International Journal of Applied and
Natural Sciences (IJANS)
ISSN (P): 2319-4014; ISSN (E): 2319-4022
Vol. 6, Issue 5, Aug – Sep 2017; 31-44

International Academy of Science,
Engineering and Technology
Connecting Researchers; Nurturing Innovations

EARTHQUAKE PROBABILITIES IN THE KUMAUN-GARHWAL HIMALAYA FROM STOCHASTIC MODELING OF MODERATE-TO-LARGE SEISMIC EVENTS

S. PASARI[1] & S. K. ARORA[2]

[1]Birla Institute of Technology and Science, Pilani, Rajasthan, India

[2]Ex-Head, Seismology Division, Bhabha Atomic Research Centre, Mumbai, Maharashtra, India

ABSTRACT

Empirical statistical modeling of earthquake interevent time-gaps has over the years generated enormous interest to geoscientists and other professionals, for a variety of applications relating to mitigation of earthquake risk. In this study, we estimate probabilities of earthquake recurrence in the Kumaun-Garhwal region of the central Himalayan belt, using a set of internationally catalogued 44 moderate-to-large $(5 \le m_b \le 6.3)$ independent earthquakes, that occurred there during a period of 60 years (1958-2017). We subjected the interevent time intervals of these earthquakes to detailed stochastic processing, to examine the efficacy of each of the four different probability distribution models, viz. exponential, gamma, lognormal and Weibull, and found that, the lognormal model best represents the observed data in this case. The statistical inferences drawn are based essentially on two goodness-of-fit tests: (i) Maximum Likelihood Estimation (MLE) with an improvement over the Akaike Information Criterion (AIC) and (ii) the non-parametric Kolmogorov-Smirnov (K-S) test. In addition, the surrogate Fisher Information Matrix (FIM) approach is utilized for uncertainty estimation. As a measure of seismic hazard, we determined the earthquake potential in the study region, in terms of conditional probabilities of future earthquakes, for varying elapsed times of assumed seismic quiescence, since the last event detected on 06 February 2017 at the time-complete catalog.

KEYWORDS: Earthquake, Kumaun-Garhwal Himalaya, Probability