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The earthquakes network: retrieving the empirical seismological laws

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Abstract

Here we try to show that the main statistical features of earthquake phenomena in any region can be retrieved from the associated earthquakes network. In the first attempt we draw out the Gutenberg-Richter law from the Abe-Suzuki model for the earthquakes network and the Omori law from the Telesca-Lovallo network model. Then we introduce a hybrid model for constructing the earthquakes network and extract both laws simultaneously from the same network model. Moreover, we obtain some other laws in terms of the network characteristics which have no counterparts among the standard seismological laws.

Keywords: Earthquakes Network, Statistical Property, seismological laws, q-exponential

1. Introduction

Recently the complex network theory appeared as a suitable tool for studying complex phenomena [1]. Earthquake is complex spatio-temporal phenomenon which suddenly occurs due to the movement of faults in the Earth's crust. It is so hard to consider all factors affecting the movement of faults and put them into a compact mathematical equation in order to describe the earthquake phenomenon. In complex network theory, we don't need to know details of the faults system. By knowing only about the magnitude, time of occurrence

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