Geophysical Research Abstracts, Vol. 9, 02420, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02420

Dynamic network model and anomalous diffusion of hypocenters in cuba: anomalous behavior

Oscar Sotolongo-Costa (1,2) , R. Gamez (1,2), A. Posadas (2,3,4).

(1) Departamento de Física Teórica. Universidad de la Habana. Cuba.

(2) Cátedra de Sistemas Complejos "Henri Poincaré", Facultad de Física, Universidad de la Habana, Cuba.

(3) Departamento de Física Aplicada. Universidad de Almería. Spain.

(4) Instituto Andaluz de Geofísica. Granada. Spain.

When an earthquake occurs, the surrounding Earth volume is subject to a sudden change in dynamic stress associated with the passage of seismic waves and in static elastic stress, with a spatial distribution whose amplitude decays with distance. These stress changes may then induce further earthquakes, either in the form of smaller aftershocks in the immediate vicinity of the main shock (i.e., at a distance of around one source dimension), or in the form of long-range triggered events (several source dimensions). The main physical theory for the occurrence of anomalous transport is the Continuous Time Random Walk, which generalizes the standard Random Walk theory for homogeneous diffusion in two main senses. First, the time step between individual steps can occur at any time, not just at discrete and equal time intervals and, second, that the step length is not constant, but sampled from a power law distribution. In this sense the transport properties are akin to a Lévy flight as we shown before. In this paper we will use the Fokker Planck equation (FPE) to describe the anomalous diffusion of hypocenters in Cuba. The FPE equation was first obtained by Fokker in 1914 and Planck in 1917. Kolmogorov in 1938 derived a kinetic equation using a special scheme and conditions that are important for understanding some basic principles of kinetics. With the dynamic network model proposed by Baiesi-Paczusky, some earthquake catalogs are organized as subgroups formed by a mainshock and its aftershocks. This way, the diffusive behavior of earthquake aftershocks was determined for Cuba from 1964 to 2000. It is shown that an anomalous subdiffusion directed to the center occurs

with an exponent $\alpha = 0.24$. The probability distribution of epicentres corresponds with the solution of the fractional Fokker Planck equation.