

## Temporal change of b-value revealed by a graph of cumulative magnitude vs cumulative number of events

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Temporal b-value changes are revealed prior to three recent large Japanese earthquakes: The M6.2 Northern Miyagi earthquake of 2003, the M7.3 Western Tottori earthquake of 2000, and the M6.8 Fukushima-Oki earthquake of 2003. A temporal change of b value of the Gutenberg-Richter's law can be studied in detail by using a graph of cumulative magnitude vs cumulative number because the slope of this plot gives the most likelihood estimate of b value. We already have pointed out a decrease of b value prior to the M6.2 Northern Miyagi earthquake which occurred on July 26, 2003. We divided the five years prior to the earthquake into the last one year and the preceding four years and concluded that the b-value in the last year is low. However, more detailed change became clear this time. It seems that the b value is decreasing immediately before the Northern Miyagi earthquake. However, in the longer time scale, the increase of b value for four years prior to the last one year appears to be unusually high. The earthquake occurred when b-value recovered to the normal value.

Next, the source region of the M7.3 Western Tottori earthquake of October 6, 2000 is investigated. Several sequences of earthquake swarm took place before the main shock in 2000 and the b-value was reported as low (Shibutani et al., 2002). In this study, we further studied the swarm of 1997 and found that the swarm can be separate into a few stages in time according to b-value.

Furthermore, the rupture area of the M6.8 Fukushima-Oki earthquake which occurred on October 31, 2003 was studied. We found that b value is low between half and two-year and half and one

year before the M6.8 event. However, in this time period, the occurrence rate of earthquakes whose magnitude is larger than or equal to 2.5 did not change.

