique for confirmation. This was the first antenna mapping technique ever performed for determining possible earthquake epicenters. Six and a half months later, Timpson experienced two M4 (M4.1 and M4.3) earthquakes on September 2, 2013 followed by a M2.4 earthquake three days later, all occurring at a depth of five kilometers. The Timpson earthquake activity now has a cyclical rate and a forecast was given to the proper authorities.

As a result, the Southern California and Timpson, TX field results led to an improved design and construction of a third prototype antenna. With a loop antenna array, a viable communication system, and continuous monitoring, a full fracture cycle can be established and observed in real-time. In addition, field data could be reviewed quickly for assessment and lead to a much more improved earthquake forecasting capability. The EM precursors determined by this method appear to surpass all prior precursor claims, and the general public will finally receive long overdue forecasting.