MULTIFRACTAL ANALYSIS OF SEISMOGENIC DECOMPOSED LINEAMENTS IN NORTH AND NORTH-WEST OF TEHRAN

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ABSTRACT

According to geophysical assessments, Structural lineaments are usually decomposed and made a hidden complex pattern for seismic interpretations in the northern seismic region of Tehran. Fractal geometries provide a chaos-based method for resolving geometrical, mechanical, and mathematical ambiguities of seismic ruptures. While the faulted regions simply assumed as planar zones, the macroscopic structures show smoothened fabrics with self-similar segmentations. In a fractal framework, structures are irregular with discrete features incline to heterogeneous characteristics on various scales. Most of destructive earthquakes have pre-seismic evidences of which frequently triggers subject to deterministic chaos. Multi-fractal analysis of geophysical databases is a nonlinear statistical solution for revealing hidden decomposed lineaments as the relevant structures producing pre-seismic activities. Several cases for studying north Tehran faulted regions have been performed since 1965, but it is theoretically updated in this research by discriminating coherent structures as a deep but relevant to seismicities from other lineaments (incoherent). The available geo-databases including geological features and attributes (table data) have been processed by Arc-GIS for producing magnetic and gravimetric gridded maps of which contours indicated to paternal gradient of the hidden lineaments (coherent seismic structures) in coincidence with earthquake catalogues and active faulting zonation according to seismotectonics investigations. A minimal set of geophysical databases including seismic, aeromagnetic and airborne gravimetric are needed for reducing decomposition effects of the lineaments. It is widely accepted that spatial disordering of geophysical gradients may be affected by the ruptures. Like a case in northern region of Tehran, both magnetic and gravimetric gradients uses for revealing nonlinear features at the end members of seismogenic lineaments.

INTRODUCTION

Most of the earthquakes have severe long term processes in a continuum solid states assumption before responding to triggering movements near hypocenters (Datta, 2005). In Fractal, there is a major competent framework in association with mathematical nature of faulted regions (Mandelbrot, 2006). Faults are not regular planar Euclid zones and never extended in a continuum solid state (Turcotte, 2007). Also there is no focuses on granular aspects of faulted structures of which faulted zones are discrete and strongly behave heterogeneously (Kagan, 1994, Newman et al., 2005). In this framework the fundamental structures are irregular with significant discrete features, which have strongly heterogeneous characteristics in various scales. The fractal structures follow a power law frequency-size distribution which is reported to characterize important brittle deformation in the crust over several bands of length scales. This research focused on nonlinear processes with an optimized geophysical database for multi-fractal frequency modeling the structures in north of Tehran. Processes involve two types of power law relationships which realized number of decomposed lineaments related to Tehran seismicity. The city is located in active region near central