Geophysical Research Abstracts, Vol. 7, 02175, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02175

Earthquake Vapor, a reliable precursor

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When rock is stressed by external forces, its weak parts break first and small earthquakes occur. For example, the Southern California earthquake database shows that small shocks happened before and around all large hypocenters there. The fact that a large earthquake produces a large crack suggests that small shocks generate small crevices. Next, groundwater percolates into the crevices. Its expansion, contraction, and chemistry further reduce the cohesion of the rock. The water is heated due to friction, eventually generating vapor at high temperature and pressure. The vapor erupts from an impending hypocenter to the surface through the crevices, rises and cools to condense into a cloud, denoted an earthquake cloud. At the same time the dehydration of the rock near the impending hypocenter rapidly decreases its yield strength, as seen in laboratory experiments. Thus, the same physical mechanism that creates the earthquake cloud triggers the earthquake.

An earthquake cloud is distinguished by its sudden appearance and unusual shape and movement. It comes from an impending hypocenter, so its tail generally points toward or predicts an impending epicenter. The more mass an earthquake cloud has, the bigger the subsequent earthquake. By comparing the magnitudes of previous earthquakes with the mass of their associated earthquake clouds as seen in satellite images, an empirical relationship has been developed for predicting magnitudes. Based on statistics from about 500 events, the longest delay from an earthquake cloud to its earthquake is 103 days, and the average is 30 days, so an earthquake cloud can predict the time. Therefore, an earthquake cloud can predict an earthquake. For example, on Dec.20, 2003, a distinctive cloud suddenly appeared above Bam, Iran, and then stuck there for 24 hours in spite of strong wind before the devastating Bam earthquake on Dec. 26, 2003.

http://quake.exit.com/SHOU.zip

In general, the vapor released at the epicenter does not immediately encounter atmospheric conditions suitable for condensation into a cloud like the Bam cloud, but instead travels a considerable distance before forming a cloud. This severely limits the spatial precision of the prediction. However, in some cases, another related atmospheric phenomenon, denoted geoeruption, occurs directly above the impending epicenter. Geoeruption emerges as a sudden localized atmospheric heating or disappearance of cloud or fog, and the warm region persists despite the presence of wind and other clouds nearby.

By both earthquake clouds and geoeruptions, Author Shou made a set of 50 earthquake predictions to the United States Geological Survey. 68% of them were correct in time, location, and magnitude. The probability of each earthquake occurring within the 3 prediction windows was determined from earthquake databases. Numerical simulation shows that a random guesser has a probability of 0.000062, or a 1 in 16,000 chance, to make a similar set of predictions of the same precision and obtain a success rate of at least 68%. To the authors' knowledge, this is the first method to have generated a large statistically significant set of earthquake predictions.