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Spatial Distribution of the Gutenberg-Richter Parameters and Fractal Dimension and Their Correlations in Northeast India and its Vicinity

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Abstract

The study aims to estimate the Gutenberg-Richter parameters (*a* and *b*) and fractal dimension (*Dc*) using the maximum likelihood estimation (MLE) method in 18 shallow (≤70 km) and 5 intermediate (>70 km) depth seismic zones in northeast India and its vicinity. Scaling relations have been developed among the estimated hazard parameters. A unified and comprehensive earthquake catalogue spanning the period from 1897 to 2016 is used for the purpose. The regions associated with the low *b*-value and high *Dc*-value have been considered the utmost potential regions for the incidence of big events in the examined area. The *b*-values in the examined region vary from 0.59 to 1.31 in shallow zones and from 0.88 to 0.98 in intermediate zones. Similarly, the *Dc*-values vary from 1.81 to 2.65 in shallow zones and 2.22 to 2.71 in intermediate zones. The low *b*-values (less than 0.9) and the high *Dc*-values (greater than 2.0) are related to shallow zones 3 (Arunachal Himalaya), 6 (Eastern Himalayan syntaxis), 13 (Burmese region), 17 (south of Shillong Plateau), and all intermediate zones in Indo-Burmese regions. This makes these zones the most vulnerable to high earthquake hazards. The associations between *Dc* and *b*, and *Dc* and *a/b* illustrate a positive and negative correlation, respectively. The spatial variations of these parameters can be used as important parameters of earthquake hazard levels in the region.

Keywords: *b*-value, Fractal dimension, Earthquake hazard, Northeast India