Geophysical Research Abstracts, Vol. 8, 01824, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01824

Basic properties of a three-dimensional spring-block model with long-range stress transfer

F. Jansen

Institute of Geology, Department of Geodynamics, University of Bonn, Germany

Spring-block models have been very useful for understanding slip-complexity of earthquakes. So far, however, they have been restricted to one or two dimensions or simple nearest-neighbor stress transfer. Here, we set up a three-dimensional spring-block model with long-range stress transfer and, in a second step, implement several simplifications to realize a considerable gain in computational efficiency. Qualitatively, the two versions do not differ and we use the fast version to investigate basic properties of the model and to compare to the *Olami Feder Christensen* (OFC) model.

The spatial distribution of hypocenters is found to be scale free. At the end of a simulation of 10^7 events, it takes a value of $D_2 \approx 1.8 \pm 0.1$. At this point, however, the spatial slip organization is not stationary yet and the fractal dimension still grows slightly. This does not affect respective frequency size statistics, though, which exhibit a clear power law with a characteristic cutoff that depends on the grid size. The statistics appear smoother than in the OFC model and lack the kink between events of size one and two. In addition, strong periodicities of large events as in the OFC model do not occur in our model. In stark contrast to the OFC model, results remain the same if periodic boundaries are used. Another significant difference is the stableness of results against imposed disorder. Contrary to the OFC model, results do not change if threshold values are randomly distributed in an interval of $\pm 10\%$ around the mean value. Concluding, the model that we propose shares the main properties of the OFC model, but outreaches the latter in being stable in a larger set of configurations.