Seismicity changes before the 1999 Chi-Chi Mw7.6 and 2003 Chengkung Mw6.8 earthquakes

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The Chi-Chi, Taiwan earthquake of September 20th, 1999 was preceded by a notable decrease of the regional seismicity rate. The anomalous period started from January 1999, lasted about 9 months up to the occurrence of the mainshock as revealed from analyzing the Taiwan catalog data from 1994/01/01 to 1999/09/20. Our results indicate that the mean seismicity rate is 435 events per month with a standard deviation of 78 events for earthquakes with magnitude above 2.0. During the anomalous period, seismicity rates fell outside the range of one standard deviation with a mean value of 314 events per month. There was also a consistent trend of decreasing of regional b-value as well as notable increases of seismic activity in areas surrounding the Chi-Chi earthquake source region via the standard normal deviate Z-value analysis (Wu and Chiao, 2006; Wu and Chen, 2007). The Z-value and b-value also have calculated to investigate the variations in seismicity pattern in the Taiwan region before the 2003 Chengkung earthquake. Based on the map of Z-values, Mogi-donut-like variations in seismicity had been identified around the Chengkung earthquake rupture region. Notable decreases in b-values had been also found around the mainshock region before the Chengkung event. According to relatively low seismicity and decreases in b-values, the precursory phenomena associated with quiescence in overall seismicity and activation of moderate-sized events very likely occurred around the mainshock region before the Chengkung earthquake.

References

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