Geophysical Research Abstracts, Vol. 7, 02477, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02477

Earthquake waiting times: Theory and comparison with results from Virtual California simulations

Rundle, J.B (1)., Rundle, P.B.(2), and Shcherbakov, R (3), and DL Turcotte (4)

(1) Center for Computational Science and Engineering, University of California, Davis, CA 95616, USA (jbrundle@ucdavis.edu / Fax: 530-754-4885); (2) Department of Physics, Harvey Mudd College, Claremont, CA 91711, USA (paul_rundle@hmc.edu); (3) Center for Computational Science and Engineering, University of California, Davis, CA 95616, USA (roshch@cse.ucdavis.edu); (4) Department of Geology, University of California, Davis, CA 95616, USA (turcotte@ucdavis.edu)

Earthquakes on a specified fault (or fault segment) with magnitudes greater than a specified values have a statistical distribution of interval times. The mean interval time can be related to the rate of strain accumulation and the strength of the fault. But the distribution of interval times is related to interactions with other faults. Very few faults have a recorded history of earthquakes that well define a distribution. For hazard assessment, a statistical distribution of interval times is generally assumed along with parameter values. In Japan the distribution of choice has been the Weibull (stretched exponential) distribution. In the United States the log-normal distribution and the Brownian passage time (inverse Gaussian) distribution are more often used. The distribution of earthquake waiting times is the conditional probability that an earthquake will occur at a time in the future if it has not occurred for a specified time in the past. The distribution of waiting times is very sensitive to the distribution of intervals. An exponential distribution of intervals is Poissonian so there is no memory of the last event. The distribution of intervals must be thinner than exponential if the mean waiting time is to decrease as the time since the last earthquake increases. Neither the log-normal or the Brownian passage time distribution satisfy this requirement. We use the "Virtual California" model for earthquake occurrence on the San Francisco San Andreas fault system to produce a synthetic distribution of earthquake intervals on various faults. We find that the synthetic data is well represented by Weibull distributions. We also show that Weibull distribution follows from both damage mechanics and statistical physics approaches.