

QINGHAI—XIZANG PLATEAU — A SPECIAL TEST FIELD FOR EARTHQUAKE PREDICTION

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At present level of earthquake prediction, each prediction method should be tested in practice. Researchers of earthquake prediction often test the prediction methods in the test field. The test field for earthquake prediction usually can be divided into two kinds. One kind is a developed industry and densely populated region, another kind is a sparsely populated but great earthquake frequently occurred region. Earthquake prediction in the former region has a very important effect on the national economy and people's livelihood, but it will take large risks and may induced unnecessary social panic. However, in the latter region, earthquake prediction needn't consider such social problem. Qinghai-Xizang plateau exactly is an ideal second kind test field for earthquake prediction. The tectonic movement in the Qinghai-Xizang plateau is very strong. Many great earthquakes occurred in this region in history. Many seismologists of China and other countries have made quite some long-term and medium-term predictions on great earthquake in this region from different sides. This paper will make a brief review on this subject.

In 1957, Li Shanbang led a group to compile the first map of seismic risk zoning of China(1). They made the prediction of earthquake risk in Qinghai-Xizang plateau in that map. To compile the map, the following two principles were applied at that time.

1) Regions of similar geological conditions can be regarded as similar seismicity also.

2) In a given region, earthquake of same intensity that happened previously, may occur again.

Figure 1 is the map of seismic risk zoning of China compiled by Li Shanbang et al. in 1957. The strong earthquakes ($M \geq 7$) occurred in this Qinghai-Xizang plateau region since 1957 also are drawn on Figure 1. From Fig.1 we can see that the long-term prediction of earthquake risk in this region made by Li Shanbang et al, is basically right,

South Seismic Belt to be pointed. In one of those region, Gengma-Lanchang area, a great earthquake with $M=7.6$ occurred on Nov. 16, 1988. So the prediction for this region is successful.

In 1988, Guo Zengjian and Qin Baoyan made a prediction on earthquake risk regions in Qinghai-Xizang plateau in next few years using the stereographic model which was introduced by them. According to the model under the action of the same regional tectonic stress field, the fractures having different behavior will be generated respectively in upper and lower lithosphere. In the lower lithosphere, some of fractures are concided with the fractures in the upper lithosphere, some of them are not with. Because the creep faulting in the lower lithosphere propagates to very far distance along a straight line, it may trigger those forthcoming earthquakes which are located at various faults and boundaries of units in the upper lithosphere and form the earthquake migration at far distance, the migratory line crosses many of various tectonic units. If we found three moderate earthquakes with the arrangement on a straight line, it should be considered that a strong earthquake may occur in the location where the migration line or the extension line crosses the fault in the upper lithosphere in the near future. The estimated magnitude is determined by follow expression:

$$M=1.55 \lg T+4.6$$

here T is the years since starting time of earthquake migration line.

By means of stereographic model, they predicted three possible regions of great earthquakes in the near future. Also they predicted that the possible occurring time would be in April to May, 1989 and June to July, 1990. Actually, in one of the predicted area, four earthquakes with $M \geq 6.0$ occurred in Batang region, Sichuan in April, 1989. The maximum magnitude is 6.7 and minimum magnitude is 6.2. The total energy released by those earthquakes is corresponding to the energy of an earthquake with $M=7$.

In summary, many attempts to predict the great earthquakes in Qinghai-Xizang plateau have made. Some of those predictions are successful, some of them are not, and some of them should still be verified in future. In any case, Qinghai-Xizang plateau is a good special field for earthquake prediction.

析。统计时段中平均地震年频度为1.2次,统计时把发生地震数大于二倍地震年频度的年份称为大频度年,则地震大频度年份共出现过7次,它们分别是1920年、1937年、1941年、1951年、1955年、1972年和1976年。1920年、1941年、1951年、1955年和1976年均处于由12年周期所划分的地震活跃期内(其中包括两个地震频度最高的年份)。由此可见,不仅我国8级以上地震与12年周期相关,而且7级以上地震也与12年周期相关显著。因此,12年周期可能是一种长期以来客观存在的周期因素。

12年周期很早就被我国用于甲子纪年,用不同的12种属象显示年景,反映自然灾害呈周期性出现的规律。地震只是其中自然灾害之一,多出现在卯、辰、巳、午、未、申等年份之内。

这种12年周期可能是宇宙多因素共同作用的一种综合效应,但从某些方面的数据显示,木星运行对此周期可能起主要作用。因上述12年周期数恰好与木星公转的周期数11.86年十分接近。

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STUDY ON RELATIVITY OF GREAT EARTHQUAKES ($M \geq 7$) IN CHINA AND THE 12-YEAR PERIOD IN SOLAR YEAR

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(上接第104页)

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