APPLICATION OF PATTERN RECOGNITION TECHNIQUES TO LONG-TERM EARTHQUAKE PREDICTION IN ALBORZ REGION ON IRANIAN PLATE

Mostafa ALLAMEH ZADEH
Seismology Department, IIEES, Tehran, Iran
zadeh66@hotmail.com

Leila MAHSHADNIA
Seismology Department, IIEES, Tehran, Iran

Keywords: Earthquake, Prediction, ALBORZ, Iran

Pattern recognition was one of the first methods used in geophysical application and has found wide applications in seismology. This paper presents the seismic spatial patterns recognition of west Alborz using historical earthquake catalog data with data mining techniques. In this paper, clustering techniques are used to obtain patterns of model in behavior of seismic temporal data that can help to predict large earthquakes; its future behavior by the past behavior of earthquake catalogs. This algorithm has the ability to learn new mappings for finding earthquake clustering to show all or some of the patterns before major earthquakes such as the seismic silence pattern and doughnut pattern. These patterns in different earthquake considerably change, so unsupervised learning techniques is used. In this case study after identifying morpho-structural nodes in western Alborz, earthquakes clusters studied and the event location of future large earthquakes has been identified by using Kohonen Self-Organizing feature maps. The novelty of this work lies on discovering clustering-based patterns and the use of them as seismological precursor in Iran IIEES data. The results of the experiments show that recognition rates achieved with this system are much higher than those achieved when only the feature map is used the seismic silence and the Doughnut pattern before large earthquakes.

SOFM model is a quite useful tool for statistical properties of earthquakes, for generating huge number of events required to cluster the earthquakes. Figure 1 shows a simple example about the capabilities of SOFM in clustering. The input probability distribution contains continuous structures that are partially interleaved. Clustering by SOFM is based on continuous compact areas, and it thus easily finds the natural cluster boundary.

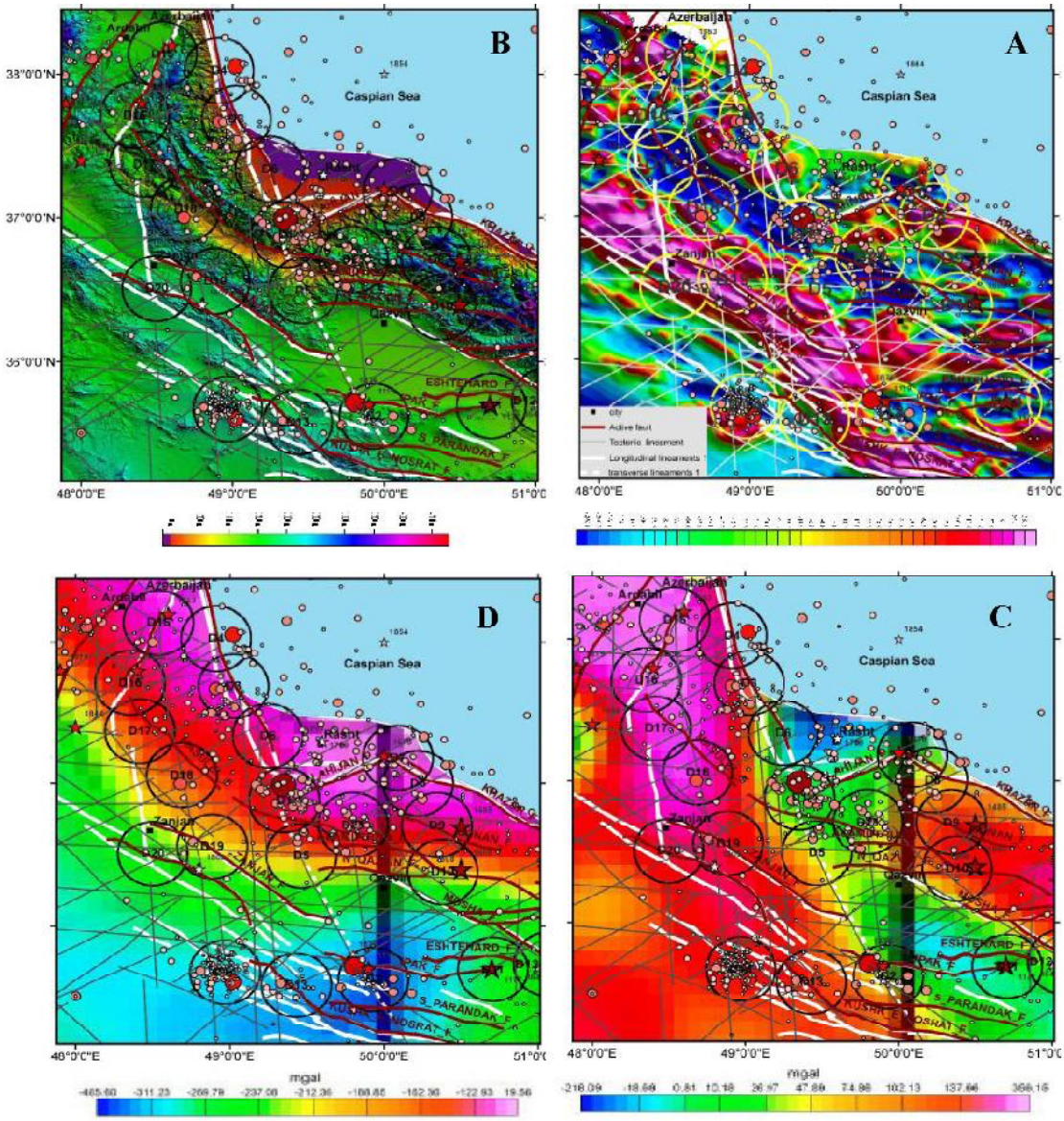

Figure 1. Extraction of lineaments in the distribution map of magnetic anomalies (digital images taken from aerial magnetic provincial geoscience database). Lineaments have been drawn, for sure, with layers of digital