

Temporal Variation and Statistical Assessment of b value

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The Gutenberg-Richter Law describes frequency-magnitude distribution of earthquakes. A number of studies have shown that the slope (b value) of the relationship between frequency and magnitude decreased before large earthquakes. In this paper, we investigate the temporal variation of the b value in the Hokkaido and Tohoku regions, Japan and the Wenchuan region, China, respectively, where M 8.0+ earthquakes occurred in the new century. The magnitude of completeness (M_c) in the catalog is evaluated by combining the maximum curvature (MAXC) technique and the bootstrap approach. Then, the b value and its uncertainty is computed by using the maximum likelihood estimation. The Akaike Information Criterion (AIC) with the bootstrap approach is introduced to statistically assess the temporal variation of b values and quantify the significance level. The results show decrease trends of the b value prior to the 2003 Tokachi Earthquake (M8.0) in Hokkaido, the 2011 Tohoku Earthquake (M9.0), and the 2008 Wenchuan Earthquake in China. In addition, the decrease of b values shows certain statistical significance few months before the three M8.0+ great earthquakes. It is concluded that the b value with statistical assessment may contain potential information for future large earthquake preparation.

Keywords: b-value, AIC