

## The Statistical Analysis of Chinese Earthquake Events in the Past Five Years

Li Yang\*, Huan Liu, Jiawei Liao

Chengdu University of Technology, Sichuan Chengdu 610059, China

\*1124390551@qq.com

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*Abstract: China is an earthquake-prone country, and the statistical analysis of the earthquake events in the past five years has some reference significances for earthquake prediction and disaster prevention and mitigation. In this paper, we firstly obtain the data of the earthquake occurrence in China from 2012 to 2017 from the China Seismological Network, and the data includes the time, the latitude and longitude, the magnitude, the focal depth and the place of the earthquake occurrence. Then the seismic magnitude, focal depth and seismic location were analyzed. In the process of analyzing seismic magnitude, the share of microseisms, weak earthquakes, medium strong earthquakes and strong earthquakes accounted for the total number of earthquakes is obtained, and the function relationship between seismic magnitude and its corresponding the number of times is obtained, which satisfies the double Gaussian function. In the process of analyzing the focal depth, the share of shallow, middle and deep earthquakes accounted for the total number of earthquakes is obtained. Then we statistics the number in accordance with the focal depth at every 1Km, and the function relationship between focal depth and its corresponding the number of times is obtained, which satisfies the 3 Gaussian function. In the process of analyzing the seismic location, the number of earthquakes in the provincial administrative regions in recent five years are obtained, and the number of earthquakes in Chinese provincial administrative regions in the past five years have been shown on the China map, and there are eight provinces in China where the number of earthquakes occurred more, which is consistent with the distribution of Chinese seismic zone.*

*Keywords: earthquake, location, Analysis*

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### 1. INTRODUCTION

Earthquakes are one of the important manifestations of the internal tectonic movement of the earth, and can complete the rupture of the rock mass in the earthquake source area in a short period of time (a few seconds to several minutes), then release large amounts of energy resulting in causing massive earthquakes on the ground, and finally causes the serious damage to the earth's social environment and natural environment. However, China is one of the

countries which have the largest number of earthquakes in the world, and the statistical analysis of the earthquake events in recent five years has some reference significance for earthquake prediction and disaster prevention and mitigation<sup>[1]</sup>. Therefore, in this paper we obtain the nearly five years seismic data from the Chinese seismic network, and then analyze the data according to the seismic magnitude, the focal depth and the location of the earthquake.

## 2 THE STATISTICAL ANALYSIS OF THE SEISMIC MAGNITUDE, THE FOCAL DEPTH AND THE LOCATION OF THE EARTHQUAKE

### 2.1 The seismic magnitude

In this paper, the earthquake magnitude is divided into the microseism, the weak earthquake, the medium strong earthquake and the strong earthquake according to the damage of magnitude<sup>[2]</sup>. Then we use Matlab to process the data of earthquakes according to the above classification, and obtaining the share of the microseism, the weak earthquake, the medium strong earthquake and the strong earthquake, which the share is 83%, 8% and 1% respectively. Therefore it can be concluded that the weak earthquake accounts for a large proportion in China.

After analyzing the damage of the earthquake, the paper analyzes the earthquake magnitude and its corresponding times.

The seismic magnitude and its corresponding times are shown in Figure 1. It can be seen from Figure1 that the data distribution is similar to the Gaussian function. So in this paper we use the least squares method to carry on the double Gaussian function fitting to get the relationship between the seismic magnitude and its corresponding times. The relationship is as shown in formula (1).

$$y = 475.5 * e^{-\left(\frac{x-7.7}{3.31}\right)^2} + 83.13 * e^{-\left(\frac{x-15.53}{4.87}\right)^2} \quad R^2 = 0.9252 \quad (1)$$

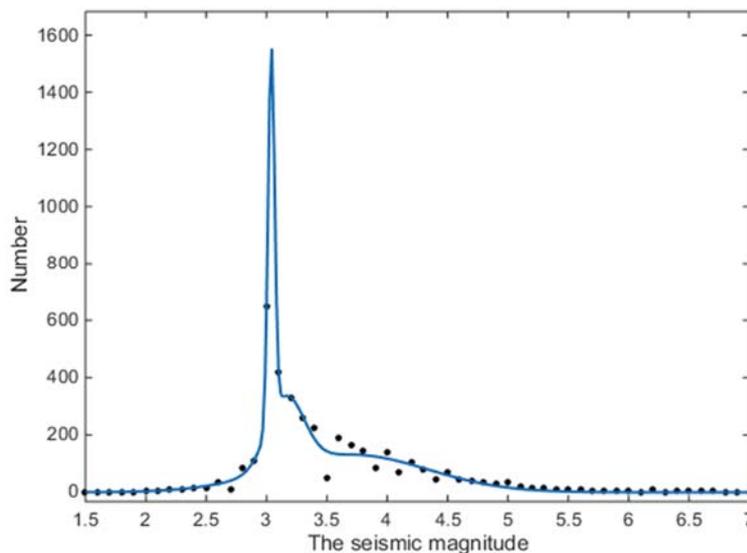


Fig 1 The seismic magnitude and its times

## 2.2 The focal depth

The depth from the epicenter to the surface is called the focal depth. In this paper, the focal depth is processed according to the classification of shallow source, middle source and deep source earthquake<sup>[3,4]</sup>.

After the seismic data were processed, the share that the shallow, medium and deep earthquake accounts for the total number of earthquakes is respectively 97.78%, 2.11% and 0.027373%. So it can be concluded that in the Chinese earthquake events, shallow earthquakes account for a large proportions, and the probability of deep earthquakes is small, and can be ignored.

Then we statistics the number in accordance with the focal depth at every 1Km, and the data obtained from the statistics are shown in Figure 2.

And then the least squares method is used to processes the statistical data by 3 Gaussian fitting. The relationship is as shown in formula(2).

$$y = 1313 * e^{-\left(\frac{x-3.04}{0.038}\right)^2} + 244.8 * e^{-\left(\frac{x-3.16}{0.212}\right)^2} + 131.1 * e^{-\left(\frac{x-3.7}{0.9}\right)^2} \quad R^2 = 0.9751 \quad (2)$$

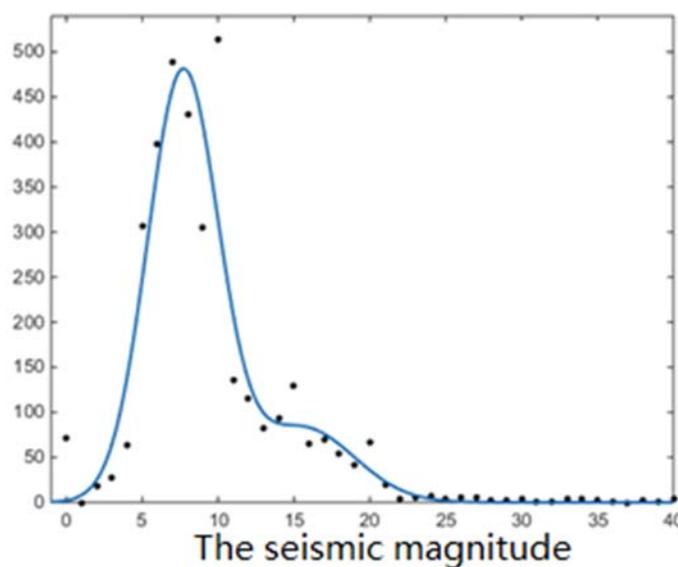


Fig 2 The focal depth and its times

## 2.3 The location of the earthquake

This paper classifies earthquakes in China according to the provincial administrative regions, and then counts the number of earthquakes in the every provincial administrative regions. The obtained data are shown in Table1.

Table1 The number of earthquakes in the every provincial administrative regions in recent 5 years

Serial number	Provincial administrative region	The number of earthquakes	Serial number	Provincial administrative region	The number of earthquakes
1	Sichuan	566	18	Hubei	16
2	Beijing	0	19	Guangxi	11
3	Tianjin	6	20	Gansu	89
4	Shanghai	0	21	Shanxi	32
5	Chongqing	18	22	Inner Mongolia	101
6	Hebei	42	23	Shaanxi	31
7	Henan	4	24	Jilin	36
8	Yunnan	418	25	Fujian	18
9	Liaoning	48	26	Guizhou	15
10	Heilongjiang	12	27	Guangdong	34
11	Hunan	4	28	Qinghai	178
12	Anhui	18	29	Tibet	360
13	Shandong	36	30	Ningxia	23
14	Sinkiang	1157	31	Hainan	1
15	Jiangsu	15	32	Taiwan	266
16	Zhejiang	25	33	Hongkong	0
17	Jiangxi	4	34	Macao	0

From Table1, it can be concluded that in the past five years, there are more earthquakes happening in Sichuan, Yunnan, Xinjiang, Shaanxi, Inner Mongolia, Qinghai, Tibet and Taiwan. The reasons of the phenomenon are that Inner Mongolia and Shaanxi are in China's North China earthquake zone, Qinghai, Tibet and Xinjiang are in the Qinghai-Tibet Plateau earthquake area, Taiwan is in Taiwan earthquake area, and Sichuan is in Sichuan Longmen Mountain seismic zone that is particularly active in recent years.

### 3. CONCLUSION

In this paper, through the above five years of Chinese earthquake statistical analysis, we obtain the following results through statistical analysis for Chinese earthquake event in recent five years:

(1) We has obtained the share of microseisms, weak earthquakes, strong earthquakes and strong earthquakes account for the total number of earthquakes in the recent five years in China, and the weak earthquake accounts for a large proportion of the earthquakes, and the function of earthquake magnitude and its corresponding number of times in the past five years in China.

(2) We has obtained the share of the shallow, medium and deep earthquake accounts for the total number of earthquakes in the recent five years in China, and the shallow earthquake accounts for a large proportion of the earthquakes, and the function of the focal depth and its corresponding number of times.

(3) We get the number of earthquakes in the past five years in China. In addition, we also has obtained that 8 provinces in China have more earthquakes, which is consistent with the distribution of China's seismic zone.

## **REFERENCES**

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