



Patterns of significant seismic quiescence in the Pacific Mexican coast

Alejandro Muñoz-Diosdado (1), Adolfo Rudolf-Navarro (2), Amilcar Barrera-Ferrer (1), and Fernando Angulo-Brown (2)

(1) UPIBI-IPN, Mexico, (2) ESFM-IPN, Mexico

Mexico is one of the countries with higher seismicity. During the 20th century, 8% of all the earthquakes in the world of magnitude greater than or equal to 7.0 have taken place in Mexico. On average, an earthquake of magnitude greater than or equal to 7.0 occurred in Mexico every two and a half years. Great earthquakes in Mexico have their epicenters in the Pacific Coast in which some seismic gaps have been identified; for example, there is a mature gap in the Guerrero State Coast, which potentially can produce an earthquake of magnitude 8.2. With the purpose of making some prognosis, some researchers study the statistical behavior of certain physical parameters that could be related with the process of accumulation of stress in the Earth crust. Other researchers study seismic catalogs trying to find seismicity patterns that are manifested before the occurrence of great earthquakes. Many authors have proposed that the study of seismicity rates is an appropriate technique for evaluating how close a seismic gap may be to rupture.

We designed an algorithm for identification of patterns of significant seismic quiescence by using the definition of seismic quiescence proposed by Schreider (1990). This algorithm shows the area of quiescence where an earthquake of great magnitude will probably occur. We apply our algorithm to the earthquake catalogue of the Mexican Pacific coast located between 14 and 21 degrees of North latitude and 94 and 106 degrees West longitude; with depths less or equal to 60 km and magnitude greater or equal to 4.2, which occurred from September, 1965 until December, 2014. We have found significant patterns of seismic quietude before the earthquakes of Oaxaca (November 1978, $M_w = 7.8$), Petatlán (March 1979, $M_w = 7.6$), Michoacán (September 1985, $M_w = 8.0$, and $M_w = 7.6$) and Colima (October 1995, $M_w = 8.0$). Fortunately, in this century have not occurred earthquakes of great magnitude in Mexico, however, we have identified well-defined seismic quiescence in the Guerrero seismic-gap, which are apparently correlated with the occurrence of silent earthquakes in 2002, 2006 and 2011 recently discovered by GPS technology. In fact, a possible silent earthquake with $M_w = 7.6$ occurred at this gap in 2002 which lasted for approximately 4 months and was detected by continuous GPS receivers located over an area of $\sim 550 \times 250$ square kilometers.