# The success of the prediction of Haicheng earthquake and the negligence of the Tangshan earthquake

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**Abstract**: The success of the prediction of Haicheng earthquake and the failure of the prediction of Tangshan earthquake were both well known in the world. What happened, why such a strong earthquake as occurred in Haicheng had been predicted successfully and with a small loss of lives and property? Why a successively strong earthquake about a year later in a region not so further was failure in the imminent stage of prediction and there were so many fatalities and a great degree of property? The author addresses these points based on these true experiences including the first hand experiences leading up to, during, and following these two earthquarter. In addition, he also introduced some seimic phenomena which he had seen after Chi-chi earthquake in Taiwan.

**Key words**: Haicheng earthquake; Tangshan earthquake; success of the prediction of Haicheng earthguake and negligence of imminent stage of Tangshan earthquake; Chi-chi earthquake

## 1 Introduction

The success of the prediction of Haicheng earthquake was well known in the world[1]. The failure of the imminent prediction of Tangshan earthquake and the heavy losses of lives and property were also well known to the public. During the time of these two episodes of great earthquakes, the writer was concurrently working in the Headquarters of Anti-seismic Works of Luda (Dalian & Lushun) and went to the seismic-risk areas of these two earthquakes to investigate the seismo-geology and destruction of the buildings very soon after explosion of the earthquakes. Meantime, some consultant meetings of earthquakes of Liaoning Province and Luda Municipality or Luda cooperating with Dandong City during the episodes of these two earthquakes were attended by me. And I shared with many seismologists and persons in some seimic phenomena during the shock when they had seen and witnessed[2-4]. Several years later after Tangshan earthquake, there was also a strong earthquake of M = 7.6 taken place along the west slope of Central Range of Taiwan. The author had been invited to go to Taiwan visiting the seismic risc area and discussed with some specialists and professors of Sino-Tech Foundation for Research & Development of Engineering Sciences & Technologies, Taiwan University and Central University, so I had learned more from them[4-6]. Recently, I read the words, glad tidings of mankind which be written for Dr. Sun Wei's paper "Destructive Earthquakes are Predictable"[7]. So I would like to give some words on this topic (Indeed, there are some precursors or signs to us before the strong earthquakes) according to my understanding.

## 2 The tectonics setting

All of the destructive earthquakes are closely related to the crustal fractures. In general, if the earthquake with M = 6 or more of shallow type, then the shock will initiate a fracture on the earth surface, and reversely, the seismogenic fracture in the crustal active area will easily accumulate and concentrate the geostress and arises the shock (inclusive those faults with adhesive slip). Hence, the possibility of the explosion of a destructive earthquake in an area might be predicted firstly according to the existence of a seismogenic fault.

A seismogenic fault might be decided by several factors: its width is with several to several decade-meters or more, and elongated with several decades km or longer, and penetrated deeply through the crust and unto the moho. The fault belt is always full of breccia which was not consolidated. Along the seismogenic fault there were at least several shocks taken place within ten thousand years. And the seismogenic fault must situated in the crustal active area, so that the seismogenic fault could be accumulating and concentrating the geostress which be originated from the collision of two plates.

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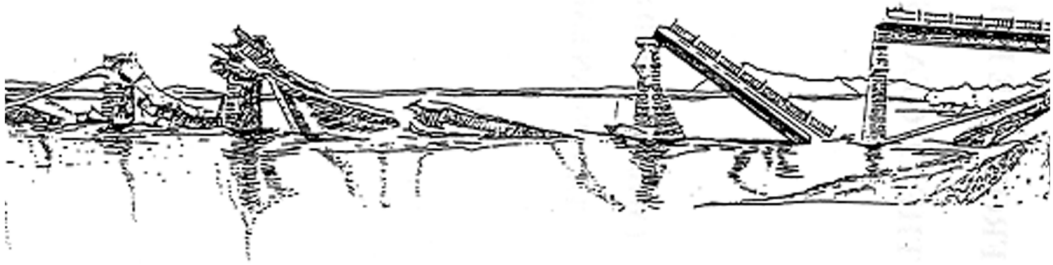


The Great Highway Bridge of Luan river damaged from the 1976 Tangshan earthquake episode:
The bridge slightly damaged from the main shock:M =7.8,*I*=7 degree,distance about 50 km,
July 28 (03:42);
Then the bridge-beams,from 2 to 24, collapsed down to the Luan river due to large horizontal
vibration of Luanxian aftershock: (M =7.1), *I*=9 degree, distance about 15 km, July 28 (18:45);
The bridge was more than 600 m in length and 8 m in width.

**Fig. 1 The Great Highway Bridge of Luan river damaged from 1976 Tangshan earthquake episode**

The existence of a seismogenic fault might be reflected by the anomalies of geophysical data, such as the gravity and magnetic anomaly, isobathy line of moho discontinuity, the geologic structure, the lithologic composition and geomorphological features.

The moho discontinuity is an imaginative interface at the bottom of the crust where the geophysical properties, such as the gravity and seismic wave velocity, the chemical composition and crystalline structure, etc., changed suddenly. The P-wave velocity is about 8.1 km/s (in average, on the top of mantle) at moho and is lower than 8.1 km/s and rapidly decreases above moho. The depth of moho is not the same everywhere. It is about 5 to 10 km under the ocean and about 65 to 70 km under Mt. Andes and Himalaya. The junction of moho features is the place where large earthquake commonly occurs[8]. Therefore, features of moho provide an important criterion for long-term earthquake assessment. The depth of moho at any place might be measured indirectly by gravitational surveys and deep seismic prospecting. Tangshan City was just at the sharp inflection turning point from line 33 km of E-W to 34 km of N-W isobathy lines. After the 1976 Tangshan earthquake, 3 deep fractures penetrated moho under Tangshan-Fengnan region was prospected and found. Under Haicheng region, a small drum-like elevation of moho was found before the earthquake.

In the early time of Haicheng earthquake, seismologists in Liaoning Province studied the deep structure of North-East China (Fig. 2). They mapped two great belts of deep tectonic variations by means of synthetic belts of deep fractures, geophysical changes, distribution of faults, topographical and geomorphological inflection-belts and the belts of the historical earthquakes and comprising the prominent borders of the fault-blocks. The eastern belt extends from Suihua and passes through Harbin, Changchun, Shenyang, Yongkou (near Haicheng), Kingchow to an area at 38°N,120°E in the Bohai Sea, then turns to the west. It coincides more or less with the Great Tan-Lu Fault Belt. The western belt is approximately located along the eastern border of Great Xin-An Mt. Range. It begins from Zhalantun, passes Hulanhaote then divides into two branches. The eastern branch goes through Tongliao, Fuxin, Jinzhou, Suizhong, Qinhuangdao and turns to the west, passing through Changli, and Luanxian. The western branch extends through Lubei to Beipiao, Chaoyang and Qinglong County (Hebei Province) with its extension onto Tangshan southward[9]. This belt is a NNE-geotectonic belt which coincides with the Tangshan earthquake structural zone and elongating to Qingxian in North China Plain.

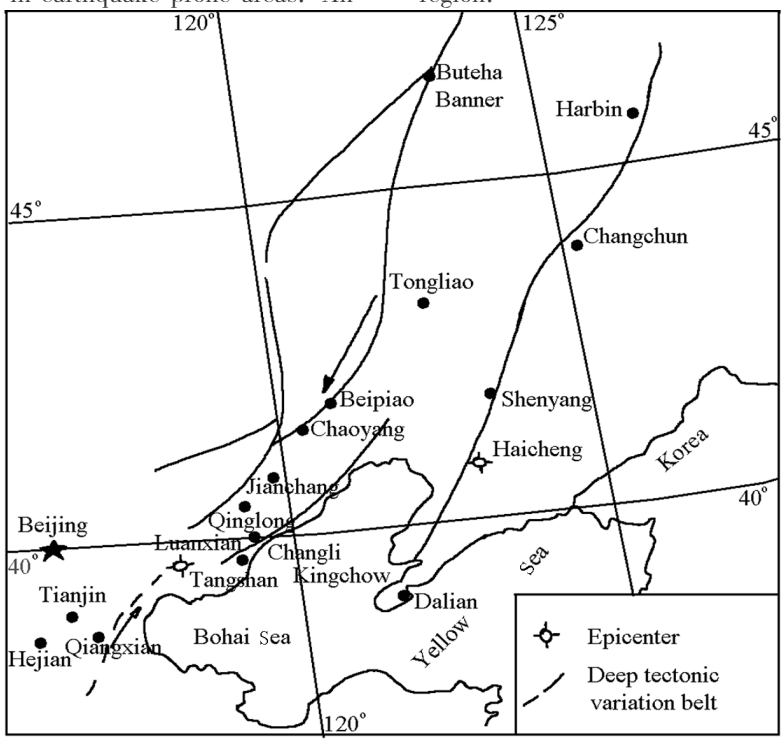
## 3 Prediction of Haicheng earthquake and the long-term and medium-term prediction of Tangshan earthquake

In the very early stage of an earthquake, the geostress begins to make the deformation of the crust, and its prominent behavior is the depression of the crust. You may see the rapid depressing began from 50 decade of last century from the chart (Fig. 3) which made by SSBC.

The southern section of the eastern deep tectonic belt (Kingchow Great Fault) is a seismogenic fault along which there are many hot springs such as, Qian-Shan, Tang-Gang-Zi, An-Bo-Tang, etc., and many small earthquakes such as Xiongyue earthquake (M = 5.75); Shenyang (M = 4) and Tieling (M = 4), etc. And medium earthquakes at the terminal of the Kingchow fault: M = 5.5, on December 11, 1855; M = 5.2, on April 10, 1856; M = 6, on July 19, 1861, and in Bohai Sea, M = 6.2[10].

These historical earthquakes combined with the rapid depression in the southern areas of two NE-direc-

tion deep tectonic variation belts showed it was one of the dangerous sections in earthquake-prone areas. Another earthquake-prone area was the Great Tangshan region.




(Haicheng and Tangshan are situated at the East and West Belts respectively)
(Modified from Work Team of Haicheng earthquake, 1975)

**Fig. 2 Two deep tectonic variation belts in North-East China**

### 3.1 Long- and medium-term prediction of Haicheng and Tangshan earthquake

Since 1972, the practice of prediction in China had been divided as 4 stages: long-term, medium-term, short-term and imminent-term prediction[1, 9]. The long-term prediction or forecast relates to a time interval of several years to ten years and for a large area. The seismic area is delineated according to the information on deep structure, geophysical field, and historical earthquakes, etc. The medium-term prediction of earthquake is slightly more focused in space and time (from several years to several months). In the early stage, scientists begin to make continuous observations of possible changes of various geophysical and geochemical properties of the crust in the identical area. In general, the anomalies recorded during the early stage of a medium-term prediction displayed continuous, gradual changes that insufficient to indicate the exact time and place of the forthcoming earthquake.

In the early 1970s some premonitory anomalies began to occur in N. E. China and then to North China. As a result, the leading of SSBC under its first leader, Hu Keshi, called a "Consultant Meeting on Earthquakes" on June 7-9, 1974 and sent a document "About the Seismological Works on the Coming Dangerous Earthquakes" to the State Council of China. The State Council of China immediately ratified this report and issued Document No. "Guo Fa" (two Chinese characters meaning: issued from the State Council) in [1974]69, and simultaneously transmitted the report of SSBC to various seismological organizations and institutes in China on June 29, 1974. The followings are some quotations from the report of SSBC[11].

"The earthquake situation of North China and Bohai region had been discussed and analyzed in the consultation meeting on June 7-9, 1974. Most delegates recognized at least an earthquake may occur this or next year with a magnitude of about 5 to 6 in the region including Beijing, Tianjin and North Bohai Sea".

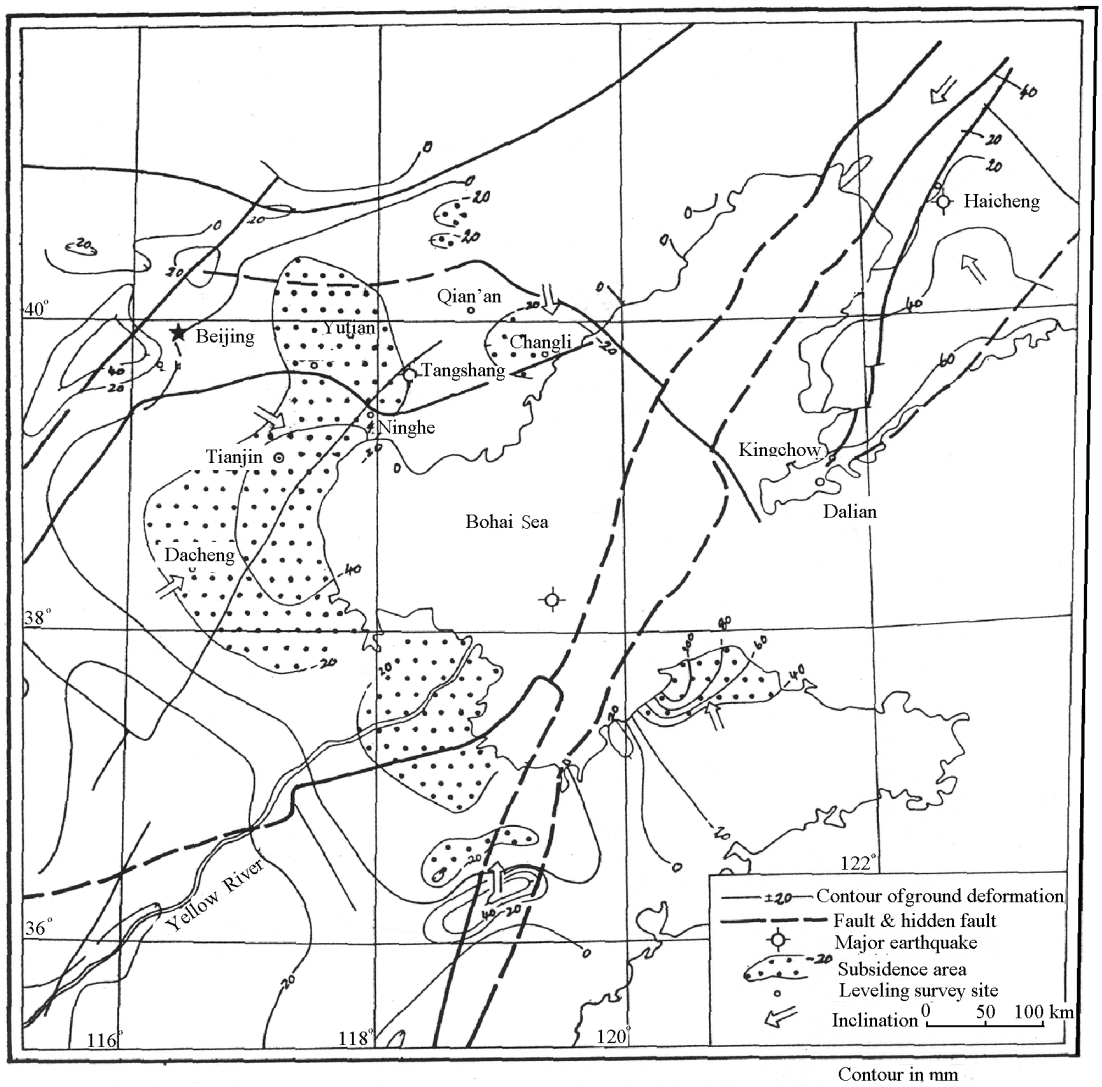
"The main basis for this assessment is that recently small earthquakes occurred very frequently in the region between Beijing and Tianjin. Also, an increasing number of anomalies were observed in gravitational and topographic surveys and in radon content observations."

There were four abrupt anomalies:

a. "The annual change of the precise short leveling of Kingchow has accelerated; the cumulative change amounted to 2.5 mm since September, 1973. Before 1973, the annual change was only 0.1 mm per year."

b. "An abrupt magnetic anomaly of 22 nT was re-

corded in Dalian."




(Modified from SSBS, 1976)

**Fig. 3 Fault-blocks around the Bohai Sea and its ground deformation (1953 – 1972)**

c. "The sea-level along the north shore of Bohai Sea (recorded by six tide-observatory points) rose by more than 10 cm in 1973, larger than combined rises in previous years."

d. "The micro-seismic activity increased now".

Moreover, the SSBC report pointed out emphatically: "According to empirical rules, the seismic activity in the west Pacific earthquake belt at 400 ~ 500 km depth in the east border of China and Russia will influence earthquake activity in Northeastern and North China significantly. Most seismologists recognized that during the present episode the lower crust of North China has accumulated sufficient energy to generate an earthquake of magnitude 7 to 8. In addition, the northern part of North China has passed through an abnormal climate with an imbalance of wet and dry weather, a long dry period, followed by a hot winter and a cold spring. Therefore, most seismologists anticipated a strong dangerous earthquake of magnitude 7 in North China."

### 3.2 Short-term prediction and imminent forecast of Haicheng earthquake

**3.2.1** Short-term anomalies and short-term prediction

Beginning from January, 1975, many macro-anomalies appeared in the Dandong district which is about 160 + km to the east (Fig. 3). Then, many macro-anomalies appeared in the area of Kingxian (210 km to south): such as the curve of short precise level survey, the Rn anomaly from Kingchow-fault deep water well, the animal-anomalies (such as the snakes appeared in the field under the rather cold winter in Kingxian) and some water-level anomalies from the deep-water well in Liguan (Fuxian, 150 km to south), etc. Dalian is about 230 km to south from Haicheng. And the same prominent macro-anomalies took place at

Chaoyang, which is about 220 km to the northwest. Several days before Haicheng earthquake, the spots of macro-anomalies had migrated very near the Haicheng. Until the eve of the shock, not many macro-anomalies were recorded in the epicentral area of Haicheng and Yingkou (25 km to Haicheng). It was a very dangerous signal before the explosion of a great shock.

**3.2.2** The imminent-term prediction of Haicheng earthquake

On February 3, that was the eve before Haicheng earthquake, Shipengyu Seismic Station in the center of monitoring system (forthcoming earthquake-epicenter) had gathered many many minor earthquakes and many macro-anomalies from the networks, combined with all of the macro-anomalies from other areas around Haicheng. The station analyzed the characteristics of these phenomena, and they learned that a strong earthquake would be exploded very soon nearby, and then the station sent a report to the Seismic Bureau of Liaoning Province. After the Consultant Meeting of Earthquake sponsored by SBLP, SBLP sent a report very soon to the Liaoning Provincial Party and Liaoning Provincial Revolutionary Committee about "A Great Earthquake will be Exploded in Haicheng Area". Then, Liaoning Revolutionary Committee issued a general order to the whole province by telephone at 10:30 A.M., February 4, and set out at once about "5 Instructions to Anshan and Yingkou Municipality-Party-Committees about Anti-precautions against Earthquakes".

According to the order from Provincial Revolutional Committee, SBLP sponsered a "Meeting at Haicheng about the Precautions against Earthquakes" inclusive of the members of Party Committee of Haicheng and Yingkou countries, the 12 leaders of Troops at P.M.2:00, February 4. They transmitted the "5 Instructions of the Provincial Revolutionary Committee" and decided to take some emergency measures, such as: stopping temporarily the production of some risk-chemical factories, keeping watch on water reservoir for accidental destruction, packing the precise instruments into the boxes or safety-places and with drawing persons from the dangerous buildings, etc.

That was a formal declaration of imminent-prediction of Haicheng earthquake to all of the people in the forthcoming seismic area and the related subordinate governments and the seismic stations. Consequently, a great earthquake with M = 7.3 exploded at expected area after the prediction issued several hours later. The success of the Haicheng earthquake had been praised by some scientists in the world[1]. However, after the negligence of the imminent prediction of Tangshan earthquake, some foreign scientists felt doubt about the truth of the success of prediction of both Haicheng and Tangshan earthquakes, among whom there was a fellow student of mine in the former university. Prof. Kenneth J. Hsu is an overseas Chinese in Switzerland as well as an international famous geoscientist, who wrote a letter to me, in which he said that "the success of Haicheng earthquake is a 'self-praise' (story) by (your) Party." So, I should review and bring up again the history of these two great earthquakes.

### 3.3 The negligence of the short & imminent-prediction of Tangshan earthquake

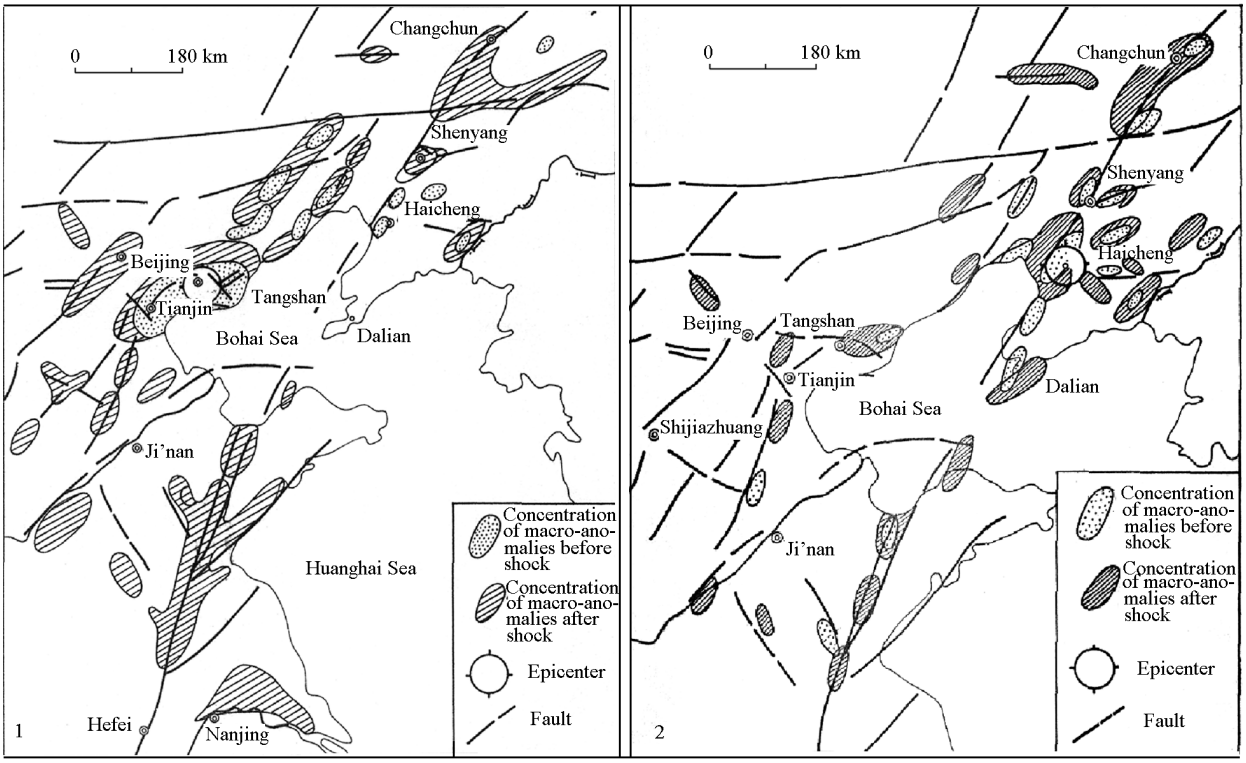
In the following, I would like to give the truth how we neglected the imminent prediction of Tangshan earthquake.

According to the Document (Guo Fa, [1974]69, see above), there were two cooperative groups organized in order to strength cooperation in the mitigation and prediction of earthquakes. One was the cooperative group leading by Liaoning Provincial Revolutional Committee, and the other was the group of Beijing, Tianjin, Tangshan, Zhangjiakou cities and Hebei Province as well as Geophysical Institute, Seismo-geological Brigade, Seismological Survey, and under the provincial leadership of State Seismological Bureau of China (SSBC). This should be considered as the long-term and medium-term of prediction of Tangshan earthquake. How sorry is that there was not a provincial government having the right to do something for anti-seimic measures, and so forth.

After explosion of Haicheng earthquake, February 4, 1975, all of the macro-anomalies gradually migrated far away from epicenter of Haicheng to the surrounding places (Fig.4-2).

And then, beginning from March, 1975, many macro-anomalies, especially, those related to the "ground-motion" (Table 1 and Table 2), occurred at the north terminal of the West Deep Tectonic Belt. Meantime, the anomaly of the curve of Kingchow precise level short survey over the Kingchow Great Fault did not recover to the base line, but continued to creep downward on NWW line or creep upward on NNE line. According to the opinion of original surveyor, engineer Ma Bingkui said: "This shows a new earthquake being just building-up". This opinion had been reported both to the seismic officers of Luda Municipality and Liaoning Province.

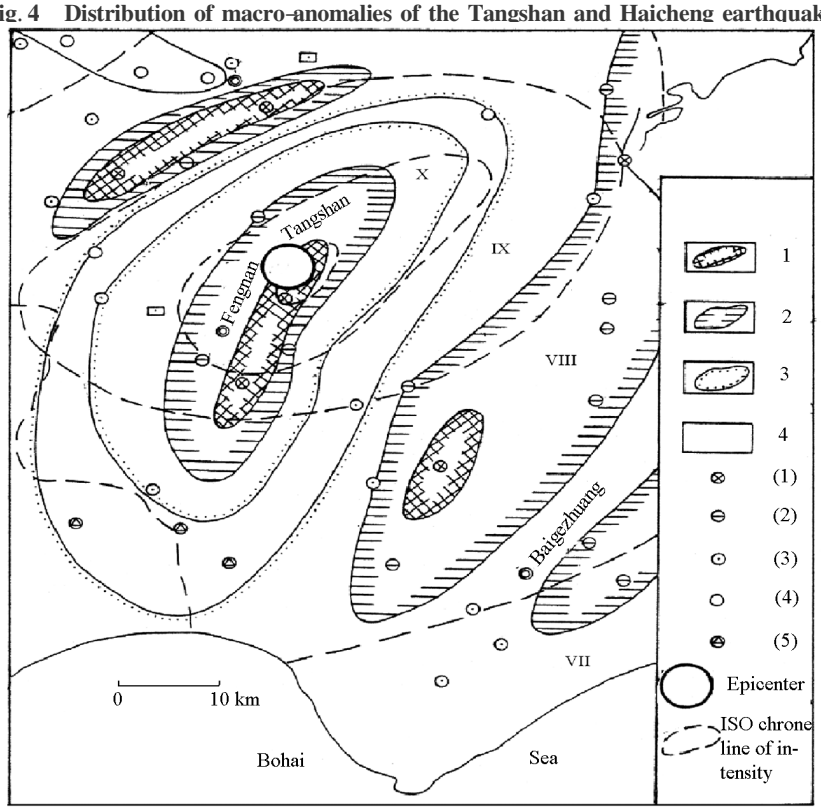
At the same time, the bulletin of the consultant meeting on earthquake sponsored by SBLP formerly pointed out that there would be an earthquake taking place in the west region of Liaoning according to a series macro-"ground-motion" along the West Deep Tectonic Belts cooperated with the anomaly of Kingchow precise short level survey was actually the medium-term prediction of Tangshan earthquake (Fig.5).




(Accolding to Zhao et al,1982)

1—Tangshan earthgnake;2—Haicheng earthquake

**Fig. 4 Distribution of macro-anomalies of the Tangshan and Haicheng earthquakes**




Legend: Anomalous area and wells

1 or(1):<6 h before Tangshan earthquake;2 or(2):6-7 h before T. E.;3 or(3):1-2 d before T. E.;
4:>2 d before T. E(area);(4):3-5 d before T. E. (wells);(5):>5 d before T. E. (wells)

(After SSBC,1976)

**Fig. 5 Isochrone lines of ground water anomaly around Tangshan in short term to impending stage**

**Table 1 The systematic ground-motion along the West Deep Tectonic Belt**

| Date | Ground Motion | Locality | Distance to TS |
|---|---|---|---|
| 1976 – 3 – 08 | NE/NNE many earth-fissures occurred. | Tongliao | 560 km to TS |
| 1976 – 3 – 11 | Ground Motion occurred over 1680 + km, | Chaoyang | 300 km to TS |
| | & 3 counties in west- | Kazuo | 220 km to TS |
| | hilly region of Liaoning. | Jianchang | 180 km to TS |
| 1976 – 3 – 14 | Explosion in large scale of coal mine. | Beipiao | 193 km to TS |
| 1976 March to April | NNE Tension Fissure with 220 m collapsed & with minor shocks. | Binggou Coal Mine | 180 km to TS |
| 1976 May | Deep well-pipe distorted and the thick-wall of test well collapsed. | Kailuan Coal Mine | in TS |

**Table 2 Anomaly of underground water**

| Date | Anomaly of underground water | Locality | Distance to TS |
|---|---|---|---|
| 1976 March to June & July 7th | Oil spurting from the unused-wells | Qingxian oil field(south) | 164 km to TS |

The above anomalous phenomena were the premonitory changes migrating southward to Tangshan during short stage of west hilly region joined with the north-east hilly region of great Tangshan region. (Fig. 2).

In addition, we should note that the document (Guo Fa, [1974]69) pointed out that small earthquakes occurred very frequently in the region between Beijing and Tianjin region.

The geo-stress which accumulated under the crust of NE China and North China resulted from the collision of the west Pacific Plate to the Euasian Plate was released significant amount of energy by Haicheng earthquake along the East Deep Tectonic Belt and partially along the West Deep Tectonic Belt, but not sufficiently released. It may be witnessed from two charts of macro-anomalies distribution after Tangshan and Haicheng earthquakes (Fig. 4-1 and Fig. 4-2). When the collision and push of the Pacific Plate continues, the second West Deep Tectonic Belt will accumulate and concentrate the geo-stress continuously. Hence, the short-term precursors of Tangshan earthquake took place successively after the explosion of Haicheng earthquake. The time was from February to April, 1975[12]. During this time, the anomalies and seismicity of small earthquakes developed into another new phases of activity.

In a general sense, it is somewhat like the case of occurrence of Chi-chi earthquake, 1999, 9:21, M = 7.6, Taiwan. Chi-chi was the epicenter and situated along the Chelongpu Seismogenic Fault and positioned over the topmost near the collision zone of two plates (in general sense): the Philippine Plate and Eurasian Plate. Taiwan Island is bordered the west Pacific Ocean. The Luzone Arc of Philippine Sea Plate (a part of Pacific Plate) has long begun to impact diagonally to Taiwan along the Huadong longitudinally valley and the impact force directing to the longitudinal Axial Tectonic belt — the Central Range system, which not only promoted the deformation of the Central Range, but also raised and pushed the Range westward. Then, a series of earthquakes occurred along the two belts: one is the East Huadong Longitudinal Seismic Belt and the other is the Western Seismic Belt in which mainly includes Chelongpu Seismogenic Fault. Historically, if there were a series of earthquakes occurred along the Easter Seismic Belt (including the shocks along the Huadong Longitudinal Valley or offshore), there would be a series of earthquakes would occurred along the West Seismic Belt. This is somewhat like the case of Haicheng earthquake and a series of small to medium earthquakes in eastern Liaoning exploded before the Tangshan earthquake, because that the Haicheng region is positioned at the east than Tangshan and rather nearer to the Pacific Plate.

Although the Bulletin of SBLP did not pointed "Tangshan" was unto the imminent term prediction, but some scholars, as Prof. Li Ping and Dr. Shao Y. Y. of Geological Institute, SSBC, pointed that 2 spots, Luanxian and Linghe near Tangshan would explode two shocks about M = 7 in several consultant meetings of consultant[13]. Really, Luanxian (M = 7.1, July 28, 1976, afternoon) and Linghe (M = 6.9, November 15, 1976, 21:53) strong earthquakes occurred after the Main shock (M = 7.8, July 28, 1976, 03:42:54) during the Tangshan earthquake episode[14].

However, such an intimate connection between two great earthquakes and the successively display of the "ground motion" along the seismogenic fault (West Deep Tectonic Belt) which elongating to the great Tangshan region, did not attracted the attention of a person who once chaired the Tangshan Meeting on July 12-21, 1976. This Tangshan Meeting was a consultative meeting on the mass observation and prediction of earthquake hazards just sponsored at Tangshan and under the circumstances there were many macro- and micro-anomalies taking place over the Great Tangshan area

and nearby.

In this meeting, seismologists and delegates from Beijing, Tianjin, and Hebei and Liaoning Provinces submitted considerable information about short-term anomalies. However, the chairman of the meeting, hurriedly concluded the meeting so that he could go to Beijing to gain the power in SSBC and the Academia, Sinica and followed a head of the Gang of Four, Liu Zhongyang (criticized by the then Premier Hua Guofeng) (Premier Hua Guofeng talks to the delegates of Seismologists of China at People's Hotel, Beijing, July 29, 1976 & September 3, 1976, etc.). He neither summed up all the information and analyzed of the recorded anomalies, nor reported the imminent danger to the State Council of China and Tangshan Municipal Party Committee.

After this meeting, a delegate from Qinglong County, who was the head of the "Office of Earthquake Study" for that county, returned home and reported the critical situation of earthquakes to the County Party Committee. The Secretary of the County Party Committee announced an imminent earthquake prediction and mobilized the entire county on how to protect from the shock. Consequently, only one person died during the Tangshan earthquake, although about 180 000 rooms were severely damaged out of which 7 300 rooms collapsed[14].

In contrast, just before the Tangshan earthquake, little or nothing was said about earthquake danger in the entire city of Tangshan. No news regarding earthquake predictions was given to its citizens. It should be strongly pointed out that this earthquake meeting was held in Tangshan and the Tangshan delegates attended the meeting[15].

After the meeting, observations of geo-stress and some macroscopic phenomena at the Tenth Middle School of Tangshan as well as the geo-electricity observations at the Second Middle School showed some abrupt changes, these schools located very near the seismogenic fault of Tangshan. And they all suggested that an earthquake of magnitude M = 7 might be forthcoming. This was reported to the Tangshan Seismic Office and the heads of the Middle Schools four days before the Tangshan earthquake, but these alarm did not get the attention of the government of Tangshan and the authorities (Fig. 6)[15, 16].

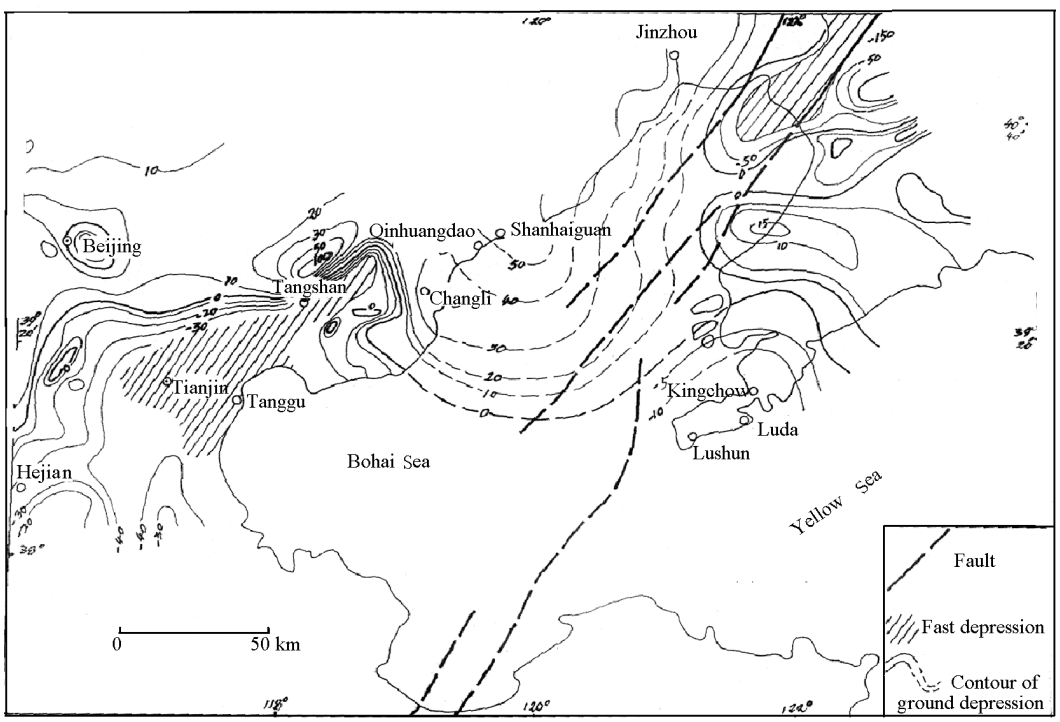



**Fig. 6 Ground deformation around the northem Bohai Sea(1970 – 1976)**

There was yet another opportunity to alert the citizens of Tangshan about the earthquake but the same person who chaired the Tangshan meeting several days before, failed again to grasp the chance. About 15 to 17 hours prior to the earthquake (at 10:00 to noon, on July 27), an urgent meeting of the leading group of the SSBC was held to discuss the problem of mobilizing the people into dealing with the anticipated earthquake.

This meeting was called by request from Wang Chengmin, head of the Peking and Tianjin Division of the Department of Analysis and Prediction, SSBC, who had just returned from Tangshan. Wang noted, "We should hurry to mobilize the citizens and closely watch the development of the coming earthquake. Leaders should quickly decide on how to arrange the mobilization". However, another leader, Zhang, Deputy Director of the Bureau, asked Wang and the other seismologists at the meeting, "What is your opinion?" The issue was not resolved.

Then the above mentioned person who chaired the Tangshan meeting and was the leader actually of SSBC, made the following "urgent" decision: "Because there are many political meetings in the Academy of China, (We have no sufficient time to let us make a thorough investigation and study, so)

1) You have to submit for consideration the detailed information of Beijing and Tianjin.

2) You may spend one week for preparation, then mark the dangerous earthquake areas with circles, and after that, send a small group to observe the earthquake.

3) In order to check the Rn-anomaly, you go to Langfang by car tomorrow"[11].

What an "urgent decision" was at such a critical situation. Actually, the distance between Beijing and Langfang is only about 50 km and the Rn-anomaly might have been easily checked either by telephone at once or by going there immediately by car. Why did he have to wait for a day? Why was such a decision delayed? Finally, a catastrophe in recent history took place 15 hours after the close of the meeting.

There was still a final chance to save many lives if the Municipal Committee of Tangshan had taken emergency measures similar to those taken by the Liaoning Provincial Government before the Haicheng earthquake. If they had paid more attention to the abrupt changes in the various observations that were being monitored, and took emergence measures like those adopted by the Qinglong County Government during this Tangshan earthquake, lives could have been saved.

Several years later after Tangshan earthquake, a strong Chi-chi earthquake of M = 7.6 occurred at (01:47:12.6), morning on the September 21, 1999, Taiwan Province. It was the greatest earthquake exploded in the mid-land of Taiwan Province during the recent one hundred years. Because the rescue measures had been disturbed and delayed by Taiwan authorities during the pushing for the leadership selection, so that it made the people died over 2 300 and wounded over 10 000. Moreover, it destroyed a great deal of private buildings and properties as well as the public constructions and properties. Hence, two years later after the explosion of the Chi-chi earthquake, when I was invited to go to the seismic stricken area, I saw many many persons still living in the simple anti-seismic shacks (Fig. 7) along the hilly slope in Puli and Yuchi , and Chi-chi town, etc., and many buildings still not be repaired in the cities[17-21].

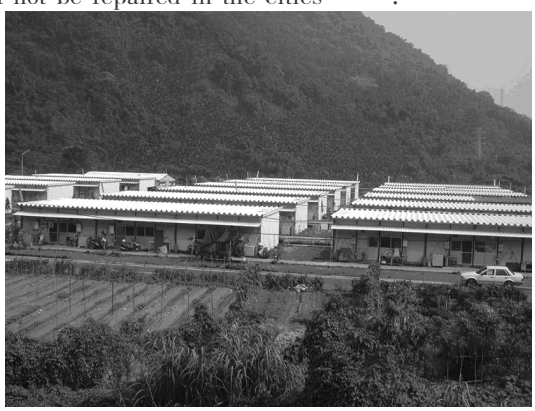


**Fig. 7 The simple anti-seismic shacks**

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