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Forecast seismicty rate based on the rate and state friction law for northeast region of India

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The main goal of this work is to compute the probability occurrence of future large earthquakes in the Northeastern region of India. For this purpose, we have adopted the methodology based on the rate-and-state friction law for forecasting the seismicity rate changes for MW $\geq$ 5.0 during the period 2009-2013 by utilizing the homogenous earthquake catalogue (MW $\geq$ 4.0), covering the period 1963-2008. In this model, the principal component is the Coulomb stress changes (deltaCFF) associated with the earthquake ruptured from the receiver's fault. The reason behind considering the Coulomb stress changes lies in the fact that the seismicity rate increases where the stress increase and decrease where the stress decreases. Here, we observed that high deltaCFF values are found widespread along the Indo-Burman range. Moreover, highest b-value is observed near or to the Indo-Burman range (zone 7, 8) and the adjoining regions of Sikkim Himalaya (zone-1) with an average value equal to 0.93. However, the highest background seismicity rate is also obtained in the zone 1, 7 and 8 with values ranging from 0 to 4.0. Finally, we have considered the consecutive fault parameter (A*sigma=0.04 MPa) for computing the forecast model with variable deltaCFF and heterogeneous b-value. So, the combination of this coulomb stress changes with other constituent parameters (b-value, background seismicity rate, deltaCFF, stressing rate, aftershock duration), this model captures the forecast seismicity rate during the period 2009-2013. Then, the statistical test known as (Statistical-Test) have been explored to check the consistency between the spatial distributions of observed earthquakes and forecast seismicity rates. The result from the observed log-likelihood and the simulated log-likelihood confirms that the distribution of observed earthquakes matches well with the forecast seismicity rates, thereby showing the reliability and skillfulness of our model.