

# Is it Possible to Spot Earthquakes Before They Strike?

**Stephan Faris, Bloomberg News Service, 1-22-13**

Warner Marzocchi remembers waking up well before dawn on Apr. 6, 2009, because the bed underneath him was trembling. Certain it was his wife having a nightmare, Marzocchi, a researcher at Italy's National Institute of Geophysics and Vulcanology, reached out an arm and fell back asleep. It wasn't until morning, when he saw the messages on his cell phone, that he learned the real cause of the shaking: An earthquake had struck the city of L'Aquila, some 60 miles from his home in Rome.

The powerful tremor killed more than 300 people and left thousands homeless. Last October seven natural disaster experts were convicted on manslaughter charges for having failed to adequately warn the city's residents that a quake was imminent, setting off an international controversy. Marzocchi, like other scientists around the world, has criticized the decision; jailing scientists for giving advice will deter others from using their expertise in the service of public safety, he says. Marzocchi also believes that, when it comes to warning the public about the risk of an earthquake like the one at L'Aquila, there's much that can be improved.

Before the earthquake in L'Aquila, the bulk of scientific research into earthquake prediction focused on calculating the chance that a quake would strike a given region over the span of several years. This provided crucial information for the drafting of building codes and emergency response plans. But it did little for citizens and local officials faced with deciding whether to evacuate their communities. Everybody knew that L'Aquila was at risk of a major quake. Nobody knew how to predict exactly when it would strike.

That's what tripped up the convicted experts. Members of a board called the National Commission for the Forecast and Prevention of Major Risks were called into the city on March 31, 2009, a week before the earthquake. Later, a leaked wiretap of a top government official would show that the meeting was less a scientific mission than an effort to calm residents of the city who were panicked by a series of small tremors and alarmist predictions issued by a local man who was not a scientist.

Given the tools at their disposal, the experts on the board were little-better-equipped than a layman to quantify the risk the city was facing. And so their conclusion—that an earthquake remained unlikely in the near term—was easily used by those looking to reassure the population of L'Aquila that it had nothing to worry about. This message, wrote the case judge in a 946-page ruling released on Jan. 18, had the effect of “producing devastating effects on the precautionary habits traditionally followed by the victims.” Rather than flee their homes as they normally would have done when the ground began to shake, residents in L'Aquila stayed put—with fatal consequences.

But what if the experts had been able to quantify the risk? Marzocchi argues that it could have saved the lives of some of the earthquake's victims—not to mention the careers of his colleagues. On the day after the quake, Marzocchi set aside his other projects and concentrated on a computer model his team had developed to predict the risk of aftershocks. For weeks, he produced colored probability maps, rating the regions around the city according to the chance that they would be struck again. His predictions turned out to be strikingly accurate; the recorded aftershocks largely occurred in the areas where he expected them.

Buoyed by his model's success, Marzocchi turned its calculations back in time by feeding it the data available before the main shock. The residents of L'Aquila had been right to be worried about the series of small tremors they had been feeling. In normal times, according to Marzocchi's model, the chances of a major earthquake striking within the next 100 years were about one in 100,000. In the days immediately following the quake, with the

might not have been predictable. But had the experts possessed analysis such as Marzocchi's, they could have warned the public that the danger had risen. And the residents of L'Aquila could have decided for themselves whether to run or ride out the risk.

The Italian geologist isn't alone in promoting this kind of approach. An international commission, of which Marzocchi was a member, came up with similar recommendations. "In some sense, this was the earthquake's silver lining," says Thomas Jordan, director of the Southern California Earthquake Center and chair of the commission. "It's focused a lot of attention on these issues." In the United States, the U.S. Geological Survey has begun to try to quantify the risk of earthquakes over a 24-hour period. Japan has launched a similar effort.

The projects are all in early stages. Models still need to be further developed, tested, and calibrated. But they do point to a way forward and to a bright spot in the legacy of the disaster in L'Aquila: a public that is more informed, better trusted in making its own decisions, and—ultimately—safer.