A New Approach to Gutenburg-Richter Scaling

The Gutenburg-Richter(GR) scaling law has been one of the fundamental pillars on which our current understanding of earthquakes has been built. The GR scaling law states that number of earthquakes with moment m, N_m is given by

$$N_m \propto \left(\frac{1}{m}\right)^{\frac{2}{3}b}$$

where the "b" value is of order 1. This power law structure stimulated researchers in both the geophysics and physics communities to construct simple models of earthquake faults and fault systems to try to understand what was responsible for the scaling. This has led to proposals of the scaling being associated with self organized critical points, regular critical points and spinodals. However, the proposed models are best understood as describing single faults and individual faults often do not exhibit GR scaling which is best seen in fault systems. In addition different fault systems exhibit different b values. In this talk I will introduce a new approach to GR scaling, also employing simple models, that relates GR scaling to a spinodal critical point modified by the effect of damage. I will introduce the models, discuss spinodal critical points, how they are modified by the presence of damage and how fault system scaling can arise from a set of faults that may not all exhibit GR scaling.