



## A study of $b$ -value precursors applied to the Andaman-Sumatra region

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The temporal and spatial frequency-magnitude distribution (FMD) of earthquakes in the Andaman-Sumatra region is analyzed. Four earthquake catalogs have been used namely the ISC, NEIC, IDC and HRVD catalogs comprising between 1,107 and 13,672 events. Reported earthquake data during period 1/1/1995 to 26/12/2004 are divided into two consecutive five-year periods, 1995-1999 and 2000-2004 for the analysis. Results of the investigation from each catalog are comparable. Temporal variations of  $b$ -values,  $b(t)$ , are investigated using sliding time windows containing 50 events with 5 event shifts at a time. The results reveal that large earthquakes occur when  $b$  decreases by more than  $\sim 0.3$ - $1.0$ , suggesting that variation of  $b$  can be used as a medium-term (months-years) earthquake precursor. Spatial variations of  $b$ -values in the region are mapped by estimating the  $b$ -value at every  $0.5^\circ \times 0.5^\circ$  grid node using the nearest 50 events. Mapping of  $b$  provides information about the state of stress of the region, i.e. major  $b$ -value anomalies (low  $b$ ) indicate epicentral areas of large earthquakes. During the studied period, large earthquakes occurred in areas of low value of  $b$  ( $b \sim 0.5$ - $1.1$ ). On the other hand, no large earthquakes were observed in high  $b$ -value ( $b \sim 1.2$ - $2.2$ ) areas. Areas of major anomalies are found at latitude  $0^\circ$ - $15^\circ$ N, i.e. north of the two giants shocks  $M_w=9$  and  $M_w=8.7$ , at  $4^\circ$ S- $2^\circ$ S and at  $5^\circ$ S- $7^\circ$ S or around and southeast of the  $M_w=8.7$  epicenter areas. Aftershocks of the  $M_w=9$ , December 26, 2004 and the  $M_w=8.7$ , March 28, 2005 events are also studied. Overall  $b$ -values of the aftershock series follow the G-R relation and are higher than overall  $b$ -values before the first mainshock by 0.12 for IDC and NEIC and by 0.14 for HRVD data.  $b$ -values in the epicentral areas increase after the two mainshocks, suggesting that changes of  $b(t)$  can also be used as a short-term (days-months) earthquake

precursor for aftershock sequences.