The Ordered Network Structure of $M \geq 8$ Great Earthquakes and their Prediction in Mainland China

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Z. Naturforsch. **67a,** 308 – 316 (2012) / DOI: 10.5560/ZNA.2012-0013
Received August 30, 2011 / revised December 25, 2011

China is one of the countries which have the most earthquake disasters in the world. A total of 23 $M \geq 8$ earthquakes occurred in Mainland China from 1303 to 2010. The seismic activity of $M \geq 8$ earthquakes has had an obvious self-organized orderliness. The main ordered values are $252 \sim 258$ a, $108 \sim 112$ a, $94 \sim 98$ a, $44 \sim 47$ a, $24 \sim 25$ a, $16 \sim 19$ a, and $11 \sim 14$ a. According to the information forecasting theory of Wen-Bo Weng and combining ordered analysis with complex network technology, we build an informational ordered network structure of $M \geq 8$ great earthquakes in Mainland China and try to explore the practical method for $M \geq 8$ great earthquake prediction with Chinese characteristics. In this paper, we have summarized the prediction research on two great earthquakes (the 2001 Kunlunshan $M8.1$ and the 2008 Wenchuan $M8.0$ earthquake) during the beginning of the 21st century in western Mainland China. At last, with the method of ordered network structure, we present a new prediction opinion: the future $M \geq 8$ great earthquakes will happen in 2026 and 2065 pre and post in Mainland China. The results show that a $M \geq 8$ great earthquake could be predicted and the network feature is the formation mechanism of great earthquakes. The ordered network method has a unique effect on moderate term and long term prediction for $M \geq 8$ great earthquakes.

Key words: Mainland China; Informational Ordered Network Structure; 2001 Kunlunshan $M8.1$ Earthquake; 2008 Wenchuan $M8.0$ Earthquake; $M \geq 8$ Great Earthquake Prediction.

1. Introduction

China, a country with many strong earthquakes, is located on the interchange of the Eurasian seismic zone and the circum-pacific seismic belt. Earthquake disaster mitigation is one of the most pressing issues that we are facing. A $M \geq 8$ earthquake is a rare emergency, which may occur once in several hundred years. Thus, the study is extremely complicated and difficult. Fortunately, China has a long and relatively continuing historical record of $M \geq 8$ earthquakes. The first $M \geq 8$ earthquake recorded in China dates back more than seven centuries, and it is possible to be the only rather complete catalogue of great earthquakes all over the world.

Geophysical disaster chain is a new innovative and cross-disciplinary subject. Since 1980s, Guo et al. have devoted themselves to the study of strong earthquake chains and triplet method, intersection model, criterion of activity in quiescence, and many other prediction methods were proposed for time and place of $M \geq 8$ great earthquakes [1 – 4]. The system view of strong earthquake prediction in 1989 [5], the method of orderly strong earthquakes in 1991, and the concept of information ordered series in 1997 were all proposed by Xu [6, 7]. Meantime, he studied time-space order and geometric distribution of $M7$ and $M8$ earthquakes in Asia [8 – 14], and then in 2001 and 2007, he proposed the network hypothesis of earthquake occurrence and the concept of self-organized network, respectively [15, 16]. In 2003, he studied the Hongtong earthquake in 1303, the earthquake which was confirmed as the first earthquake of $M8$ in China's history, and the next 20 $M \geq 8$ earthquakes, the 1303 earthquake order series and 1556 earthquake order series were suggested [17, 18]. In 2010, Xu, Men, and Deng firstly proposed the network structure of $M \geq 8$ earthquakes in Mainland China [18]. Since 1990s, we have been devoted to studying the orderliness of seismic activity and earthquake chain and its network structure

No.	Dates	Epicentral location		Magnitude	Locality
	Year-Month-Day	Latitude °N	Longitude °E	(M)	
1	1303-09-25	36.3	111.7	8	Hongtong, Shanxi
2	1411-10-08	30.1	90.5	8	Dangxiang, Xizang
3	1556-02-02	34.5	109.7	8.25	Huaxian, Shanxi
4	1654-07-21	34.3	105.5	8	Tianshui, Gansu
5	1668-07-25	34.8	118.5	8.5	Dancheng, Shandong
6	1679-09-02	40.0	117.0	8	Sanhe, Hebei
7	1695-05-18	36.0	111.5	8	Linfen, Shanxi
8	1739-01-03	38.8	106.5	8	Yinchuan, Ningxia
9	1812-03-08	43.7	83.5	8	Nileike, Xinjiang
10	1833-08-26 (A)	28.3	85.5	8	Nielamu, Xizang
11	1833-09-06 (B)	25.0	103.0	8	Songming, Yuannan
12	1879-07-01	33.2	104.7	8	Wudou, Gansu
13	1902-08-22	39.9	76.2	8.25	Atushi, Xinjiang
14	1906-12-23	43.5	85.6	8	Manasi, Xinjiang
15	1920-12-16	36.7	104.9	8.5	Haiyuan, Ninxia
16	1927-05-23	37.7	102.2	8	Gulang, Gansu
17	1931-08-11	47.1	89.8	8	Fuyun, Xinjiang
18	1950-08-15	28.4	96.7	8.6	Chayu, Xizang
19	1951-11-18	31.1	91.4	8	Dangxiang, Xizang
20	1976-07-28	39.4	118.0	7.8 – 8.2	Tangshan, Hebei
21	1997-11-08	35.2	87.3	7.9 – 8.0	Mani, Xizang
22	2001-11-14	36.2	90.9	8.1	Kunlunshan, Qinghai
23	2008-05-12	31.0	103.4	8.0	Wenchuan, Sichuan

Table 1. Catalogue of $M \geq 8$ great earthquakes in Mainland China from 1303 to 2010.

in eastern and western China, and a number of important results were achieved [19 – 22]. In the guidance of the informative prediction theory of Wen-Bo Weng [23 – 26], combining order analysis with complex network technology [27, 28], a $M \geq 8$ earthquake network was constructed and completed to predict the future $M \geq 8$ earthquakes, so that the prediction research of $M \geq 8$ great earthquakes could be advanced.

2. Ordered Network of $M \geq 8$ Great Earthquakes in Mainland China

This paper deals with a total of 23 $M \geq 8$ great earthquakes occurred in Mainland China since 1303 (Tab. 1), the average time interval between two adjacent earthquakes is 30.7 a. About the 23 events, there are 22 year numbers (2 great earthquakes in 1833 were recorded as one number). Thus, we get $C_{22}^2 = 231\,\tau$ values of time interval by pairwise subtraction. A numerical analysis shows the obvious orderliness of $M \geq 8$ great earthquakes. The main time interval, marked as τ, are 252 $\sim$ 258 a, 108 $\sim$ 112 a, 94 $\sim$ 98 a, 44 $\sim$ 48 a, 24 $\sim$ 25 a, 16 $\sim$ 19 a, and 11 $\sim$ 14 a. Specially, the 252 $\sim$ 258 a occurred most frequently. In Table 1, the 23 earthquakes can be divided into a main order series of great earthquakes (MOSGE) and a great earthquake order sub-series (GEOSS), and the MOSGE again can be divided into three great earthquake order series (GEOS).

2.1. Ordered Network Structure of MOSGE

The informational ordered network structure of $M \geq 8$ great earthquake chains from 1303 to 2010 in Mainland China is given in Figure 1, which is amended based on [18]. 15 $M \geq 8$ earthquakes are chosen (accounted for 65.2% of all earthquakes in Tab. 1). Each great earthquake is named by its occurred year number (followings are the same). 1303 is the origin of coordinate, with the way of double timing shaft, gradually extending by time series from left to right while from up to down, a two-dimensional planar network graph is constructed. To ensure the timing relationship between earthquakes, few events were repeated, such as 1556 (Huaxian in Shanxi 8.25), 1668 (Dancheng in Shandong 8.5), 1812 (Nileike in Xinjiang 8.0), and 1920 (Haiyuan in Ninxia 8.5). In Figure 1, each GEOS is named by the first earthquake in the related GEOS. Thus, we get the 1303 GEOS with eight earthquakes, the 1556 GEOS with nine earthquakes, and the 1812 GEOS with only two earthquakes. The former two GEOS are completed while the last one is uncompleted (see the top three horizons in Fig. 1).

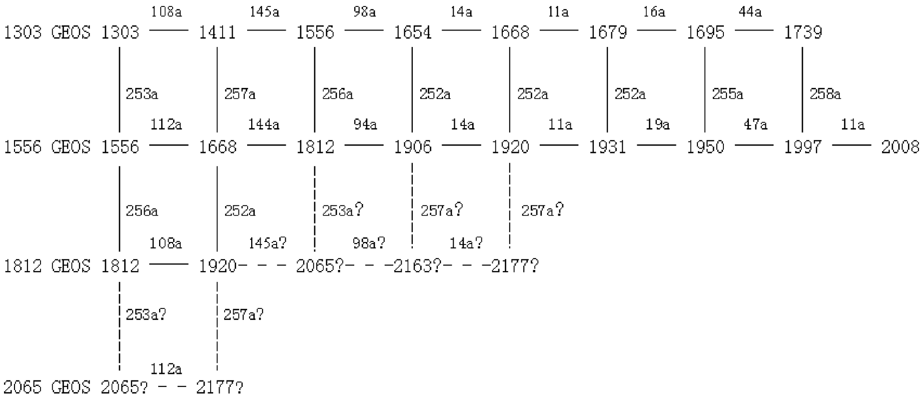

Fig. 1. Ordered network structure of $M \geq 8$ great earthquakes in Mainland China. (Note: Revised by Fig. 1 in [18]. Dotted line for prediction, followings are the same).

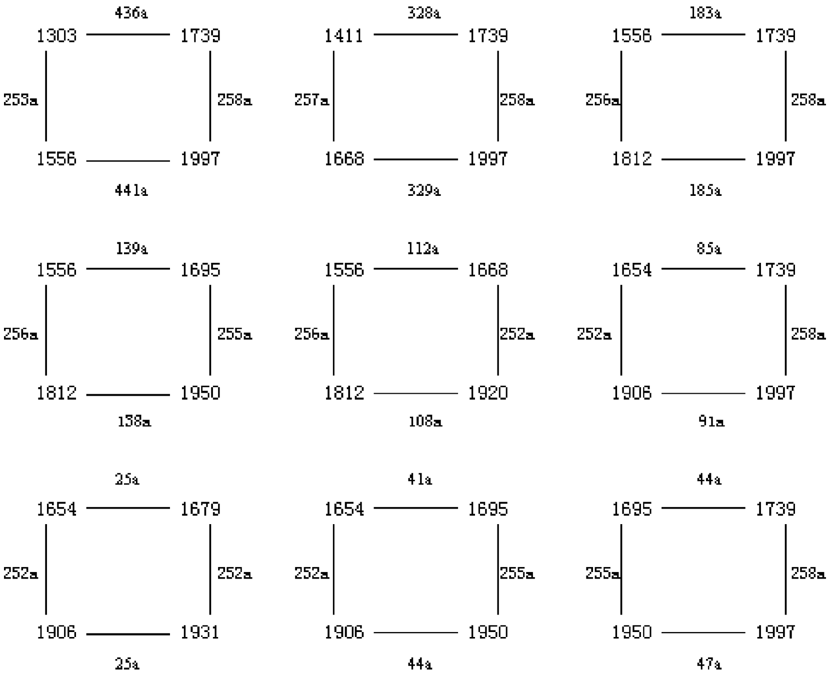

Fig. 2. Structure relationship between the 1303 GEOS and the 1556 GEOS.

Figure 1 demonstrates two features. Firstly, observe the 1303 GEOS and the 1556 GEOS, respectively; we find that the horizontal intervals are different in the range of 11 ∼ 145 a. It is chaotic. But put them together, it shows nice orderliness:

The interval sequence of the 1303 GEOS shows seven values: 108 a, 145 a, 98 a, 14 a, 11 a, 16 a, and 44 a; however in the 1556 GEOS, the seven intervals of the former eight events (except event 2008) are: 112 a, 144 a, 94 a, 14 a, 11 a, 19 a, and 47 a. Each interval of the 1303 GEOS might be equal to or deviate a little to corresponding intervals of the 1556 GEOS. The absolute value of the maximum deviation is rather small, only four years.

The second feature is more important: the values of the time interval between two corresponding events of every two GEOSes, that is, ten values of longitudinal interval are varied in a narrow range of 252 ∼ 258 a, among them, 252 a accounts for four, 256 a accounts for two, 253 a, 255 a, 257 a, and 258 a have one, respectively. The average interval is 254.3 a.

In Figure 1, the corresponding two earthquakes of the 1303 GEOS and the 1556 GEOS consist of eight pairs of ordered numbers. Each of the two pairs con-

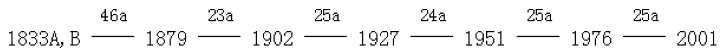

Fig. 3. Relationship between earthquake samples of the 1833 GEOSS.

structs 28 ordered combinations. That is 28 quadrilaterals. The opposite side in a quadrilateral is equal or deviates a little, the deviation is varied in a narrow range of $0 \sim 6$ a (see Fig. 2). It demonstrates the rather stable and symmetrical construction between the 1303 GEOS and the 1556 GEOS and the special meaning of the interval $252 \sim 258$ a in predicting $M \geq 8$ great earthquakes in Mainland China. The structure with the similar interval indicates a quite homogeneous medium, which means there might be a dynamic process control in a larger scale of the deep Earth. It is not accidental for information transferred by the interval values in Figure 1. They reflect the overall of objects movement and reveal the overall control of coupling on earth [15, 29, 30].

2.2. *Orderly Network Structure of GEOSS*

In Table 1, in the other eight earthquakes belonging to a GEOSS, we defined it the 1833 GEOSS (see Fig. 3), the time intervals are in narrow range of $24 \sim 25$ a or twice of that. The network structure of the 1833 GEOSS is shown in Figure 4.

Four corresponding earthquakes consist of a quadrilateral in the 1833 GEOSS (see Fig. 5). Two pairs of

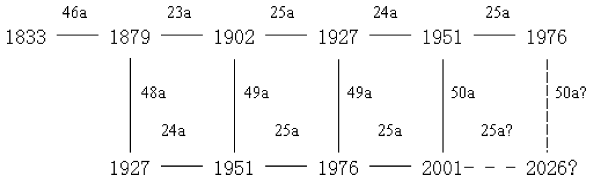

Fig. 4. Ordered network structure of the 1833 GEOSS and its prediction sketch.

opposite sides in a quadrilateral equal nearly or deviate in a narrow range of $0 \sim 5$ a.

The 1833 GEOSS is not isolated to the 1303 GEOS and the 1556 GEOS. In Figure 6, each quadrilateral has equal opposite sides, which is in order. It means the quite relation between them.

3. Example for Prediction

Since the early 21st century, four $M \geq 7$ earthquakes occurred in West China, three of which happened in the northern Xizang Plateau: the Kunlunshan M8.1 earthquake in 2001, Wenchuan M8.0 earthquake in 2008 and Yushu M7.3 earthquake in 2010. Combining the network structure of $M \geq 8$ great earthquakes in Mainland China with $M \geq 7$ strong earth-

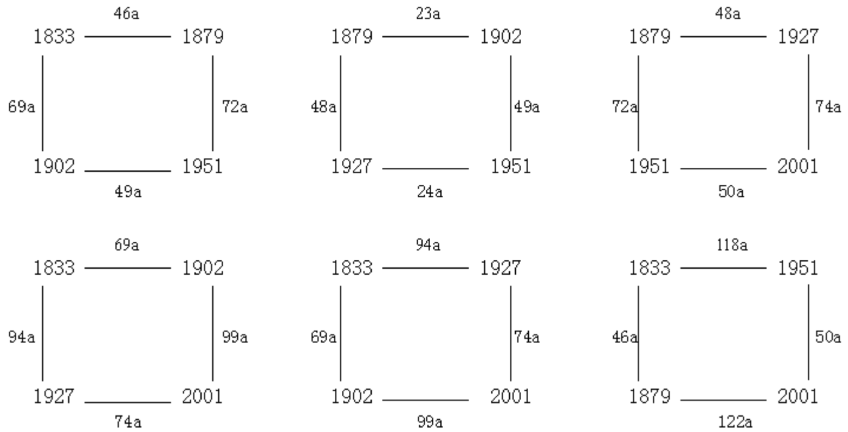

Fig. 5. Symmetrical and quadrilateral structure of the 1833 GEOSS.

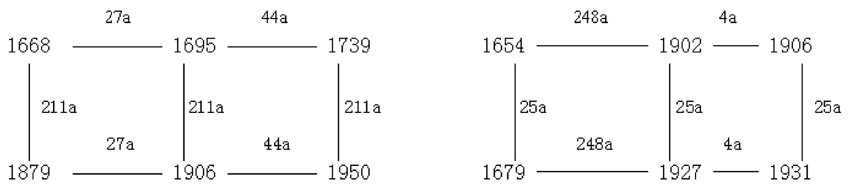

Fig. 6. Order relation between the 1833 GEOSS and the 1303 GEOS or the 1556 GEOS.

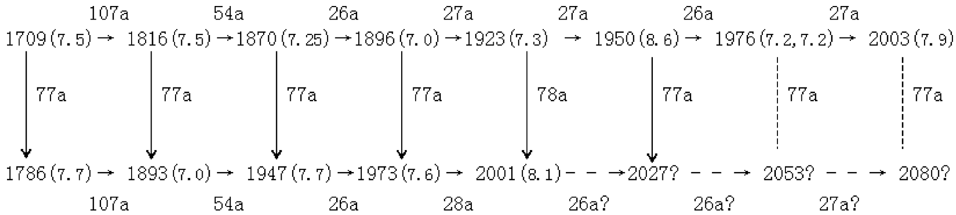

Fig. 7. Ordered network structure of $M \geq 7$ earthquakes in the large triangle region of West China. (The $M7.9$ earthquake occurred in 27 September 2003 in the Frontier of Russia, Mongol and China.)

quakes in related region, the geographical area can be minimized to offer accurate information for earthquake prediction.

3.1. Prediction of the 2001 Kunlunshan M8.1 Earthquake

In [19 – 22, 31, 32], the author has studied and constructed ordered network structures of $M \geq 7$ strong earthquakes in the northern Qinghai-Xizang Plateau and successfully predicted the $M8.1$ Kunlunshan great earthquake in 2001 (see Figs. 1, 4 – 10 in [28]).

The network structure of $M \geq 8$ great earthquakes given in Figure 1 fully reflects the information of the $M8.1$ Kunlunshan earthquake and the $M8.0$ Wenchuan earthquake. Combined with the $M \geq 7$ strong earthquake network structure in the northern Xizang Plateau, minimizing the region earthquake happened, the 2001 Kunlunshan $M8.1$ earthquake could be absolutely predicted.

The ordered network structure of $M \geq 7$ strong earthquakes in the large triangle region of West China (Xizang, Qinghai, and Xinjiang) is given in Figure 7. It not only reveals the relation among the Chayu $M8.6$ great earthquake in 1950, the Kunlunshan $M8.1$ great earthquake in 2001, and the $M7.9$ great earthquake in 2003 around the Chinese-Russian border, but also shows that the ordered value of 77 a has a momentous significance in prediction.

3.2. Prediction of the 2008 Wenchuan M8.0 Earthquake

3.2.1. Ordered Network Analysis of $M \geq 7$ Strong Earthquakes in the Qinghai-Xizang Plateau

Combining the network structure of $M \geq 8$ great earthquakes in Mainland China and $M \geq 7$ strong earthquakes in the Qinghai-Xizang Plateau, the

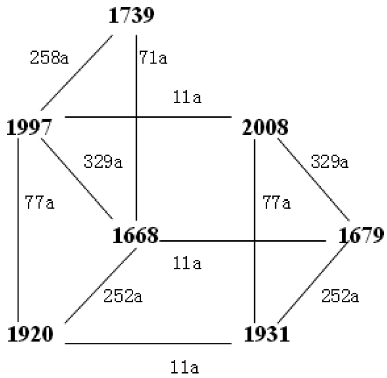

Fig. 8. Sketch of prediction for the Wenchuang $M8.0$ great earthquake.

Wenchuan $M8.0$ great earthquake in 2008 could be successfully predicted. Figures 1 and 5 in [28] also show the quite special meaning of the interval values $53 \sim 54$ a and $26 \sim 27$ a of $M \geq 7$ earthquakes in the Qinghai-Xizang Plateau to predict the Wenchuan $M8.0$ earthquake. In Figure 5 of [28], the interval values of earthquake events in three horizons are about $52 \sim 54$ a, which is very clear. The quadrilateral formed by the 1947, 1954, 2001, and 2008 events clearly conveys the time information of the Wenchuan earthquake.

3.2.2. Ordered Network Analysis of $M \geq 8$ Great Earthquakes in Mainland China

With the technology of genetic bonding in biology engineering, Figure 8, which is a 3D figure, was constructed based on Figure 1. In Figure 8, there are three quadrilaterals whose opposite sides are equal. The structure is very nice, symmetrical and orderly (see Fig. 9). The four ordered values – 11 a, 77 a, 252 a, and 329 a – are the most important in prediction. The relation among them may be stated as follows:

$$77\text{ a} = 11\text{ a} \cdot 7,\ 252\text{ a} = 77\text{ a} \cdot 3 + 11\text{ a} \cdot 2,$$
$$329\text{ a} = 252\text{ a} + 77\text{ a}.$$

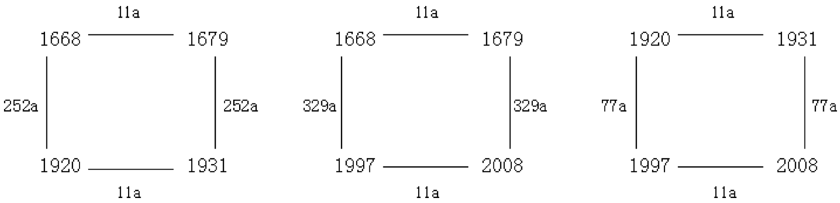

Fig. 9. Three quadrilaterals with stable and symmetrical structure.

It reveals the occurrence rule for the Wenchuan $M8.0$ earthquake. With the ordered network structure of $M \geq 7$ strong earthquakes in the northern Qinghai-Xizang Plateau, the Wenchuan great earthquake should have been predicted.

As everyone knows, the average period of sunspot activity is about 11 a, the magnetic period of it is 22 a. $M \geq 7$ strong earthquakes occurred in western Mainland China one year ago or later than sunspot peak or valley. Dating from 1755, 1996 is the valley of the 23rd solar circle. According to the observations of the Beijing Astronomical Observatories, Chinese Academy of Sciences, 2007 – 2009 are very low solar activity years. The sunspot relative number is less than ten for three years in a row. 2008 is in the valley of the 24th solar circle. With the astronomical background, the Wenchuan $M8.0$ earthquake is absolutely no accident. Besides, solar activity has been in rise period of the 24th solar circle since 2010. In prediction, the peak may be around 2013–2014, while the next one may be around 2025–2026. The astronomical background changes deserve high attention.

3.2.3. Analysis on Commensurability

To predict the Wenchuan $M8.0$ earthquake, Qing-Guo Geng has proposed the meaningful analysis method of commensurable element. Based on Figure 1, for the 1303 GEOS with the commensurable elements 44 a, 16 a, 14 a, and 11 a, the commensurable operations are as follows:

$$
\begin{aligned}
&1303 + 8 \cdot (\underline{44+44}) = 2007\,,\\
&1411 + 6 \cdot (\underline{44+44}) + 44 + 14 + 11 = 2008\,,\\
&1556 + 4 \cdot (\underline{44+44}) + 44 + 2 \cdot (\underline{14+14}) = 2008\,,\\
&1654 + 3 \cdot (\underline{44+44}) + \underline{16+16} + 16 + \underline{14+14} + 14\\
&= 2008\,,\\
&1668 + 3 \cdot (\underline{44+44}) + 44 + \underline{16+16} = 2008\,,\\
&1679 + 3 \cdot (\underline{44+44}) + \underline{16+16} + \underline{11+11} + 11 = 2008\,,\\
&1695 + 3 \cdot (\underline{44+44}) + 16 + \underline{11+11} + 11 = 2008\,,\\
&1739 + 2 \cdot (\underline{44+44}) + \underline{16+16} + \underline{14+14} + \underline{11+11}\\
&+ 11 = 2008\,.
\end{aligned}
$$

For the 1556 GEOS, with the commensurable elements 47 a, 19 a, 14 a, and 11 a, the commensurable operations are given as follows:

$$
\begin{aligned}
&1556 + 4 \cdot (\underline{47+47}) + 2 \cdot (\underline{19+19}) = 2008\,,\\
&1668 + 3 \cdot (\underline{47+47}) + 47 + 11 = 2008\,,\\
&1812 + \underline{47+47} + 47 + 19 + 14 + \underline{11+11} = 2008\,,\\
&1906 + 47 + 19 + 14 + \underline{11+11} = 2008\,,\\
&1920 + \underline{19+19} + \underline{14+14} + \underline{11+11} = 2008\,,\\
&1931 + 47 + 19 + 11 = 2008\,,\\
&1950 + 47 + 11 = 2008\,,\\
&1997 + 11 = 2008\,.
\end{aligned}
$$

For the 1812 GEOS, with the commensurable elements 98 a and 44 a, the commensurable operations are given as follows:

$$
\begin{aligned}
&1812 + 98 + 98 = 2008\,,\\
&1920 + 44 + 44 = 2008\,.
\end{aligned}
$$

In a word, an $M8$ great earthquake would happen in China in 2008. And then, Q.-G. Geng proposed the short term and impending prediction with the strong geomagnetic storm combination method: a $M7.5$ strong earthquake was very likely to happen on 8 May 2008 (error is ± 10 days) [33].

3.3. Future Prediction of $M \geq 8$ Great Earthquakes in Mainland China

(i) The structural relationship of $M \geq 8$ great earthquake chains in 700 years in Mainland China is given in Figure 1. It reveals the regular, the trend, and the prediction of $M \geq 8$ great earthquakes. In Figure 1, the first vertical is 509 a, that is, 1303 (+253 a) $\rightarrow$

1556 (+256 a) → 1812. The second vertical is also 509 a, that is, 1411 (+257 a) → 1668 (+252 a) → 1920. It is not accidental. If the activity of $M \geq 8$ great earthquakes keeps the regular, the third vertical should be 509 a, too, that is from 1556 to 1812 and to 2065. According to Figure 1, we could predict that the next $M \geq 8$ great earthquake might happen around 2064 – 2068. Also the fourth and fifth vertical are the same, that is:

(i) 1654 (+252 a) → 1906 (+257 a) → 2163?
(ii) 1668 (+252 a) → 1920 (+257 a) → 2177?

If an $M \geq 8$ great earthquake really occurs in 2065, 2065 would be the first $M \geq 8$ earthquake of the future GEOS; we defined it as the 2065 GEOS (see as the dotted line in Fig. 1).

(ii) In Figure 4, eight earthquakes belong to the 1833 GEOSS. Based on Figure 4, we predict that about 2026 an $M8$ great earthquake might occur in Mainland China.

In the 1833 GEOSS of Table 1, we select six samples of great earthquake and express them separately as follows:

$$x_1 = 1879\,,\ x_2 = 1902\,,\ x_3 = 1927\,,$$
$$x_4 = 1951\,,\ x_5 = 1976\,,\ x_6 = 2001\,.$$

Then the eight three-variable commensurable formulas can be obtained as

$$x_6 + x_5 - x_4 = 2026\,,\ x_6 + x_3 - x_2 = 2026\,,$$
$$x_6 + x_6 - x_5 = 2026\,,\ x_5 + x_4 - x_2 = 2025\,,$$
$$x_6 + x_4 - x_3 = 2025\,,\ x_5 + x_5 - x_3 = 2025\,,$$
$$x_6 + x_2 - x_1 = 2024\,,\ x_5 + x_3 - x_1 = 2024\,.$$

It also shows that the time point of 2026 is not accidental. In another word, it is quite possible that the next $M \geq 8$ earthquake may occur during 2024 – 2026 in Mainland China.

In sum, based on the analysis on the network structure of $M \geq 8$ great earthquakes, we propose some moderate term and long term predictions as follows: the future $M \geq 8$ great earthquakes might occur around 2026 and 2065, 2065 is the most possible. Great earthquake prediction is a gradual process. The latter short term and imminent prediction is based on the mid-and-long term prediction, combining multidisciplinary with multi-method, focusing on information of great earthquakes and minimizing prediction scale to lock and capture great earthquakes.

4. Conclusion and Discussion

(i) During the 1980s, W.-B. Weng created the information forecasting theory and made outstanding achievements in the forecasting of earthquakes and other natural disasters such as drought and flood, opening up a brand-new path for the prediction of major natural disaster. Information forecasting theory, which combines the advantages of Chinese and Western cultures, is a major theoretical innovation in contemporary natural disaster prediction [23 – 26]. W.-B. Weng divided forecasting methods into two kinds, one is based on the commonality of elements which is called statistical forecasting, and another is based on special elements which is called informative forecasting. Statistical forecasting mainly studies gradient events forecast, it requires a large sample size and a typical distribution. For the great earthquake emergency with small samples and poor information, this kind of forecast looks powerless. However, the order network approach, which belongs to the information forecasts category, is based on the characteristics of the study, it is based on an open, dynamic holistic view, and specially focuses on excavating from all original disorder information and extracting higher order useful information (i.e. feature information); so it is more usefull for great earthquake prediction.

(ii) The 21st century is the network age, a complex network idea and theories have penetrated to each aspect of natural science and social science [34 – 36]. Therefore, the complex network technology also is applied to the $M8$ great earthquake prediction research. Great earthquake chain network is a kind of implicit network. Great earthquake chain and its network, as a whole, must contain and display the amount of information more than a single earthquake sample information. The network characteristic which presents great earthquake activities should be a mechanism for the formation of great earthquakes. The concept of constrained generating procedures was put forward by Holland in 1998 [37]. In this paper, the network of $M8$ earthquakes in Mainland China is a simple constrained generating process with different parameters or information. 252 a and 256 a, which are the most important parameters, are the main connection of the three great earthquake ordered series which are composed of great earthquakes network, with the features of participation and integration. According to the view of bio-genetic explain, a self-replicating reproduction of the 1556 GEOS from sample 1556 to sample 1997 is vary similar to the 1303 GEOS [16, 18]. But in difference to that, the 1303 GEOS was suspended after the 1739 Yinchuan M8.0 earthquake, while the 1556 GEOS occurred 'variant' or 'cancer' in 2008 after the Mani earthquake in 1997, which was the Wenchuan M8.0 great earthquake. Perhaps the geophysical disaster chain will continue with variation.

(iii) By Table 1, the $M \geq 8$ great earthquakes in Mainland China can be divided into two clustering periods. In the first period, 1303 – 1739, the great earthquake activity center region was located in the eastern and central Mainland China. After calm 73 years, from 1812 to the present lasts the second clustering period. Here the great earthquake activity center moved to the western and central regions. The previous activity center may be affected by the present activity center; the $M \geq 8$ great earthquakes occur individually, but the activity level is not as high as the original. On 11 March 2011, a super-great earthquake of M9.0 occurred near the northeast coast of Honshu, Japan (38.1°N, 142.6°E): Will it affect the shift of the $M \geq 8$ great earthquakes activity center in Mainland China? This issue deserves our further attention [17, 18].

(iv) The 23 $M \geq 8$ great earthquakes, which occurred in Mainland China, have a significant self-organized orderliness in time, characterized by a nice ordered network structure, and show the importance of historical research for the understanding of the unknown features of great earthquakes. This concept and method differ from the traditional elastic rebound hypothesis and statistical method, but also provide a new instance for the network hypothesis. In this paper, the proposed network structure covers highly and reveals the complex and ordered feature of the $M \geq 8$ great earthquake activity in Mainland China within more than 700 years, and will help us to deeply understand the rule of $M \geq 8$ great earthquakes, in order to advance the prediction research. The orderly network analysis is a visual image, a concise and easy way of moderate term and long term prediction, it avoids the complicated and non-identifiable analysis by the traditional mathematical model. Although earthquake prediction is a world problem, a great earthquake can be predicted. In this paper, the forecast summary of the three major earthquakes in western China Mainland since the early 21st century shows again that the network structure analysis, which is based on the information forecasting theory of W.-B. Weng, is an effective method of moderate term and long term leaping prediction of strong or great earthquakes.

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