Long-term seismic quiescence before the 2010 M_w8.8 Chile earthquake and the 2001 M_w8.4 Peru earthquake

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An earthquake catalog created by International Seismological Center (ISC) was analyzed in the study area, 65°W to 80°W, 10°S to 60°S, between 1 January 1964 and 31 December 2009, including 1062 earthquakes shallower than 60 km with the body wave magnitude of 5.0 or larger. Clustered events such as earthquake swarms and aftershocks were removed from the ISC catalog by using a stochastic declustering method developed by Zhuang et al. (2002). A detailed analysis of the earthquake catalog using a gridding technique (ZMAP) shows that the seismic quiescence areas are found in and around the focal area of the 2010 M_w8.8 Chile and the 2001 M_w8.4 Peru earthquakes. The seismic quiescence area for the 2010 Chile earthquake is a circle centered at (36.7°S, 73.1°W) with a radius of 144 km. The seismicity rates in this area are 1.1 events/year between 1964.0 and 1990.4, 0.19 events/year between 1990.4 and 2004.3, and 0.83 events/year between 2004.3 and 2010.0. The seismic quiescence area for the 2001 Peru earthquake is a circle centered at (17.7°S, 72.1°W) with a radius of 113 km. The seismicity rates in this area are 0.76 events/year between 1964.0 and 1990.4 and 0.0 events/year between 1990.4 and 2000.5. In the case of the Chile earthquake the seismic quiescence ended six years before the main shock on 27 February 2010. On the other hand, in the case of the Peru earthquake the seismic quiescence ended at the almost same time as occurrence of the main shock on 23 June 2001.

Keywords: seismic quiescence, ZMAP, the 2011 Chile earthquake, the 2001 Peru earthquake

