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

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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 (Turcotte, 2007). While the faulted regions simply assumed as planar zones, the macroscopic structures show smoothened fabrics with self-similar segmentations (Datta, 2005; Newman et al., 2007). 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 (recursive function).

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 (Ashtari et al., 2005), 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 (Berberian and Yeats, 1999).

A minimal set of geophysical databases including seismic, aeromagnetic and airborne gravimetric are needed for reducing decomposition effects of the lineaments (Turcotte, 2007). It is widely accepted that spatial disordering of geophysical gradients may be affected by the ruptures (Datta, 2005). 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.

As it is shown in Figure 1, Coherent Component Nonlinear Analysis (CCNA) of decomposed lineaments in north and northwest of Tehran provided a new seismic pattern can be used for discriminating deep seismic structures (Bold lines) from incoherent. It is an updating procedure for n Hazard Analysis Program (HAP) by reducing in structural complexities of Greater Tehran.

It is a vectorized integrative model that is represented to both seismic, magnetic and gravimetric databases after CCNA technique applied in north and northwest of Tehran (Berberian and Yeats, 1999). The first segments (bold lines) are located between the longitudes: 50.75 – 51.25 and latitudes: 35.75 – 35.78. Also a long segmented lineament has been located between longitudes: 51.25 – 51.35 and latitudes: 35.71 – 35.79 as the second.

The revealed seismogenic lineaments have spatial association with deep and stable structures (next to hypocenters). The first seems to be directly originated from North Tehran Fault (NTF) in Sologhan station but the second is mostly extended toward North West of the city and therefore increases earthquake hazards for recently developed constructions in Hemmat-Kharrazi Express way.

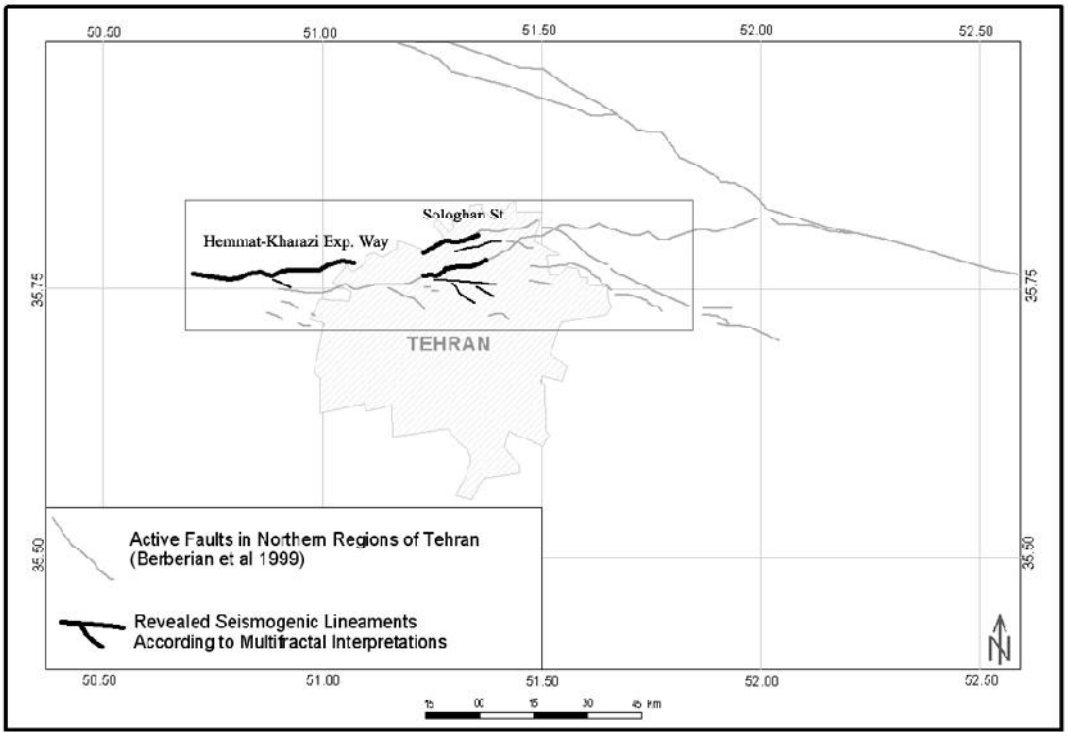

Figure 1. CCNA integration result for revealing seismogenic lineaments in north & northwest of Tehran

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