

DISCUSSION ON RELATIONSHIP BETWEEN CIRCULAR STRUCTURE AND EARTHQUAKES

Zou Jinchang

(*The Earthquake Research Institute of Lanzhou, SSR*)

Seismologists are interested in the linear structure and neted tectonic framework and their relations to seismicity from the remote sensing images, but do not pay enough attention to seismicity. The circular structure is a kind of particular tectonic pattern showing on the sensing images. By using the remote sensing, author has analysed seismo-tectonic environment in the northwestern region of China for several years. About the action of circular structure on study of earthquakes, some points of view are presented in the following.

1. Study on the Seismo-Tectonic Environment

Circular structure is seldom seen as a tectonic pattern in common geological map. It has been gradually recognized since the remote sensing images were used extensively. The circular structures are some circular pictures that appear as round, oval, arc, and multilateral forms et al. in all sizes from colour, shape, drainage system in the remote sensing images, and it is regular distribution and is in close relation to geological structure. In a specific region or zone, either there may occur several different patterns of the circular structure, one superposed on the other, becoming mutually interference and interlock, or there may present only one circular structure alone. According to study of tectonic environment of strong earthquakes in the Shaanxi-Gansu-Ningxia-Qinghai region (陕甘宁青) of China, either most of epicentres relate to the linear structures (the active fault zones), or relate closely to the circular structures. For example, in 1927 year, magnitude 8 earthquake occurred in the Gulang (古浪) region of Gansu Province. We have discovered the microscopic epicentre that lies on the centre of Wuwei (武威) Circular Structure that is about 80km in diameter, and most of $M \geq 4$ earthquakes occurred at inner or margin of

the circular structure, and some earthquakes occurred at fault zones in close relation to the circular structure, by interpretation of the remote sensing images of this region (see Fig.1). In the southern Ga-

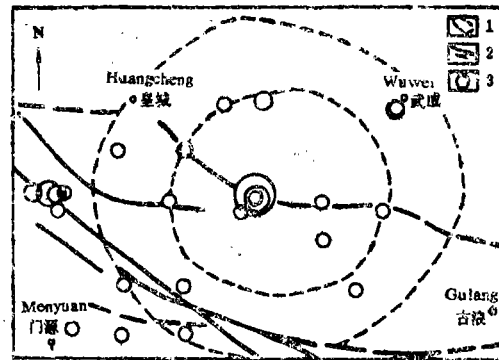


Fig.1 Distribution of Wuwei circular structure and earthquakes of $M \geq 4$
1.circular structure 2.main active fault 3.earthquake of $M \geq 4$

nsu Province the trending of main structures are composed of composite strongly compressed zones of E-W trend comprising fold belts and compressive fractures of the same trend in the common geological maps of this area. But the distribution of the epicentre locations and the feature of seismicity appear mainly as NE-SW trending which lacks harmony. However, on the basis of interpreting from the remote sensing images, there is not only clear NE-trending linear structure, but also a series of the circular structures in all sizes. And most of the epicentre locations of $M \geq 4.7$ earthquakes relate to the circular structure in the area.

2.Regional Seismic Risk Estimation and Earthquake Prediction

It plays a certain role for distributive feature of circular structure and its relationship with earthquakes to estimate quakeprone area. The earthquakes occurred in north western China are all shallow earthquakes. There are some features by analysis of relationship between the circular structure and the earthquake as the following:

(1) There relatively is obvious circular structure in the places there earthquake occurs frequently.

(2) Most of epicentre of moderately strong earthquakes lie on the margin and the inner of circular structure.

(3) The quakeprone area may be either two types of circular and linear structure, one superposed on the other, becoming mutually interfered and interlocked, or only circular structure.

(4) Seismic events relatively are more in the place where lie on the marginal great fault as tangential line of circular structure and

the main fault zone in connection with the cause of formation of circular structure.

It follows that identification of circular structure has certain significance from remote sensing images to analyse the quakeprone areas in the seismo-active region. It must be combined with analysis of precursory phenomena of earthquake and the feature of circular structure about its affect in earthquake prediction from circular structure. When we analyse quakeprone area and predict earthquake, must also study the distributive feature of linear structure (fault) and their relation to circular structure. For example, Eerduosu (鄂尔多斯) Landmass shows as a huge circular structure from landsat photos, and its marginal area has occurred epicentre shift many times, on the basis of the study on historical earthquakes in the area, in other words, when at one side of the circular body occurs a earthquake, and at another also occurs at regular intervals. This phenomenon may be relative to movement of Eerduosu Circular landmass, and has also certain significance for earthquake prediction.

3. Study on Seismogenesis

Some circular structures have irrefutable geological meaning themselves, as volcanic structure, center of magma movement, hidden and uncovered intrusive mass, dome tectonics, arc and circular fracture, circular uplift and depression, and nuclear column of vortex structure and so on. The circular structure belonging to different types is identified chiefly by their tectonic features expressed on the earth's surface, that is to say, tectonic patterns reflect the movement of crust. Along vertical direction, the shape of circular structure whether will change or not at certain depth below the surface, of course, it cannot be neglected. About a power source of formation of circular structure, the hypothesis is similar to that of the seismogenesis, therefore, it can promote the study on seismogenesis by study on circular structural genesis.

As an example, one of the genetic hypotheses of circular structure—the hypothesis of thermodynamic rock mass considers that the crustal matter and its movement may be unisostatic, there is a magmatic thermodynamic body from a thermo nuclear reaction in the deep-seated crust, it gathers together toward a parts of areas and forms a thermodynamic height when it rushes upon the median-shallow crust, and produces the circular structures of different patterns as a huge thermodynamic flow in the shallow crust. The basic property of this cir-

cular structure is rushing upward in pulse of way and follows horizontal vortex-shear movement, it can be or not as one of seismo-dynamic sources of occurring earthquake? On the basis of the fact that there are interactions of vertical and horizontal forces about the continental earthquakes of China, this hypothesis is not reasonless. With respect to the hypothesis of active rock mass from the circular structure genesis, its active feature is close in the relation to feature. According to investigation, in different parts of a fault belt, there occurs different types of fault active feature and intensity, and one of causes of formation closely relate to activity of the circular structure near by the fault belt.

From the above-mentioned, the circular structure is of particular importance in the reseaching for earthquake.