

## **A Simple Cascade Model based on the Gutenberg Richter Magnitude Frequency Distribution**

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An important unanswered question about earthquake nucleation is whether foreshocks are different from other earthquakes. This question will no doubt bear on the possibility of earthquake prediction in the future. Two main models have been proposed for foreshock occurrence; in this study we test the cascade model incorporating the Gutenberg-Richter magnitude frequency distribution. We create unique foreshock sequences based on the sizes of the sequences found in a previous study, Schaff et al. (2010). We then compare the results of two model simulations on the unique sequences - mainshock magnitude vs maximum foreshock magnitude, and mainshock magnitude vs percent of mainshocks with foreshocks greater than magnitude 4 - with the empirical data from the previous study. After averaging 1000 simulations, the mainshock magnitude vs maximum foreshock magnitude comparison shows that the model has a low probability of generating the empirical data. However, after averaging 1000 simulations for the mainshock magnitude vs percent of mainshocks with foreshocks greater than magnitude 4 comparison, we found a similar upwards trend in the model and empirical data for relatively low magnitude earthquakes (magnitude 4 – 4.5). Above this threshold, the model shows lower values than the empirical data for percent mainshocks with foreshocks greater than magnitude 4. This may indicate that foreshocks display cascade behavior below a certain threshold and some other behavior – perhaps preslip behavior – above that threshold.