Mathematics, Physics, and Computer Science Faculty Articles and Research

Science and Technology Faculty Articles and Research

2013

Multi Geophysical Parameters for Earthquake Forecasting

Ramesh P. Singh
Chapman University, rsingh@chapman.edu

Recommended Citation

Singh, R.P., "Multi geophysical parameters for earthquake forecasting." *Current Science*, 2013. 105(12): p. 1657-1657.

Multi Geophysical Parameters for Earthquake Forecasting

Comments

Copyright

Multi geophysical parameters for earthquake forecasting

Bapat[1] has stated that various funding agencies should come forward and support research related to earthquake prediction in order to save the lives of people. Various academic institutions as well as the Geological Survey of India have carried out field measurements in Assam over a long period and found changes in several geophysical parameters in the wake of prediction of major earthquakes of magnitude greater than 8.0. We are lucky that such a major earthquake has not occurred so far; whether it will occur in the future is difficult to predict. Similar to India, California, along the San Andreas Fault, is another vulnerable region where a major earthquake, after 1906, has been anticipated.

The US and several countries have spent millions of dollars on earthquake prediction research. While some scientists strongly believe that earthquakes cannot be predicted, some believe otherwise. The subject of earthquake prediction is debated, with little funding available in the US for research. However, scientists from several countries, including India are making efforts to find a reliable precursor for an impending earthquake.

Earthquake is a complex process as the Earth's structure is complex; subsurface configuration and inhomogeneities differ from location to location. Understanding of earthquake process is a complex system of systems. Furthermore, earthquakes can occur in the ocean, land and coastal regions, and such complex environments make the understanding of earthquake process more challenging.

In the last few decades, several efforts have been made to study the complexity of the Earth and various parameters from the epicentral regions using ground, meteorological stations and satellite observations. All these observations have strong coupling among land–ocean–atmosphere–ionosphere associated with earthquakes[2-4]. Scientists have found that some parameters change prior to earthquakes. Though thousands of research papers have been published on the subject matter, they lack long term analysis of data and detailed statistical analysis. It is clear that earthquake process may impact the atmosphere, ionosphere and ground parameters, but the question is whether we can integrate all these parameters and predict an impending earthquake. All these parameters from land surface, *in situ*, emission of greenhouse gases, meteorological and ionospheric, must show complementary behaviour if they are associated with earthquakes.

Earthquake prediction research based on a single parameter should be discouraged; an integrated approach to combine all the parameters is a welcome proposition. The Ministry of Earth Sciences, Government of India has established few multi parametric geophysical observatories[5] in the seismic-prone areas. All the measured parameters should be examined and if complementary behaviour of the parameters is found, confidence can be gained about an impending earthquake.

It is important to know the highly seismic-prone areas so that people living there become aware of the earthquake risk and follow seismic codes to design buildings, like in Japan, which are not affected by major earthquakes. Thousands of people were killed and buildings were damaged during the following major earthquakes (magnitudes greater than 6 and 7) – Bihar–Nepal earthquake (1988), Uttarkashi (1991), Latur (1993), Jabalpur (1997), Chamoli (1999) and Bhuj (2001) in India.

As stated by Bapat[1], if we want to save lives and property, we must try to teach the population at large that earthquakes are bound to occur and it is 'impossible' to avoid earthquake. At the same time we can take lesson from the Japanese and follow proper seismic codes to design buildings in the seismic-prone regions. Such practice can save lives and property associated with an earthquake.

1. Bapat, A. V., *Curr. Sci.*, 2013, **105**, 1035–1036.
2. Singh, R. P. *et al.*, *Int. J. Remote Sensing*, 2010, **31**, 3341–3354.
3. Singh, R. P. *et al.*, *NHESS*, 2010, **10**, 1299–1305.
4. Singh, R. P. *et al.*, *Int. J. Remote Sensing*, 2007, **28**, 2885–2896.
5. Verma, M. and Bansal, B. K., *Asian Earth Sci.*, 2012, **54–55**, 1–8.

RAMESH P. SINGH

School of Earth and Environmental Sciences,
Schmid College of Science and Technology,
Chapman University,
One University Drive,
Orange, CA 92866, USA
e-mail: rsingh@chapman.edu