Historical Earthquake Pattern before Wenchuan M8 Earthquake

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The spatio-temporal evolution characteristics of seismic activity before Wenchuan M8 earthquake in 2008 are studied. (1) The Wenchuan earthquake occurred in Longmenshan overthrust fault zone. There was no $M \ge 7.0$ earthquakes occurred and only five earthquakes with $M \ge 6.0$, the maximal one is M6.5 on 21, April 1654 in Wenchuan. While the seismic activity of the neighboring Minjiang fault zone is outstanding and there are four earthquakes with $M \ge 7.0$ occurred in it. (2) A background seismic gap with $M \ge 5.0$ earthquakes formed in Longmenshan seismic belt 38 years before Wenchuan earthquake. A seismogenic gap of $M \ge 4.0$ shocks with 400km long and in NE direction striking formed in the same area 6.5 years prior to the Wenchuan earthquake. It is noticed that some particular earthquakes with M4 in the two ends of the seismogenic gap one year before, which cause the seismogenic gap narrowed. (3) The quietude of $M \ge 7.0$ earthquakes in the North-South seismic zone has lasted twelve years since the 1996 M7.0 Lijiang event and a new active period will begin. Historical earthquake activity indicates that the magnitude of earthquakes at the beginning of the active periods is relative large. Another feature of earthquakes with $M \ge 7.0$ in this region is the migration from south to north in space distribution. The occurrence of the Wenchuan earthquake, being in full compliance with the time-spatial characteristics of historical earthquakes, has started a new active period. (4) The seismicity level in the western China and its adjacent regions was obviously higher in the first 50 years of the 20th century and the level is lower from the 1960s to the 1990s. The level became high again in the 21th century, and 3 large earthquakes above M7.8 occurred in succession before Wenchuan M8.0 Earthquake. This shows that this region is in an active stage of strong earthquakes. While during the same time the seismic activity level of Chinese mainland gets lower and lower. The 6.5-year long quietude of $M \ge 7.0$ earthquakes, the 756-day long quietude of $M \ge 6.0$ shocks and the 172-day long quiescence of $M \ge 5.0$ events appear one after the other.

Keywords: Wenchuan Earthquake; Seismicity Pattern; Earthquake Forecast.

References

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