With Terra Seismic earthquake prediction, we can be better prepared for earthquakes in Italy

by Oleg Elshin

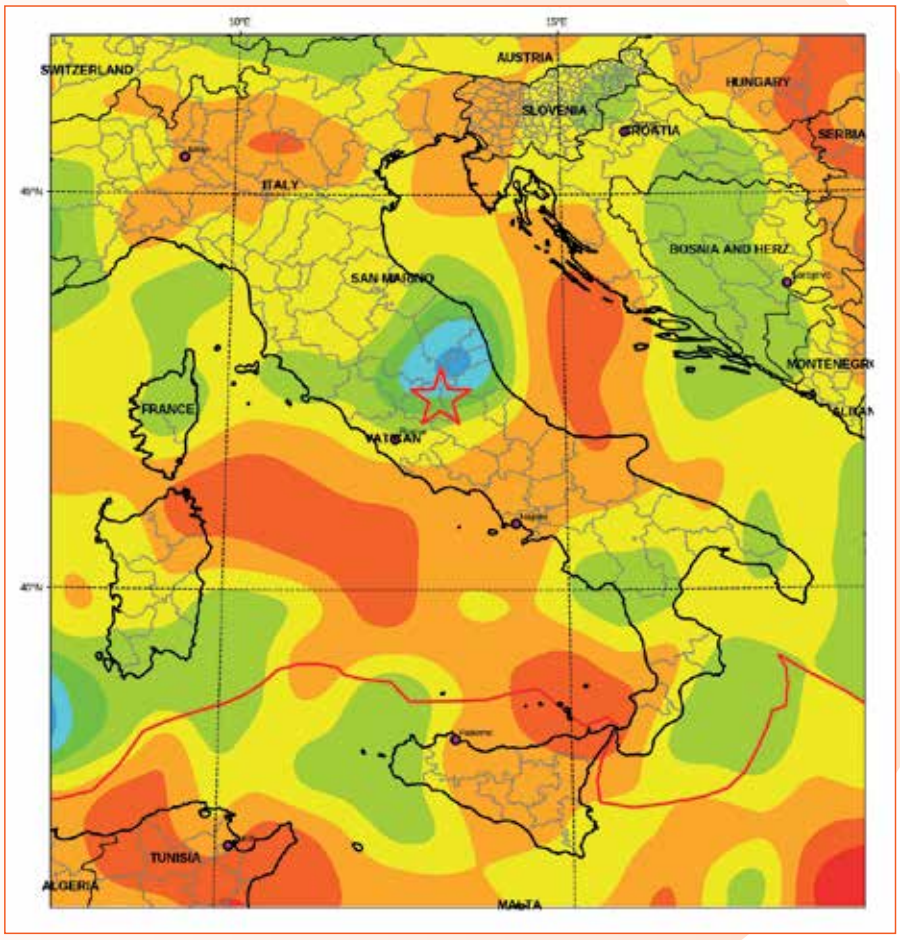

Fig. 1 - Real predictions, stressed areas and anomalies map: the case for L'Aquila earthquake.

Earthquakes have represented a permanent threat to Italy throughout the country's entire history: seismic events have been well known since Roman times. The country also suffered major events in the 20th century. The most tragic was the 1908 M7.1 Messina earthquake and subsequent tsunami that almost completely destroyed the cities of Messina and Reggio Calabria, leaving more than 80,000 victims in its wake. This threat still hangs over the Italian people. Just within the last decade, the 2009 L'Aquila quake, the 2012 Emilia Romagna quakes and the 2016 Central Italy quakes reminded us that we live in a dangerous and seismically active period for Italy.

The traditional response to earthquake-related danger is based on long-term preparation in areas where major earthquakes were historically recorded. These preparations usually include establishing more resilient building standards for new buildings and reinforcing old heritage. Italy is home to a plethora of invaluable historic buildings that are very vulnerable to earthquakes. According to some estimates, only about 25% of Italian buildings are built in accordance with seismic standards and only about 40% of current Italian infrastructure is earthquake proof. Akin to many other seismic regions around the world, insurance is not usually used as a tool to obtain earthquake damage relief in Italy. It's estimated that only about one per cent of Italian buildings are insured against earthquakes (2). Recent events have again clearly demonstrated that the traditional approach provides a little help in preventing human loss, saving historic buildings and mitigating the economic damage produced by earthquakes. For instance, the Italian Civil Protection Agency estimated the economic losses from the 2016 October earthquakes at €16.5 billion. The insured loss was just €208 million, which indicates that only 1.3% of the overall economic loss was insured (3). Thus, Italy remains very vulnerable to

major earthquakes. With this in mind, we need to find new and better solutions to address the danger posed by earthquakes in Italy.
Fortunately, science and technology progresses, and global earthquake prediction, a radically novel technology, has created new and very promising prospects for mitigating earthquake danger in Italy and globally. Terra Seismic, the world's first company of its kind, has successfully developed satellite Big Data technology that can predict most major earthquakes (M6.2+ or greater) at least 2-5 months before they will occur. The technology has been in practical use since 2013.
Terra Seismic's unparalleled technology has been successfully tested against historical data for global and Italian quakes that have occurred in the last 50 years. Backward testing shows that the technology would have successfully detected all major M6+ Italian earthquakes since 1980.
Global earthquake prediction is based on simple and universally understandable assumptions. While earthquakes occur suddenly for humans, these perils are not sudden for nature. Nature needs time to accumulate a huge amount of stress before producing a major earthquake. The area where the future earthquake will hit will be stressed and behave differently from other areas in the vicinity. These areas of abnormal behavior can be detected well in advance and this gives humans a warning period to prepare effectively for forthcoming major earthquakes.
Italians know that earthquakes are a real and permanent danger, but every new event still catches Italy underprepared. With radically new technology and a much better understanding of earthquake build-up processes, what can we do differently now?
Firstly, we now know that seismic danger is distributed unevenly across time and different Italian regions. A specific peculiarity of Italy is that periods of high seismic activity may be interspersed with relatively quiet and prolonged risk-free periods. Italy could establish a special earthquake preparedness and recovery fund, which would accumulate funds during quiet seismic periods and spend money effectively just before major earthquakes.
Secondly, the scarce resources available for preparedness could be more efficiently allocated across Italian regions. While almost all Italian regions are exposed to earthquake risks, funds could be invested mainly in the region that will be affected by a forthcoming major earthquake.

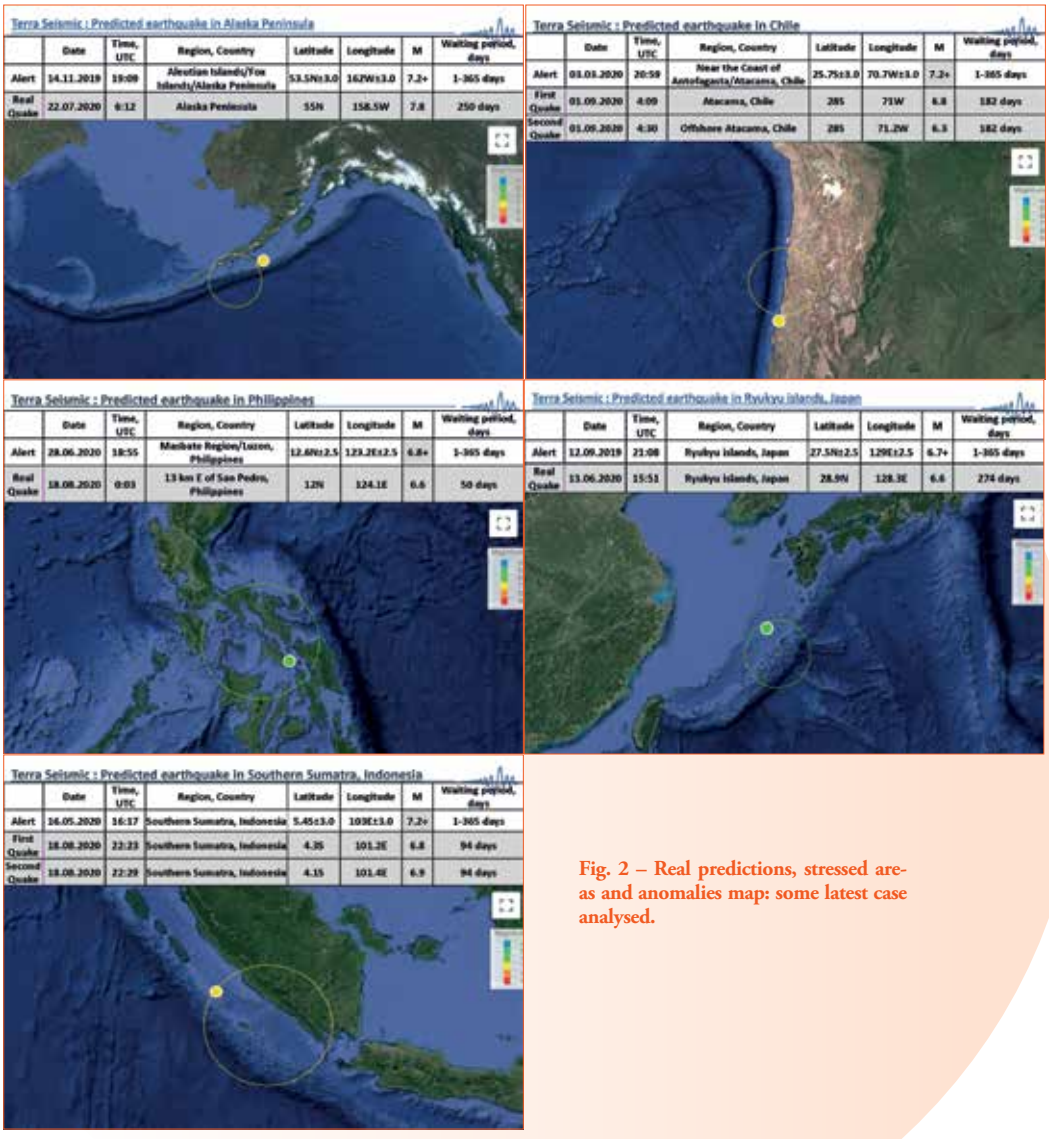

Fig. 2 – Real predictions, stressed areas and anomalies map: some latest case analysed.

Thirdly, we need to carefully reanalyze and draw lessons from past Italian events to predict the potential secondary consequences associated with earthquakes. For example, the 2016 Amatrice quake shows that destroyed and damaged roads and bridges may hinder the prompt arrival of rescue teams and heavy rescue machinery in the damaged area, and so on.

Terra Seismic can predict most major earthquakes (M6.2 or greater) at least 2 - 5 months before they will strike. Global earthquake prediction is based on determinations of the stressed areas that will start to behave abnormally be- fore major earthquakes. The size of the observed stressed areas roughly corresponds to estimates calculated from Dobrovolsky's formula. To identify abnormalities and make predictions, Terra Seismic applies various methodologies, including satellite remote sensing methods and data from ground-based instruments. We currently process terabytes of information daily, and use more than 80 different multiparameter prediction systems. Alerts are issued if the abnormalities are confirmed by at least five different systems. We observed that geophysical patterns of earthquake development and stress accumulation are generally the same for all key seismic regions. Thus, the same earthquake prediction methodologies and systems can be applied successfully worldwide. Our technology has been used to retrospectively test data gathered since 1970 and it successfully detected about 90 percent of all significant quakes over the last 50 years.

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Fourthly, detailed action plans could be developed before major events to address a region's specific characteristics. According to these plans, the government would need to examine and reinforce the critical and important infrastructure in the area of a forthcoming quake – hospitals, schools, cultural heritage buildings, etc. The rational use of millions of euros on effective loss prevention measures before earthquakes hit is estimated to save billions that are usually spent on recovery after earthquakes. Thus, thanks to this approach, billions of euros' worth of economic damage could be prevented in Italian earthquakes and these huge savings allocated to other purposes.
Fifthly, besides government funding, private money and, specifically, insurance companies could play a greater role in preparedness and earthquake risk mitigation. Earthquake insurance penetration is currently very low in Italy. One of the main reasons for this situation is that quake insurance is very expensive due to incorrect quake risk assessment. Earthquake prediction will assess quake risk much more accurately, thus allowing insurers to offer much lower premiums for many Italian regions and make insurance coverage more attractive. Innovation will create conditions for affordable earthquake insurance to penetrate into the Italian market.
Finally, in Italy, building collapses are responsible for most deaths during earthquakes. The death toll would be significantly lower if people were outside and distanced from old buildings when the quake strikes. As such, a timely warning for people to simply sleep and spend more time outside buildings before major earthquakes represents a very cheap and effective solution. Training drills and early warning alarms will be effective at preventing significant human loss due to earthquakes. Based on Terra Seismic's global technology, we can dramatically reduce the human loss arising from these awful perils and better protect Italy. Terra Seismic calls for cooperation with the Italian Central and Regional governments in order to improve preparedness for forthcoming events.

REFERENCES AND FURTHER READINGS

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KEYWORDS

Global earthquake prediction; Big Data and novel technologies; Earthquakes; Remote sensing; Terra Seismic

ABSTRACT

Terra Seismic can predict most major earthquakes (M6.2 or greater) at least 2 - 5 months before they will strike.

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