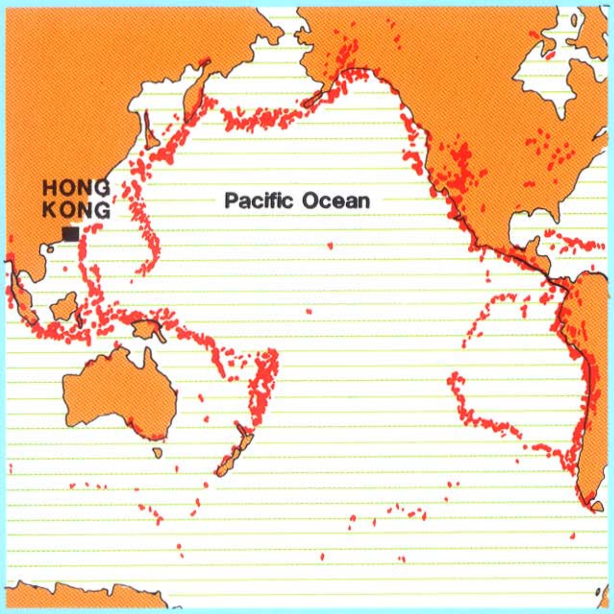
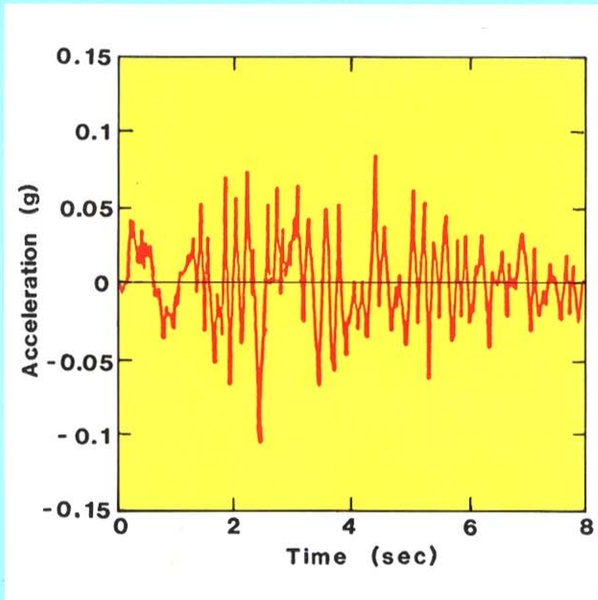
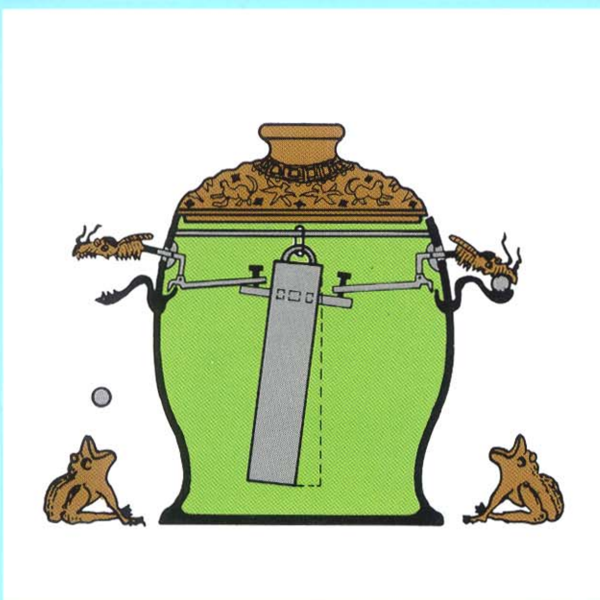
GCO PUBLICATION No. 1/91

# REVIEW OF EARTHQUAKE DATA FOR THE HONG KONG REGION




**GEOTECHNICAL CONTROL OFFICE**
**Civil Engineering Services Department**
**Hong Kong**

GCO PUBLICATION No. 1/91

# REVIEW OF EARTHQUAKE DATA FOR THE HONG KONG REGION

GEOTECHNICAL CONTROL OFFICE
Civil Engineering Services Department
Hong Kong

© Government of Hong Kong

First published, May 1991

Prepared by :

Geotechnical Control Office,
Civil Engineering Services Department,
6th Floor, Empire Centre,
68, Mody Road,
Kowloon,
Hong Kong.

Captions of Figures on the Front Cover :

| | |
|---|---|
| Top Left | Seismicity Map Showing the Circum-Pacific Belt |
| Top Right | Part of a Trace Recorded by an Accelerograph |
| Bottom Left | Diagrammatic Sketch Showing the Chang Heng Seismograph |
| Bottom Right | Locations of Earthquake Epicentres in the Hong Kong Region |

This publication is available from :

Government Publications Centre,
General Post Office Building,
Ground Floor,
Connaught Place,
Hong Kong.

Overseas orders should be placed with :

Publications (Sales) Office,
Information Services Department,
1, Battery Path,
Central,
Hong Kong.

Price in Hong Kong : HK$42

Price overseas : US$11.50 (including surface postage)

Cheques, bank drafts or money orders must be made payable to HONG KONG GOVERNMENT

# FOREWORD

This document presents the results of a review of earthquake information for a region within about 350 km of Hong Kong. As part of the review, earthquake magnitudes published previously have been critically examined, and where appropriate, these have been re-calculated. The earthquake magnitudes given here may be used with greater confidence for any subsequent assessment of seismic risk in Hong Kong.

The review was carried out by Mr W.K. Pun as an MSc project under the direction of Professor N.N. Ambraseys at the Imperial College of Science, Technology and Medicine of the University of London. This publication was checked and edited by Drs P.L.R. Pang and R.P. Martin.

Numerous other staff of the Geotechnical Control Office and the Royal Observatory of Hong Kong, as well as the Guangdong Bureau of Seismology and the International Seismological Centre, provided assistance in the course of the review. In particular, Professor Y.Z. Ding supplied many seismic data and references. All these contributions are gratefully acknowledged.

(A.W. Malone)
Principal Government Geotechnical Engineer
May 1991

# CONTENTS

# 1. INTRODUCTION

Hong Kong appears to be situated in an area of relatively low seismicity judging by the scarcity of earthquake data for the region. Previous work has been carried out by the Hong Kong Royal Observatory to collect earthquake data for a region within 320 km of Hong Kong and to evaluate local seismicity (Lau, 1972; Lam, 1980). The data given by Lau (1972) cover only a short period of 38 years. Some historical earthquakes are listed by Lam (1980), but other data which are contained in Chinese and international publications have now become available. The earthquake magnitudes reported by Lau (1972) and Lam (1980) were taken directly from earlier Chinese publications without re-calculation.

During the 1980s, there has been increasing public expression of interest in the seismicity of Hong Kong. It is considered timely to review the earthquake database for the Hong Kong region, in order to provide reliable data for assessing seismic risk in Hong Kong and predicting the effects of earthquakes.

This document presents the results of a review of available information on historical and recent earthquakes with epicentres in the Hong Kong region. The region covered by the review is bounded by longitudes 111°E and 117°E, and latitudes 19.5°N and 25.5°N, i.e. area ABCD shown in Figure 1. A less intensive review of published information on earthquakes originating in the area surrounding the region has also been carried out. An assessment of all the information studied indicates that earthquakes which occur outside the region are generally less critical than those inside for the purpose of aseismic design in Hong Kong.

# 2. EARTHQUAKE RECORDS

## 2.1 SOURCES OF RECORDS

A review of all the available literature known to the Geotechnical Control Office has been carried out in compiling the earthquake records. Owing to the location under study, Chinese publications on earthquakes have been found to be particularly useful. A brief discussion of the background to the relevant Chinese publications is given below.

In China, ancient records on earthquakes date back to almost 4 000 years B.P. In Guangdong Province, the first documented earthquake occurred in 288 A.D. Some early western publications containing earthquake information for Guangdong Province are those by Biot (1841), MacGowan (1887), Omori (1893), Hirota (1908), Parker (1909), Hoang (1909), Drake (1912a; 1912b) and Sieberg (1932).

In 1956, the Academia Sinica in China published a two-volume document entitled "Chronological Tables of Earthquake Data of China" (Academia Sinica, 1956). With over 3 000 years of earthquake records, this was the first extensive compilation of Chinese earthquake data. These data were later compiled into an earthquake catalogue by the Academia Sinica, Institute of Geophysics (Academia Sinica, 1970). Since then, various updated catalogues on Chinese earthquakes have been published from time to time (e.g. Academia Sinica, 1974; 1976).

In addition to the catalogues published by the Academia Sinica, seismological authorities in a number of Chinese provinces have also published their own catalogues to include local earthquakes of smaller magnitudes (e.g. Seismological Brigade of Guangzhou, 1974).

In the late 1970s, a committee was set up in China to review and consolidate all the existing documents on earthquake records. This resulted in a five-volume set of catalogues entitled "Compilation of Historical Materials on Chinese Earthquakes", published between 1983 and 1986 by the Editorial Committee on Historical Materials on Chinese Earthquakes.

Apart from the catalogues mentioned above, information on earthquakes in the Hong Kong region is also available from Gutenberg & Richter (1954), Gorshkov (1960), Lau (1972), Lee et al (1976; 1978), Lam (1980), Lam & Fong (1982), Ding et al (1984) and Pun (1990), as well as from the earthquake databases of various international authorities on earthquakes such as the International Seismological Centre (ISC) in Newbury, UK and the Global Seismology Group of the British Geological Survey in Edinburgh, UK.

## 2.2 TABLES ON EARTHQUAKES

Table 1 contains a summary of dates and locations where earthquake shocks have been recorded within the area ABCD shown in Figure 1, listed in chronological order. This list, which is up to 1980, has been compiled on the basis of information given by the Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986). It is reasonable to expect that the historical records are incomplete. Nevertheless, all major events are likely to have been included. It should be noted that from 1949 onwards there are only a few records for Guangdong Province. These records correspond to events with surface-wave magnitude greater than 4.7. The smaller events appear to have been omitted by the Editorial Committee. There is no record of any earthquake after 1969.

In Table 1, only about half of the cases reported by the Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986) for Guangdong Province have been included. The remaining cases have been omitted as they are either references to aftershocks or descriptions of the same earthquakes appearing in various publications.

Data on intensity, magnitude and other seismic parameters are available for the larger earthquakes. In Table 2, a list of such data has been compiled for earthquakes that have occurred within the area ABCD, either with macroseismic magnitude ≥ 4¾, or instrumental magnitude ≥ 4.0. This list is up to the end of 1989. The epicentres of the listed earthquakes are shown in Figure 1. Table 2 has been compiled on the basis of information given in the following sources :

(a) Earthquake database of the ISC.

(b) Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986).

(c) Lee et al (1976).

(d) Ding et al (1984).

Data from other sources have not been included due to uncertainties about the reliability of the data. The magnitudes given in Table 2 are reassessed values as described in Section 2.3 below.

In the earthquake database maintained by the ISC, there is information on a series of earthquakes originating in the South China Sea which are reported under the agency code LAO for the period 1966 to 1968. These events were determined by the Large Aperture Seismic Array (LASA) in Montana, USA. However, these earthquakes have not been reported by any other seismological stations. Also, there is no record of the effects produced by these events in the Chinese earthquake catalogues. Ambraseys & Adams (1986) considered these LASA records to be completely spurious. They believed that these events had been grossly mislocated as a result of an automatic analysis adopted which misinterpreted some core phases of the seismic waves. In view of the doubts expressed, the LASA events have not been included in Table 2.

Table 2 contains data on the main shock (1962 Mar 18) and aftershocks (e.g. 1962 Apr 05) of an earthquake induced by the impounding of the Xinfengjiang Reservoir at Heyuan.

## 2.3 EARTHQUAKE MAGNITUDES

### 2.3.1 General

One of the seismic parameters given in Table 2 is earthquake magnitude, which is a measure of the size of an earthquake. There are many types of earthquake magnitudes, e.g. local magnitude $M_L$, body-wave magnitude $m_b$, surface-wave magnitude $M_S$ and moment magnitude $M_w$ (see Glossary of Terms for definitions). For the purpose of seismic risk studies, the surface-wave magnitude is the most commonly used.

### 2.3.2 Macroseismic Magnitudes

For early earthquake events, no instrumental data are available and earthquake magnitudes have to be estimated from empirical correlations. Relationships between magnitude (often the surface-wave magnitude) and epicentral intensity are usually used. The resulting magnitude values are known as macroseismic magnitudes. The magnitudes quoted in the Chinese publications for events which occurred prior to this century correspond to such values.

The use of empirical correlations to convert epicentral intensity to magnitude has attracted much criticism. The main shortcoming is that the scatter in the data used to establish the correlations is usually so large that one estimate of magnitude can be associated with several intensity levels. Ambraseys (1985) adopted an approach for estimating magnitude which takes into account the spatial distribution of earthquake intensities. This approach is generally considered to yield more realistic results than those given by other correlation methods. However, information on both instrumental magnitude and isoseismal distribution for a number of earthquakes is required in order to establish the magnitude-intensity-distance relationship for a region.

Within the area ABCD shown in Figure 1, there have been only four earthquakes for which both instrumental magnitude data and corresponding isoseismal maps are available. In order to obtain a representative relationship for the region, data from five more earthquakes which are just outside the study area were also used. By means of an optimisation process, the following relationship has been derived (Pun, 1990) :

$$M_{SC} = 0.87 + 0.54j^{-1}\Sigma I_i + 1.57\times10^{-3}j^{-1}\Sigma R_i + 1.06j^{-1}\Sigma\log_{10}(R_i) \quad \ldots\ldots\ldots (1)$$

where $M_{SC}$ = macroseismic surface-wave magnitude
$I_i$ = earthquake intensity of rating i, based on the Chinese Intensity Scale (Hsieh, 1957)
$j$ = number of isoseismals constructed for the earthquake ($j \geq 1$)
$R_i$ = radius of isoseismal corresponding to earthquake intensity of rating i

The above equation was then used by Pun (1990) to calculate the macroseismic surface-wave magnitude of all earthquakes for which isoseismals have been constructed. These events can be identified easily in Table 2 as they are events with $R_i$ values.

A comparision of the $M_{SC}$ values and the corresponding $M_S$ values of the nine earthquakes used for optimisation is shown in Figure 2. Bearing in mind the reliability of the macroseismic data, all macroseismic magnitude estimates were rounded to the nearest ¼ unit. After adopting this rounding off procedure, the difference between the calculated macroseismic surface-wave magnitudes and the values quoted in other earthquake catalogues is found to be not greater than ¼ (see Table 3).

### 2.3.3 Instrumental Magnitudes

Since the begining of this century, seismographs have been installed by various national authorities to record ground displacements during earthquakes. The amplitudes and the corresponding periods of the recorded seismic waves are published in seismological station bulletins. These instrumental data are used for determining earthquake magnitudes.

For the earthquakes within the study area, there is a concern that some of the published magnitudes may not be accurate. Moreover, different formulae have been used by different authorities for the calculation of magnitude. In order to obtain a consistent set of results, the surface-wave magnitudes $M_S$ of all earthquakes for which amplitude and period data are available have been re-calculated using the Prague formula (Vanek et al, 1962):

$$M_S = \log_{10}(A/T) + 1.66\log_{10}(\Delta) + 3.3 + C \quad \ldots\ldots\ldots\ldots (2)$$

where $A$ = amplitude of surface wave in microns measured from the trace recorded by a seismograph
$T$ = corresponding period of surface wave in seconds
$A/T$ = maximum A/T ratio for a given record
$\Delta$ = $\cos^{-1}[\sin(\phi_1)\sin(\phi_2) + \cos(\phi_1)\cos(\phi_2)\cos(\lambda_2-\lambda_1)]$, the distance in degrees between a seismological station and an epicentre
$\phi_1$ = latitude of the seismological station
$\phi_2$ = latitude of the epicentre
$\lambda_1$ = longitude of the seismological station
$\lambda_2$ = longitude of the epicentre
$C$ = station correction

The parameter C in equation (2) above has been determined empirically for each seismological station from data on past earthquakes originating within area ABCD. Reference should be made to Pun (1990) for details of these determinations.

The difference between the published and re-calculated values of the surface-wave magnitudes is generally not greater than 0.3 (see Appendix A).

### 2.3.4 Magnitude Selection

In compiling the surface-wave magnitudes given in Table 2, the values re-calculated using the Prague formula were adopted wherever available. In cases where there were no amplitude and period data to permit such a calculation, the instrumental surface-wave magnitudes given by the Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986) or in the ISC earthquake database have been quoted. For cases without instrumental magnitudes, the macroseismic surface-wave magnitude is estimated from equation (1). Where isoseismal records are not available, macroseismic magnitudes have been taken directly from the catalogue published by the Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986), or from Lee et al (1976) and Ding et al (1984).

## 3. SUMMARY SHEETS ON EARTHQUAKES

Appendix A contains summary sheets on all known post-1900 earthquakes within the area ABCD shown in Figure 1. Explanatory notes are given in the Appendix on the layout of the sheets as well as the symbols used. For earthquakes which occurred prior to 1900, no summary sheets have been prepared as only limited information is available. The available data on these events have already been included in Table 2.

# 4. CONCLUSION

A review of earthquake information for a region within about 350 km of Hong Kong has been carried out. Where possible, earthquake magnitudes have been re-calculated. The difference between the re-calculated magnitudes and those given in previous publications is generally not greater than ¼ for earthquakes with macroseismic data and 0.3 for those with instrumental data. The earthquake magnitudes given in Table 2 may be used with greater confidence for any subsequent assessment of seismic risk in Hong Kong.

# 5. REFERENCES


Abe, K. (1985). Magnitudes and origin times from Milne seismograph data : earthquakes in China and California, 1898-1912. *Preliminary Proceedings of the Symposium on Historical Seismograms and Earthquakes*, Tokyo, pp 37-50.

Academia Sinica, Institute of Geophysics (1970). *Chinese Earthquake Catalogue* (in Chinese), Academia Sinica, Beijing, 361 p.

Academia Sinica, Institute of Geophysics (1974). *Summary of Large Earthquakes in China from 780 B.C. to 1973 with Magnitude ≥ 6* (in Chinese), Map Press, Beijing, 31 p.

Academia Sinica, Institute of Geophysics (1976). *Summary of Large Earthquakes in China from 780 B.C. to 1976 with Magnitude ≥ 6* (in Chinese), Map Press, Beijing, 29 p.

Academia Sinica, Seismological Committee (1956). *Chronological Tables of Earthquake Data of China* (in Chinese), Science Press, Beijing, 1653 p.

Ambraseys, N.N. (1985). Intensity-attenuation and magnitude-intensity relationships for northwest European earthquakes. *Earthquake Engineering and Structural Dynamics*, vol. 13, pp 733-778.

Ambraseys, N.N. & Adams, R.D. (1986). Seismicity of West Africa. *Annales Geophysicae*, vol. 4B, no. 6, pp 679-702.

Biot, E. (1841). General catalogue of earthquakes, subsidence and uplift of mountains, observed in China, from ancient times up to the present (in French). *Annales de Chimie et de Physique, 3e Série*, vol. 2, pp 372-416.

Ding, Y.Z., Huang, Y.H. & Zhang, R.H. (1984). On several problems of researches in the seismicity of the sea area of the shallow waters along the coast - take Daya Bay as an example (in Chinese). *Journal of South China Seismology*, vol. 4, no. 1, pp 1-10.

Drake, N.F. (1912a). Destructive earthquakes in China. *Bulletin of the Seismological Society of America*, vol. 2, no. 1, pp 40-91.

Drake, N.F. (1912b). Destructive earthquakes in China, supplementary list. *Bulletin of the Seismological Society of America*, vol. 2, no. 3, pp 124-133.

Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986). *Compilation of Historical Materials on Chinese Earthquakes* (in Chinese), Science Press, Beijing, 5 volumes, 4372 p.

Gorshkov, G.P. (1960). *Proceedings of the Seismo-tectonic and Seismological Regionalisation of the Territory of China, PRC* (in Russian). Bulletin of the Soviet Committee on Seismology No. 7, Moscow, 55 p.

Gutenberg, B. & Richter, C.F. (1954). *Seismicity of the Earth and Associated Phenomena. (Second edition).* Princeton University Press, New Jersey, 310 p.

Hirota, S. (1908). A catalogue of Chinese earthquakes. *British Association of Advanced Sciences*, Dublin, pp 84-112.

Hoang, R.P.P. (1909). *Catalogue of significant earthquakes in China from Chinese sources* (in French), edited by l'Imprimerie de la Mission Catholique a l'Orphelinat de T'-oi-sè-wè, Shanghai, China, 298 p.

Hsieh, Y.S. (1957). A new scale of seismic intensity adapted to the conditions in Chinese territories (in Chinese). *Acta Geophysica Sinica*, vol. 6, pp 35-47.

Lam, H.K. (1980). Earthquakes. *Royal Observatory, Hong Kong, Technical Note (Local)* no. 28, 55 p.

Lam, H.K. & Fong, S.W. (1982). Statistical analysis of earthquake occurrences in the vicinity of Hong Kong. *Proceedings of the International Symposium on Continental Seismicity and Earthquake Prediction*, Beijing, pp 177-188.

Lau, R. (1972). Seismicity of Hong Kong. *Royal Observatory, Hong Kong, Technical Note* no. 33, 30 p. (Reprinted with revisions, 1977).

Lee, W.H.K., Wu, F.T. & Jacobsen, C. (1976). A catalogue of historical earthquakes in China compiled from recent Chinese publications. *Bulletin of the Seismological Society of America*, vol. 66, no. 6, pp 2003-2016.

Lee, W.H.K., Wu, F.T. & Wang, S.C. (1978). A catalogue of instrumentally determined earthquakes in China (Magnitude $\geq 6$) compiled from various sources. *Bulletin of the Seismological Society of America*, vol. 68, no. 2, pp 383-398.

MacGowen, J. (1887). Earthquakes in China. *Transactions of the Seismological Society of Japan*, vol. 10, pp 37-45.

Omori, F. (1893). A note on early Chinese earthquakes. *Seismological Journal of Japan*, vol. 1, pp 119-125.

Parker, E.H. (1909). A catalogue of Chinese earthquakes, 1638-1891. *British Association of Advanced Sciences*, Winnipeg, pp 15-18.

Pun, W.K. (1990). *Seismicity of Hong Kong.* MSc Dissertation, Department of Civil Engineering, Imperial College of Science, Technology & Medicine, University of London, 277 p. (Unpublished).

Seismological Brigade of Guangzhou (1974). *Catalogue of Earthquakes in Guangdong* (in Chinese), Seismological Brigade of Guangzhou, State Seismological Bureau, 19 p.

Sieberg, A. (1932). Earthquakes (in German). *B. Gutenberg's handbuch der Geophysik*, Berlin, vol. 4, pp 140-144.

Vanek, J., Zátopek, A., Kárnik, V., Kondorskaya, N.V., Riznichenko, Y.U.V., Savarensky, E.F., Solov'ev, S.L. & Shebalin, N.V. (1962). Standardization of magnitude scale. *Izvestia Akademii Nauk, Seriya Geofizitsekaya*, Moscow, no.2, pp 153-158.

TABLES

# LIST OF TABLES

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 1 of 11)

| Date | Place |
|---|---|
| 288 Jun 7 | Guangzhou |
| 288 Aug 14 - Oct 11 | Guangzhou |
| 1045 Sep 3 | Guangzhou |
| 1067 Nov 12 | Chaoan |
| 1069 Jan 2 - 31 | Chaoan |
| 1318 Jun 26 | Deqing |
| 1362 Apr 4 - May 2 | Nanxiong |
| 1370 Oct 15 | Meixian |
| 1372 Jun 1 | Guangzhou, Zhongshan, Dongguan |
| 1372 Jul 9 - Aug 7 | Fogang |
| 1372 Sep 25 | Guangzhou |
| 1372 Oct 26 | Guangzhou |
| 1381 Jan 21 | Guangzhou |
| 1403 Sep 21 | Chaozhou, Chaoyang |
| 1440 Nov 4 - Dec 3 | Guangzhou |
| 1445 | Sihui |
| 1478 Jun 3 | Zengcheng |
| 1479 Apr 18 | Guangzhou, Shaoguan |
| 1479 May 13 | Qingyuan, Fogang |
| 1480 Jun 30 | Zhongshan |
| 1482 Mar 28 - Apr 26 | Shunde, Wuchuan |
| 1482 | Chaoyang |
| 1484 Sep 17 | Yangjiang |
| 1485 Sep 4 | Dianbai |
| 1485 | Guangdong Province |
| 1487 Jun 21 | Guangzhou, Zhongshan, Xinhui, Dongguan |
| 1487 Sep 19 | Shunde |
| 1487 Oct 26 - Nov 23 | Sihui |
| 1490 Jan 8, 10, 12 | Yangchun |
| 1490 Dec 4 | Zhaoqing |
| 1493 Sep 28 | Chaozhou |
| 1495 Jul 1 - 29 | Gaohe, Yangchun |
| 1496 Jul 20 | Shunde |
| 1497 Jul 9 - Aug 6 | Guangzhou, Haifeng |
| 1498 Jun 29 - Jul 27 | Dongguan |
| 1508 Nov 3 - Dec 2 | Xingning, Huizhou, Chaozhou, Chaoyang, Jieyang |
| 1509 Aug 13 | Xingning, Huizhou, Chaozhou |
| 1511 Autumn | Xinxing, Kaiping |
| 1513 Jan 20 | Raoping |
| 1514 May 5 - Jun 2 | Deqing |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 2 of 11)

| Date | Place |
|---|---|
| 1519 Mar 11 - Apr 8 | Zengcheng, Huizhou, Boluo, Zhongshan |
| 1519 May 12 | Zengcheng |
| 1520 Jul 9 | Meixian |
| 1526 Nov 15 - Dec 13 | Yangchun, Enping |
| 1530 Mar 10 - Apr 7 | Gaohe |
| 1530 May 30 | Deqing |
| 1530 Oct 1 - 30 | Guangzhou, Shunde, Haikang |
| 1534 Nov 16 - Dec 14 | Enping, Yangjiang |
| 1535 Mar 7 | Yangjiang, Sihui |
| 1535 Jun 11 - Jul 9 | Jieyang |
| 1535 Aug 9 - Sep 6 | Fengkai |
| 1535 Oct 27 | Yangjiang |
| 1536 Jan 3 | Deqing |
| 1536 Jul 28 - Aug 26 | Deqing |
| 1537 Jun 3 | Zengcheng, Conghua |
| 1537 Jun 18 - Jul 16 | Zhaoqing |
| 1538 Mar 7 | Dabu, Xingning |
| 1538 Mar 11 - Apr 8 | Chaozhou, Chaoyang |
| 1538 Apr 9 - May 8 | Dabu |
| 1539 Apr 29 | Deqing, Shunde, Sihui |
| 1539 Aug 31 | Shunde |
| 1539 Nov 21 - Dec 19 | Xinhui, Zhongshan, Kaiping |
| 1540 May 23 | Deqing, Guangzhou |
| 1540 Oct 19 | Deqing, Guangzhou, Taishan |
| 1543 Oct 8 - Nov 6 | Shunde |
| 1546 | Chaoyang |
| 1548 Jun 16 - Jul 14 | Chaozhou |
| 1550 Sep 21 - Oct 19 | Boluo |
| 1552 Jul 11 | Dianbai |
| 1554 | Chaoyang |
| 1555 Nov 24 | Dabu |
| 1557 Feb 9 - Mar 10 | Yangjiang |
| 1557 Aug 4 | Shunde, Zhongshan, Xinhui, Taishan, Gaohe |
| 1558 Apr 5 | Chaozhou |
| 1558 Jun | Guangzhou, Xinhui, Zhaoqing, Xinxing, Deqing, Kaiping, Fengkai, Chaozhou, Taishan |
| 1558 Jul 29 | Shunde, Zhongshan |
| 1559 Oct 27 | Taishan |
| 1560 Jul 4 - Aug 1 | Shunde, Zhongshan, Guangzhou, Panyu, Foshan, Xinhui, Xinxing |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 3 of 11)

| Date | Place |
|---|---|
| 1561 Jul 20 | Taishan |
| 1561 Sep 19 - Oct 18 | Sihui |
| 1563 May 12 | Xinhui |
| 1564 Feb 22 - Mar 22 | Guangzhou, Chaozhou |
| 1568 Jan 9 | Shenzhen |
| 1568 Sep 2 - 30 | Sihui, Zhaoqing |
| 1569 Jun 24 - Jul 23 | Yangchun |
| 1571 Jun 5 | Qingyuan, Fogang |
| 1573 Nov 5 - Dec 3 | Zhaoqing |
| 1573 Dec 4 - 1574 Jan 2 | Dianbai |
| 1577 Jul 25 - Aug 23 | Panyu, Foshan, Guangzhou, Deqing |
| 1581 Spring | Taishan |
| 1583 Feb 22 - Mar 23 | Sanshui |
| 1583 Mar 24 - Apr 21 | Xinxing |
| 1584 Jul 8 - Aug 5 | Guangzhou, Shunde, Zhongshan, Zhaoqing, Gaohe, Enping, Fengkai Xinhui, Lianxian, Foshan, Panyu |
| 1584 Aug 6 - Sep 3 | Guangzhou, Shunde, Zhongshan, Zhaoqing, Gaohe, Enping, Fengkai, Xinhui, Sanshui |
| 1585 Jul 27 | Zhaoqing |
| 1585 Nov 10 | Taishan |
| 1585 Nov 21 - Dec 20 | Zhaoqing |
| 1586 May 26 | Xinhui |
| 1586 Sep 1 | Zhaoqing, Gaohe |
| 1590 Oct 28 - Nov 26 | Huizhou |
| 1591 Aug 20 | Nanao |
| 1591 | Sihui |
| 1592 Mar 11 | Meixian, Pingyuan |
| 1593 Mar 3 | Lechang |
| 1594 Jan 21 - Feb 19 | Zhaoqing |
| 1596 Aug 24 - Sep 21 | Xinhui, Jieyang, Qingyuan |
| 1596 Oct 21 - Nov 19 | Deqing, Foshan, Panyu, Guangzhou, Xinxing |
| 1597 Sep 13 | Deqing, Chaoyang, Jieyang |
| 1599 Jan | Deqing, Maoming, Wuchuan,Lianjiang, Xinxing, Haikang, Suichi, Xuwen |
| 1599 Oct 10 | Shenzhen |
| 1599 | Nanfeng, Chaoyang |
| 1600 Apr 13 - May 12 | Raoping, Dabu |
| 1600 Sep 29 | Nanao, Chaoyang, Jieyang, Dabu, Huilai, Guangzhou, Dongguan, Zengcheng, Huizhou, Boluo, Wuhua, Xingning, Raoping, Shunde |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 4 of 11)

| Date | Place |
|---|---|
| 1601 | Nanao, Chaoyang, Jieyang, Dabu |
| 1602 Feb 9 | Nanao |
| 1602 | Gaohe |
| 1603 Sep 26 | Shenzhen |
| 1604 Summer | Zhaoqing, Guangning, Sihui, Gaohe |
| 1604 Jul 27 - Aug 24 | Zhaoqing, Guangning |
| 1606 Feb 18, 20 | Xinhui, Kaiping |
| 1606 May 1 | Guangzhou, Shunde, Foshan, Sanshui, Huizhou |
| 1607 Apr 7 | Guangzhou, Shunde |
| 1607 Jun 4 | Guangzhou, Shunde, Panyu, Taishan |
| 1608 Dec 7 | Taishan |
| 1609 Oct 28 - Nov 25 | Liannan |
| 1610 Feb 23 - Mar 24 | Fengkai, Sihui |
| 1610 Sep 17 - Oct 16 | Boluo |
| 1611 Sep 9 | Guangzhou, Shunde, Dianbai, Zhaoqing, Huaxian, Maoming, Yangjiang, Xinhui |
| 1612 Jan 3 - Feb 1 | Fengkai, Wuhua |
| 1612 Mar 3 - 31 | Guangzhou, Shunde, Deqing |
| 1615 Jan | Shunde, Fengkai |
| 1616 Jan 19 - Feb 16 | Guangzhou, Shunde, Fengkai, Zhaoqing, Xinhui, Dongguan |
| 1618 Feb 25 - Mar 25 | Dabu, Chenghai |
| 1618 Jul 22 - Aug 19 | Dabu, Chenghai |
| 1620 Jan 5 - Feb 3 | Haifeng |
| 1620 Mar 5 | Zhaoqing, Huizhou |
| 1620 Jul 16 | Shenzhen |
| 1621 | Dongguan, Taishan |
| 1630 | Deqing |
| 1632 Aug 16 - Sep 13 | Lianxian |
| 1635 Jul 14 - Aug 12 | Dabu, Chenghai, Chaoyang |
| 1635 Dec 12 - 15 | Dabu, Chenghai, Chaoyang |
| 1636 Feb 7 - Mar 6 | Dabu |
| 1637 Apr 25 - May 23 | Xinxing, Kaiping |
| 1638 Feb 14 - Mar 15 | Meixian |
| 1638 May 14 - Jun 11 | Guangzhou, Shunde |
| 1639 Jun 12 - 30 | Meixian |
| 1639 Jul 1 - 29 | Chenghai |
| 1640 Jun 19 - Jul 18 | Guangzhou, Panyu, Zengcheng, Zhaoqing, Gaohe |
| 1640 Sep 26 | Kaiping |
| 1640 Nov 13 - Dec 12 | Boluo |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 5 of 11)

| Date | Place |
|---|---|
| 1641 Jan 23 | Jieyang, Chaoyang, Chaozhou, Chenghai |
| 1641 Nov 26 | Jieyang, Chaoyang, Raoping, Huilai |
| 1642 Mar 30 - Apr 28 | Jieyang |
| 1642 Jul 27 - Aug 24 | Zhaoqing |
| 1642 Aug 25 - Sep 23 | Xinhui |
| 1642 Oct 20 | Fengkai |
| 1643 Mar 20 - Apr 17 | Chaoyang, Shaoguan |
| 1644 Mar 9 | Chaoyang |
| 1644 Apr 9 | Guangzhou, Panyu, Zhaoqing |
| 1644 Jun 5 - Jul 3 | Jieyang, Chaoyang |
| 1644 Sep 25 | Jieyang, Chaoyang |
| 1645 Aug 20 | Jieyang |
| 1646 Mar 21 | Jieyang |
| 1647 Aug 30 - Sep 27 | Xinhui |
| 1648 Oct 13 | Foshan, Shunde |
| 1649 Mar 14 | Jieyang, Wuhua |
| 1649 Aug 8 | Foshan, Shunde |
| 1651 May 21 | Jieyang |
| 1652 Sep 3, 4 | Zhongshan |
| 1652 Dec 25 | Dianbai |
| 1654 Mar 19 - Apr 16 | Xinhui |
| 1655 Mar 8 - Apr 6 | Xinhui |
| 1655 Jul 4 - Aug 1 | Xinxing |
| 1655 Sep 10 | Zhaoqing |
| 1656 Mar | Xinhui |
| 1656 Nov 16 - Dec 15 | Xinxing |
| 1658 Mar 17 | Huilai |
| 1659 Feb 21 - Mar 22 | Jieyang, Chaoyang, Chaozhou, Jiaoling |
| 1664 Jan 18 | Deqing |
| 1664 Feb 23 | Zhaoqing |
| 1664 May 25 - Jun 23 | Kaiping |
| 1664 Aug 21 - Sep 19 | Fengkai |
| 1664 Sep 20 - Oct 18 | Kaiping, Taishan, Maoming, Sanshui, Wuchuan, Yangjiang, Xingning |
| 1664 Dec 5 | Shunde, Xinhui |
| 1665 Jan 16 - Feb 14 | Guangzhou, Panyu, Zengcheng, Wuchuan |
| 1665 Jun 2 | Guangzhou, Xinhui, Zhaoqing |
| 1665 Sep 9 - Oct 8 | Kaiping, Zengcheng, Wuchuan, Sihui, Deqing, Yangchun, Sanshui, Zhaoqing, Xinxing |
| 1666 Mar 27, 28 | Kaiping, Taishan |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 6 of 11)

| Date | Place |
|---|---|
| 1666 Aug 30 - Sep 27 | Lianping, Guangning |
| 1666 Sep 28 - Oct 27 | Jieyang, Chaoyang, Chaozhou, Chenghai, Sihui, Zengcheng, Sanshui, Huilai, Longmen |
| 1667 Jan 27 | Yangjiang, Yangchun |
| 1667 May 4 | Jieyang, Chaoyang |
| 1667 Aug 19 | Conghua |
| 1667 Dec 30 | Jieyang, Chaoyang, Chaozhou, Chenghai, Raoping |
| 1670 Aug 21 | Jieyang |
| 1671 Aug 12 | Fengkai |
| 1671 Nov 14 | Chaoyang |
| 1672 Jul 14 - Aug 22 | Chaoyang |
| 1672 Sep 21 - Oct 20 | Chaoyang |
| 1672 Nov 19 - Dec 18 | Chaoyang |
| 1677 Feb 2 - Mar 3 | Sihui |
| 1677 May 20 | Dianbai |
| 1678 Apr 21 - May 19 | Yangjiang, Xinxing |
| 1680 Oct 6 | Yangjiang |
| 1683 Oct 10 | Guangzhou |
| 1684 Jun 13 - Jul 11 | Fengkai |
| 1685 Feb 3 - Mar 4 | Chaoyang, Puning |
| 1685 Jun 2 - Jul 1 | Shixing |
| 1693 Apr 24 - 25 | Haifeng |
| 1693 Nov 14 | Haifeng |
| 1693 Nov 29 | Haifeng |
| 1694 Apr 24 - May 23 | Xinxing, Yangchun |
| 1700 May 19 - Jun 16 | Yangjiang |
| 1702 Jan 28 - Feb 26 | Deqing, Wenchang |
| 1702 Oct 21 - Nov 18 | Yangjiang |
| 1702 Autumn, Winter | Dabu |
| 1707 Oct 25 - Nov 23 | Xingning |
| 1707 Nov 24 - Dec 23 | Xingning |
| 1708 Mar 22 - Apr 20 | Longchuan |
| 1714 Oct 8 - Nov 6 | Yangjiang, Yangchun |
| 1717 Dec | Zhongshan |
| 1718 Jul 5 | Chaoyang, Jieyang, Puning |
| 1722 Jan 8 - 16 | Chaoyang, Sihui |
| 1722 Jan 28 | Qingyuan, Fogang |
| 1722 Aug 12 - Sep 10 | Deqing |
| 1722 Dec 8 - 1723 Jan 6 | Foshan, Shunde |
| 1724 Spring | Enping, Kaiping |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 7 of 11)

| Date | Place |
|---|---|
| 1724 Nov 30 | Deqing |
| 1725 | Boluo |
| 1731 Oct 2, 22 | Chaozhou |
| 1731 Dec 19 | Chaozhou, Chaoyang, Puning |
| 1733 Jul 29 | Boluo |
| 1733 Aug 27 | Chaozhou |
| 1734 Jun 22 | Guangning |
| 1734 Nov 8 | Chaozhou, Chaoyang, Meixian |
| 1734 Dec 25 | Qingyuan, Fogang |
| 1736 Jun 9 - Jul 8 | Yangchun |
| 1738 Dec 30 | Puning |
| 1739 May 14 | Chaozhou |
| 1746 Mar 22 - Apr 20 | Guangzhou |
| 1746 Jun 19 - Jul 17 | Guangzhou, Foshan, Shunde, Zengcheng |
| 1746 Aug 5 | Boluo |
| 1747 Apr 18 | Deqing |
| 1749 Feb 17 - Mar 17 | Guangzhou, Foshan, Shunde, Deqing, Fengkai, Yunfu |
| 1751 Sep 19 - Oct 18 | Meixian |
| 1752 Oct 18, 19 | Boluo, Huilai |
| 1753 Aug 28 - Sep 26 | Meixian |
| 1756 Apr 20 | Longjiang |
| 1758 Jun 6 - Jul 4 | Yangshan |
| 1769 Apr 7 - May 5 | Fengkai |
| 1769 Aug 31 - Sep 29 | Fengkai |
| 1770 Sep 2 | Shenzhen |
| 1773 Dec 18 | Jieyang |
| 1774 Jan 23, 25, Feb 1 | Jieyang |
| 1774 Feb 14, 20 | Jieyang |
| 1776 | Zhaoqing, Xinxing, Gaohe |
| 1778 Jan 28, Feb 3 | Haifeng |
| 1779 Feb 16- Mar 17 | Yingde |
| 1781 Jun 23 - Jul 20 | Fengkai |
| 1781 Aug 19 - Sep 17 | Fengkai |
| 1785 Feb 9 - Mar 10 | Fengkai |
| 1786 Mar 30 - Apr 27 | Nanfeng |
| 1787 May 17 - Jun 14 | Enping |
| 1789 Jul 22 - Aug 20 | Zengcheng |
| 1791 Mar | Chenghai, Chaozhou, Chaoyang, Wuchuan, Maoming, Dabu |
| 1791 May 3 - Jun 1 | Chenghai |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 8 of 11)

| Date | Place |
|---|---|
| 1791 Aug 29 - Sep 27 | Foshan, Shunde, Lunchiang, Xinhui |
| 1793 Winter | Xingning |
| 1796 Sep | Fengkai |
| 1797 Jun 25 - Jul 23 | Xingning |
| 1800 Jul 22 - Aug 19 | Chaoyang, Chaozhou, Dabu, Sanshui |
| 1801 Jan 24, 27 | Guangzhou, Shunde |
| 1801 Jul 11 - Aug 8 | Chaoyang, Chenghai |
| 1805 Oct 22 - Nov 20 | Chaoyang, Chaozhou, Xingning |
| 1806 Jun 17 - Jul 15 | Xinhui |
| 1808 Jul 23 - Aug 21 | Guangning |
| 1808 | Chenghai |
| 1810 Mar 19 | Xinhui |
| 1813 Oct 9 | Xinhui, Zhongshan |
| 1815 Apr 10 - May 8 | Zhaoqing |
| 1815 Jun 25 | Chaoyang, Chaozhou |
| 1815 Aug 5 - Sep 2 | Xinhui, Zhongshan, Yangjiang, Enping, Kaiping |
| 1816 Nov 29 | Guangning |
| 1817 Jan 29 | Zhongshan |
| 1817 Jul 14 - Aug 12 | Sanshui |
| 1817 Aug 13 - Sep 10 | Zhaoqing |
| 1818 Jun 5 | Longchuan |
| 1819 Jul 22 - Aug 20 | Yangshan |
| 1823 Dec | Zhaoqing, Zhongshan, Enping, Taishan |
| 1824 Jul 26 - Aug 23 | Zhaoqing, Zhongshan, Guangzhou, Panyu, Guangning |
| 1826 Jan 17, 20 | Enping, Shunde |
| 1830 Sep 16 | Zhongshan |
| 1831 | Dabu |
| 1834 Oct 3 - 31 | Xingning |
| 1836 Nov 22 | Xinhui |
| 1839 Dec 6 - 1840 Jan 4 | Shaoguan, Yingde |
| 1842 Sep 16 | Macao |
| 1848 Aug 31 | Zhongshan |
| 1849 | Xinyi, Dingan, Puning |
| 1854 | Guangzhou |
| 1856 Jul 2 - 31 | Chaoyang, Puning |
| 1859 Dec 5 | Guangzhou, Shunde |
| 1865 Autumn | Lianxian |
| 1868 May 22 - Jun 19 | Yangchun |
| 1871 Dec 23 | Enping |
| 1872 Apr 18 | Deqing |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 9 of 11)

| Date | Place |
|---|---|
| 1873 Oct 7 | Shixing |
| 1874 Jun 23 | Hong Kong, Huizhou |
| 1874 Jul | Haifeng |
| 1878 Jan 30, 31 | Chaoyang, Jieyang, Puning |
| 1878 May 30 | Hong Kong |
| 1879 Sep 16 - Oct 14 | Chixi |
| 1880 Dec 2 - 30 | Renhua |
| 1881 Jan 15 | Shantou |
| 1881 Jul 26 - Aug 24 | Chixi, Shunde |
| 1884 Jan 2 | Deqing |
| 1884 Dec 23 | Guangzhou, Panyu, Foshan |
| 1886 Jan 13 | Shantou |
| 1887 Apr 8 | Chaozhou, Raoping |
| 1887 Aug 19 - Sep 16 | Yangchun |
| 1888 Aug 18 | Shunde |
| 1889 Jul 28 - Aug 25 | Yangchun, Qingyuan |
| 1889 Sep 26 | Enping |
| 1889 Nov 5 - 6 | Guangzhou, Foshan, Yangshan |
| 1890 Aug 27 - Sep 1 | Guangzhou, Foshan, Shunde, Zhaoqing, Gaohe, Luoding, Dianbai, Wuchuan, Lianjiang,Taishan, Yangjiang, Hong Kong, Huaxian |
| 1890 Dec 27 | Chaozhou |
| 1891 Sep 3 - Oct 2 | Longchuan |
| 1892 Feb 9, 11 | Nanxiong |
| 1893 Jul 24 | Qingyuan |
| 1893 Nov 8 - Dec 7 | Yangshan |
| 1894 Aug 1 - 30 | Chaozhou, Fengliang, Hong Kong, Meixian, Shunde |
| 1894 Aug 31 - Sep 28 | Longchuan |
| 1895 Jan 26 - Feb 24 | Chaozhou, Shixing |
| 1895 Apr 25 - May 23 | Chaozhou, Fengliang |
| 1895 Aug 30 | Chaozhou, Fengliang, Chaoyang, Jieyang, Puning, Guangzhou, Huizhou, Haifeng, Shantou, Hong Kong, Chenghai, Shunde |
| 1896 Feb 13 - Mar 13 | Chaozhou, Fengliang |
| 1896 Aug 9 - Sep 6 | Yangchun |
| 1897 Dec 3 | Luoding |
| 1898 Apr 18 | Chaozhou, Fengliang |
| 1898 Nov 12 | Zhaoqing, Shunde |
| 1899 Apr 29 | Luoding |
| 1900 | Shunde |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 10 of 11)

| Date | Place |
|---|---|
| 1902 Feb 18 | Yangshan |
| 1903 Jun 21 | Enping |
| 1905 Jan 10 | Chaozhou, Jieyang |
| 1905 Feb 4 | Yingde |
| 1905 Mar 16 | Shantou |
| 1905 Jul 3 - 31 | Shunde, Zhongshan, Chingping |
| 1905 Aug 11 - 12 | Zhongshan, Enping, Guangzhou, Panyu, Hong Kong, Macao |
| 1905 Sep | Taishan, Chixi |
| 1905 Nov 22 | Guangzhou, Panyu, Macao |
| 1906 Jan | Zhongshan |
| 1907 Feb 15 | Yingde |
| 1907 Dec 21, 23 | Xinxing |
| 1908 Jan 6 | Xinxing |
| 1908 Jun | Zhongshan, Enping |
| 1910 Feb 22 | Yingde |
| 1911 Jan 30 | Haifeng |
| 1911 May 14 | Zhongshan, Enping, Haifeng, Guangzhou, Shunde, Qingyuan, Xinhui, Longchuan |
| 1912 Jun 2 | Guangzhou, Hong Kong |
| 1915 Feb 14 | Lechang |
| 1915 | Guangzhou, Gaohe |
| 1917 Sep 16 | Guangdong Province, Yingde, Longmen |
| 1918 Feb 13 | Whole of Guangdong Province and some other parts of China |
| 1919 Spring | Meixian |
| 1919 Jul 25 | Shantou |
| 1919 Aug 10 | Hong Kong |
| 1920 Mar 9 | Longchuan |
| 1921 Mar 8 | Shantou |
| 1921 Mar 19 | Hong Kong, Xinhui, Zhanjiang |
| 1924 Aug | Nanao |
| 1925 Jan 27 | Heping |
| 1930 Sep 26 | Guangzhou |
| 1931 Mar 19 | Guangzhou, Hong Kong |
| 1931 Apr 12 | Shantou, Chaozhou, Chaoyang, Jieyang, Chenghai |
| 1931 Sep 13 | Longchuan |
| 1931 Sep 21 | Guangzhou, Hong Kong, Sanshui, Zhaoqing, Kaiping |
| 1932 Jun 14 | Guangzhou, Hong Kong |
| 1932 Aug 13 | Guangzhou |

Table 1 - Dates and Locations of Earthquake Shocks Recorded in the Region 19.5°N - 25.5°N, 111°E - 117°E, up to 1980 (Sheet 11 of 11)

| Date | Place |
|---|---|
| 1933 May 20 | Huilai, Huizhou |
| 1934 Mar 12 | Heyuan, Boluo |
| 1935 Apr 14 | Shunde, Xinhui |
| 1935 Apr 24 | Guangzhou |
| 1936 Apr 23 | Zhongshan |
| 1937 Sep 30 | Chaozhou |
| 1938 Dec 1 | Chaozhou, Hong Kong |
| 1940 Mar 2 | Chaozhou |
| 1940 Early Sep | Foshan |
| 1941 Sep 21 | Chaozhou, Shaoguan, Nanxiong, Heping, Dabu, Meixian, Fengliang, Jieyang, Wuhua, Zijin, Heyuan, Lianping, Jiaoling |
| 1942 Mar 21 | Chaozhou |
| 1943 Dec 2 | Zhaoqing |
| 1947 Sep 27 | Shantou, Chaozhou, Chenghai |
| 1948 Mar 3, 4 | Hong Kong, Panyu |
| 1962 Mar 18 | Whole of Gaungdong Province except Hainan Dao |
| 1962 Jul 29 | Zengcheng, Huizhou, Fogang, Heping, Wengyuan |
| 1962 Nov 6 | Zijin, Xinfeng, Lianping |
| 1964 Sep 23 | Heyuan, Guangzhou |
| 1969 Jul 25 | Yangjiang, Xinyi, Deging, Fengkai, Xinxing, Gaohe, Panyu, Conghua, Zengcheng |

Table 2 - Seismic Parameters of Earthquakes Originating Within the Region with Macroseismic Magnitude ≥ 4¾ or Instrumental Magnitude ≥ 4.0, up to 1989 (Sheet 1 of 3)

| Date | Time (GMT) | Epic. (Instr.) | | Epic. (Macro.) | | d (km) | Magnitude Data | | | | $I_m$ | Radii of Isoseismals (km) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | N | E | | $M_s$ | S.D. | n | M | | $R_4$ | $R_5$ | $R_6$ | $R_7$ | $R_8$ | $R_9$ | $R_{10}$ |
| 1067 Nov 12 | | | | 23.6 | 116.5 | | 6¾* | | | | IX | - | - | 69 | 33 | - | 14 | - |
| 1372 Sep 25 | | | | 23.1 | 113.3 | | 4¾* | | | | VI | | | | | | | |
| 1445 | | | | 23.4 | 112.6 | | 4¾* | | | | VI | | | | | | | |
| 1520 May | | | | 25.2 | 116.2 | | 4¾* | | | | VI | | | | | | | |
| 1558 Jun | | | | 23.4 | 111.5 | | 5¼* | | | | VII | 85 | 32 | 11 | 4 | - | - | - |
| 1571 Jun 05 | | | | 23.9 | 113.5 | | 5* | | | | VI | | | | | | | |
| 1600 Sep 29 | | | | 23.5 | 117.0 | | 7* | | | | IX | - | 162 | 91 | 45 | 16 | - | - |
| 1611 Sep 09 | | | | 21.4 | 111.0 | | 5* | | | | VI | | | | | | | |
| 1641 Nov 26 | | | | 23.6 | 116.5 | | 5¾* | | | | VII | - | 68 | 33 | 13 | - | - | - |
| 1656 Mar | | | | 22.8 | 113.0 | | 4¾* | | | | VI | | | | | | | |
| 1683 Oct 10 | | | | 23.0 | 113.2 | | 5* | | | | VI | | | | | | | |
| 1693 Apr 24 | | | | 23.0 | 115.4 | | 5* | | | | VI | | | | | | | |
| 1791 Mar | | | | 23.5 | 116.7 | | 5* | | | | VI | | | | | | | |
| 1806 Jan 11 | | | | 25.3 | 115.7 | | 6* | | | | VIII | 179 | 85 | 41 | 18 | 8 | - | - |
| 1874 Jun 23 | | | | 22.0 | 114.2 | | 5¾* | | | | VII | | | | | | | |
| 1874 Jul | | | | 23.0 | 115.4 | | 5* | | | | VI | | | | | | | |
| 1886 Jan 13 | | | | 23.4 | 116.7 | | 5* | | | | VI | | | | | | | |
| 1887 Apr 08 | | | | 24.0 | 116.8 | | 5* | | | | VI | | | | | | | |
| 1895 Feb | | | | 25.0 | 114.0 | | 4¾* | | | | VI | | | | | | | |
| 1895 Aug 30 | | | | 23.5 | 116.3 | | 6¼* | | | | VIII | - | 72 | 35 | 14 | - | - | - |
| 1905 Aug 12 | | | | 22.1 | 113.5 | | 5½* | | | | VII | | | | | | | |

Table 2 - Seismic Parameters of Earthquakes Originating Within the Region with Macroseismic Magnitude ≥ 4¾ or Instrumental Magnitude ≥ 4.0, up to 1989 (Sheet 2 of 3)

| Date | Time (GMT) | Epic. (Instr.) | | Epic. (Macro.) | | d (km) | Magnitude Data | | | | $I_m$ | Radii of Isoseismals (km) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | N | E | | $M_s$ | S.D. | n | M | | $R_4$ | $R_5$ | $R_6$ | $R_7$ | $R_8$ | $R_9$ | $R_{10}$ |
| 1918 Feb 13 | 0607 | 24.0 | 117.0 | 23.5 | 117.2 | 60 | 7.42 | 0.15 | 8 | 7.2b | X | 862 | - | 275 | 138 | 72 | 30 | 15 |
| 1921 Mar 19 | 0819 | 24.0 | 116.5 | | | | 6.37 | 0.07 | 6 | | | | | | | | | |
| 1922 May 20 | | | | 24.7 | 116.5 | | 5* | | | | | | | | | | | |
| 1926 Jun 13 | 0203 | 20.0 | 116.5 | | | | (5¼) | | | | | | | | | | | |
| 1931 Sep 21 | 1027 | 19¾ | 113 | | | | 6.68 | 0.17 | 24 | | | | | | | | | |
| 1936 Apr 23 | | | | 22.7 | 113.2 | | 5* | | | | | | | | | | | |
| 1941 Sep 21 | 1419 | | | 25.1 | 115.7 | | 6* | | | | VII | 233 | 101 | 53 | 10 | - | - | - |
| 1962 Mar 18 | 2018 | 23.88 | 114.62 | 23.7 | 114.7 | 22 | 5.82 | 0.18 | 13 | | VIII | - | 158 | 69 | 17 | 5 | - | - |
| 1962 Apr 05 | 1310 | 23.8 | 114.5 | | | | 4.9 | | | | | | | | | | | |
| 1962 Jul 19 | 0930 | 23.75 | 114.5 | | | | | | | 4.0 | | | | | | | | |
| 1962 Jul 29 | 0857 | 23.8 | 114.4 | | | | 4.7 | | | | | | | | | | | |
| 1962 Aug 30 | 1343 | 23.8 | 114.5 | | | | 4.8 | | | | | | | | | | | |
| 1962 Nov 06 | 0914 | 23.8 | 114.5 | | | | 4.8 | | | | | | | | | | | |
| 1964 Sep 23 | 0004 | 23.74 | 114.71 | 23.7 | 114.7 | 5 | 5.1 | | | | VI | 80 | 34 | 9 | - | - | - | - |
| 1969 Jul 25 | 2249 | 21.61 | 111.83 | 21.7 | 111.8 | 11 | 6.22 | 0.12 | 12 | 5.5b | VIII | - | - | 38 | 18 | 9 | - | - |
| 1977 May 11 | 2031 | 23.70 | 114.65 | | | | 4.7 | | | | | | | | | | | |
| 1980 Jul 24 | 0900 | 22.485 | 111.825 | | | | | | | 4.0L | | | | | | | | |
| 1981 Apr 09 | 0103 | 22.971 | 115.434 | | | | | | | 4.0L | | | | | | | | |
| 1981 May 04 | 1105 | 23.821 | 114.699 | | | | | | | 4.8b | | | | | | | | |
| 1982 Feb 25 | 0039 | 24.799 | 114.764 | | | | 4.1 | | 2 | 4.4b | | | | | | | | |
| 1985 Sep 03 | 2358 | 21.855 | 111.775 | | | | 4.2 | | | 4.3b | | | | | | | | |

Table 2 - Seismic Parameters of Earthquakes Originating Within the Region with Macroseismic Magnitude ≥ 4¾ or Instrumental Magnitude ≥ 4.0, up to 1989 (Sheet 3 of 3)

| Date | Time (GMT) | Epic. (Instr.) | | Epic. (Macro.) | | d (km) | Magnitude Data | | | | $I_m$ | Radii of Isoseismals (km) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | N | E | | $M_s$ | S.D. | n | M | | $R_4$ | $R_5$ | $R_6$ | $R_7$ | $R_8$ | $R_9$ | $R_{10}$ |
| 1986 Jan 27 | 2313 | 21.672 | 111.752 | | | | 5.0 | | | 4.5b | | | | | | | | |
| 1987 Feb 25 | 1428 | 21.730 | 111.643 | | | | 4.7 | | | 4.1b | | | | | | | | |
| 1987 Aug 02 | 0907 | 24.924 | 115.608 | | | | 4.88 | | 15 | 4.9b | | | | | | | | |
| 1987 Sep 15 | 0204 | 23.783 | 114.496 | | | | 4.7 | | | 4.7b | | | | | | | | |

Legend :

| | |
|---|---|
| Epic. (Instr.) | Instrumental epicentre with northings and eastings given |
| Epic. (Macro.) | Macroseismic epicentre with northings and eastings given |
| d | Distance between the instrumental epicentre and the macroseismic epicentre |
| $M_s$ | Surface-wave magnitude |
| M | Earthquake magnitude other than $M_s$ (see note 3) |
| $I_m$ | Maximum earthquake intensity observed |
| $R_i$ | Radius of isoseismal corresponding to earthquake intensity of rating i |

Notes :

(1) $M_s$ values which are followed by an asterisk "*" have been derived from macroseismic data. The $M_s$ value in brackets has a low reliability according to its original source.

(2) For $M_s$ values which have been re-calculated using the Prague formula, the number of data sets n used in the calculations and the standard deviation S.D. of the calculated $M_s$ values are also given in this table.

(3) M values followed by letters b and L are body-wave magnitudes and local magnitudes respectively. For the unqualified M value, the magnitude scale has not been given in the original source.

(4) $R_i$ values are given for earthquakes for which an isoseismal map can be found. For each isoseismal, the $R_i$ value has been taken to be the radius of a circle with an area equal to that bounded by the isoseismal.

(5) The earthquakes of 1520 May, 1571 Jun 05, 1895 Feb, 1922 May 20 and 1936 Apr 23 given in this Table are found to have been based on incorrect information by the Guangdong Bureau of Seismology and have now been deleted from their earthquake database.

Table 3 - A Comparison of Macroseismic Magnitudes from Various Sources for Pre-1900 Earthquake Events

| Date | $M_{sc}$ Values from Different Sources | | | | | $M_{sc}$ Adopted |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | |
| 1067 Nov 12 | 6¾ | 6¾ | 6¾ | - | 6.8 | 6¾ |
| 1372 Sep 25 | - | 4¾ | 4¾ | - | - | 4¾ |
| 1445 | - | 4¾ | 4¾ | - | - | 4¾ |
| 1520 May | - | 4¾ | - | - | - | 4¾ |
| 1558 Jun | - | 5½ | 5½ | - | 5.2 | 5¼ |
| 1571 Jun 05 | - | 5 | 5 | - | - | 5 |
| 1600 Sep 29 | 7 | 7 | 7 | - | 6.9 | 7 |
| 1611 Sep 09 | - | 5 | 5 | - | - | 5 |
| 1641 Nov 26 | - | 5¾ | 5¾ | - | 5.7 | 5¾ |
| 1656 Mar | - | 4¾ | 4¾ | - | - | 4¾ |
| 1683 Oct 10 | - | 5 | 5 | - | - | 5 |
| 1693 Apr 24 | - | 5 | 5 | - | - | 5 |
| 1791 Mar | - | 5 | 5 | - | - | 5 |
| 1806 Jan 11 | 6 | 6 | - | - | 5.9 | 6 |
| 1874 Jun 23 | - | - | - | 5¾ | - | 5¾ |
| 1874 Jul | - | 5 | 5 | - | - | 5 |
| 1886 Jan 13 | - | 5 | 5 | - | - | 5 |
| 1887 Apr 08 | - | 5 | 5 | - | - | 5 |
| 1895 Feb | - | 4¾ | 4¾ | - | - | 4¾ |
| 1895 Aug 30 | 6 | 5¾ | 5¾ | - | 6.3 | 6¼ |

Notes :
(1) $M_{sc}$ values from Academic Sinica (1973, 1976)
(2) $M_{sc}$ values from Lee et al (1976)
(3) $M_{sc}$ values from Seismological Brigade of Guangzhou (1974)
(4) $M_{sc}$ values from Ding et al (1984)
(5) $M_{sc}$ values calculated from equation (1) (Pun, 1990)

# FIGURES

# LIST OF FIGURES

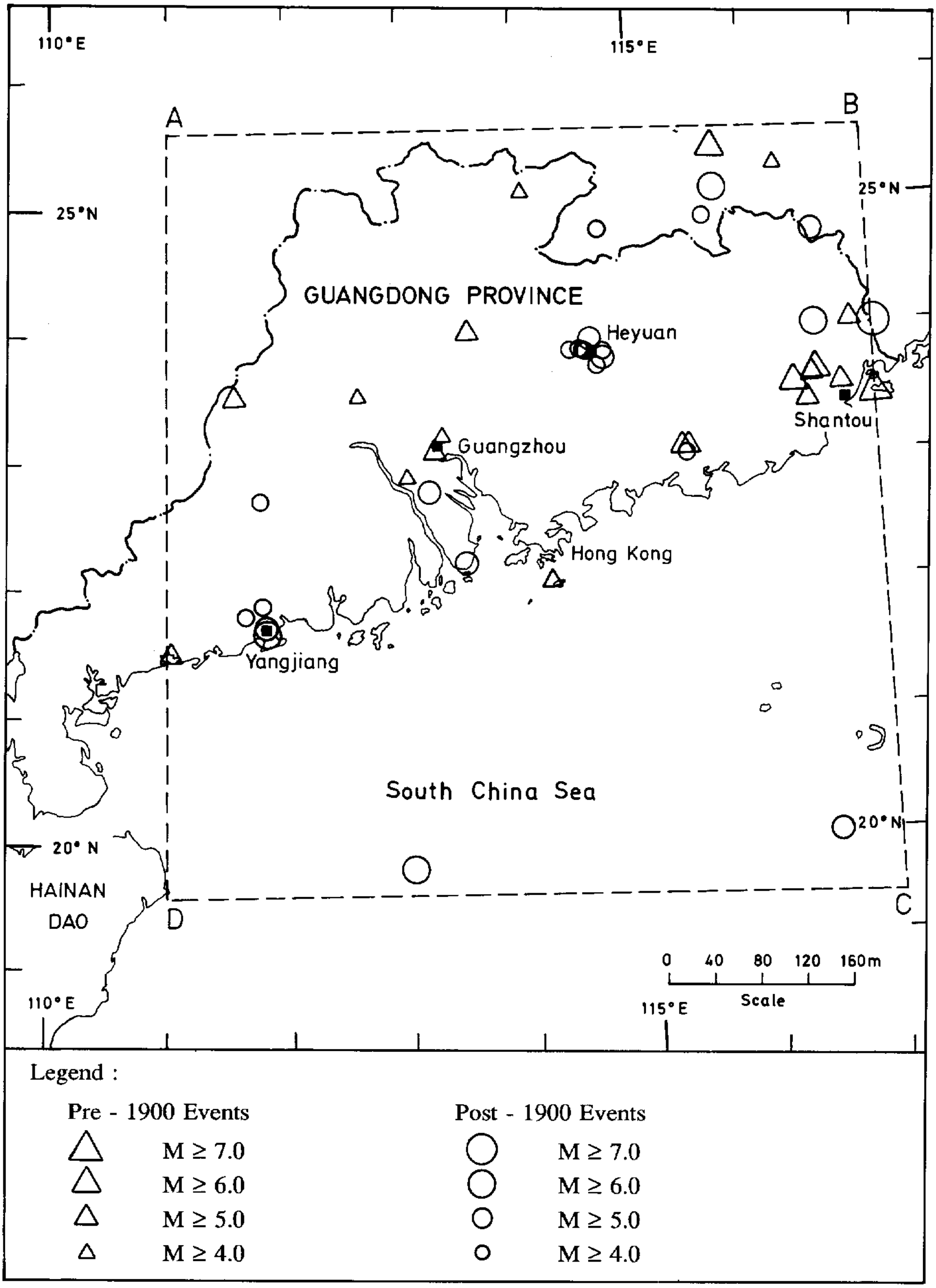



Figure 1 - Location of Earthquake Epicentres Within the Region 19.5°N - 25.5°N, 111°E - 117°E ($M \geq 4\frac{3}{4}$ for Pre-1900 Events, $M \geq 4.0$ for Post-1900 Events)

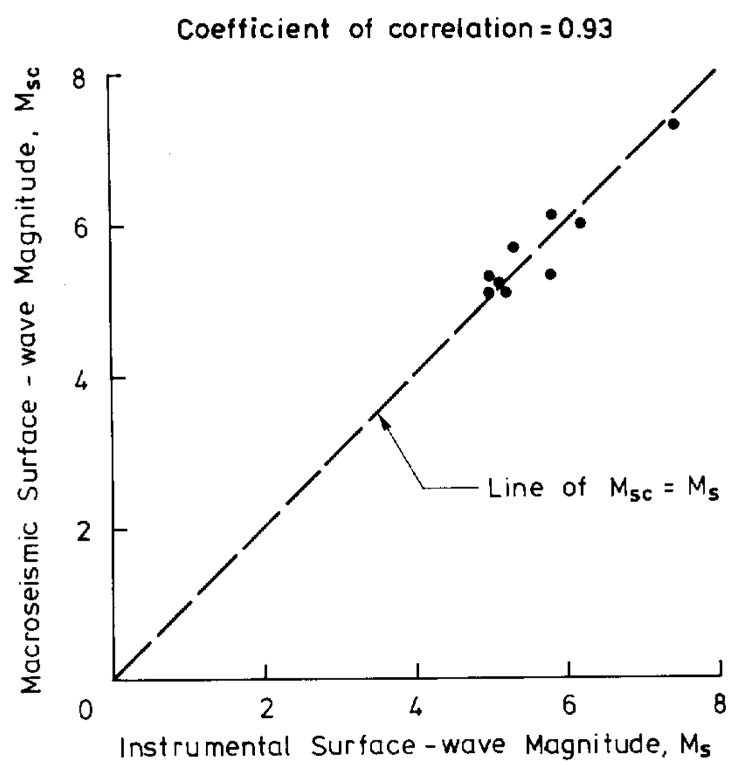



Figure 2 - Comparison of $M_{sc}$ and $M_s$ Values for the Nine Earthquake Events Used in the Derivation of Equation (1)

# APPENDIX A

# SUMMARY SHEETS ON EARTHQUAKES

# CONTENTS

## A.1 INTRODUCTION

This Appendix contains summary sheets for all the post-1900 earthquakes listed in Table 2 of this document. In each sheet, the seismic parameters collected from various sources are listed. Where the surface-wave magnitude of the earthquake has been re-calculated, the data used in the calculation and the results are shown in the summary sheet. Brief descriptions of the earthquake are also given where relevant information is available.

Explanatory notes on the layout of the summary sheets and the symbols used are given in the following sections. All the symbols are defined in the Glossary.

## A.2 EXPLANATORY NOTES

### A.2.1 Summary of Seismic Parameters

The information given in the various columns is described below.

Column (1) : Source code

| *Code* | *Source* |
|---|---|
| ABE | Abe (1985) |
| ALG | Algiers, Algeria |
| BAK | Baku, USSR |
| BOM | Bombay, India |
| BUD | Budapest, Hungary |
| CH | Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986) |
| DBN | De Bilt, the Netherlands |
| DUR | Durham, UK |
| FUR | Furstenfeldbruck, West Germany |
| GOT | Gothenburg, Sweden |
| GUT | Gutenberg and Richter (1956) |
| HFS | Hagfors, Sweden |
| HKC | Hong Kong |
| HYD | Hyderabad, India |
| IRK | Irkutsk, USSR |
| ISC | International Seismological Centre, UK |
| ISS | International Seismological Summary, UK |
| JEN | Jena, East Germany |
| KEW | Kew, UK |
| KIR | Kiruna, Sweden |
| KUC | Kucino, USSR |
| KYO | Kyoto, Japan |
| LEI | Leipzig, East Germany |
| MAT | Matsushiro, Japan |
| MOS | Moscow, USSR |

| | |
|---|---|
| MOX | Moxa, East Germany |
| NEC | National Earthquake Information Centre, Golden Co., USA |
| NES | National Earthquake Information Service, Colorado, USA |
| OBM | Ulan-Bator, Mongolia |
| OSA | Osaka, Japan |
| PAR | Paris, France |
| PEK | Beijing, China |
| POT | Postdam, India |
| PRA | Prague, Czechoslovakia |
| PRU | Pruhonice, Czechoslovakia |
| PUL | Pulkovo, USSR |
| RIV | Riverview, Australia |
| STR | Strasbourg, France |
| TAC | Tashkent, USSR |
| UCC | Uccle, Belgium |
| UPP | Uppsala, Sweden |
| USC | United States Coast and Geodetic Survey |
| VIE | Vienna, Austria |
| ZBO | Zongo La Paz, Bolivia |

Apart from ABE, CH and GUT, all other codes are associated with seismological agencies.

Under the source code CH, there are always a few lines of seismic parameters. These are parameters given in various publications as collated by the Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986), which also gives the original source of the parameters.

Column (2) : Time of event (t)

GMT time in hours, minutes and seconds are given.

Columns (3) and (4) : Latitude (Lat.) and Longitude (Long.) of the earthquake epicentre in degrees

An asterisk "*" indicates that the figures have been derived from macroseismic data. Figures in brackets "( )" indicate lower reliability.

Column (5) : Focal depth (h) in kilometres

"Sh." means shallow earthquake, the depth of which has not been given a numerical value by the original source.

Columns (6) to (8) : Magnitude

Columns (6) and (7) give $m_b$ and $M_s$ respectively. In column (8), a magnitude value followed by the letter "L" indicates that it is a local magnitude. The absence of a letter indicates that the magnitude scale has not been specified.

A value followed by an asterisk "*" indicates that it has been derived from macroseismic data. Values in brackets "( )" indicate lower reliability.

Column (9) : Agency which has supplied the magnitude

The codes used are the same as those given for column (1).

Column (10) : Remarks

The number in bracket is the number of seismological stations associated with the determination of seismic parameters.

### A.2.2 Data Used in the Calculation of Surface-wave Magnitudes

The information given in the various columns is described below.

Column (1) : Source code

The codes used are the same as those given in Section A.2.1.

Column (2) : Period $T_N$ or $T_Z$ in seconds

A figure followed by the letter "z" indicates that it is $T_Z$, otherwise it is $T_N$.

Column (3) : Amplitude $A_N$ or $A_Z$ in microns

Column (4) : Period $T_E$ in seconds

Column (5) : Amplitude $A_E$ in seconds

Column (6) : Distance $\Delta$ in degrees between a seismological station and the earthquake epicentre

Column (7) : Surface-wave magnitude $M_S$ calculated in accordance with the Prague formula, see Section 2.3.

The mean $M_S$, its standard deviation (S.D.) and the number of data sets (n) used in the calculation are also given.

### A.2.3 Brief Descriptions

The descriptions are given in note form. They are entirely based on records collated by the Editorial Committee on Historical Materials on Chinese Earthquakes (1983-1986). Only observations which can assist in the assessment of earthquake intensity have been included.

# SUMMARY SHEETS

# SUMMARY SHEET ON THE 1905 AUG 12 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| CH | | 22.1* | 113.5* | | | 5½* | | |
| | | 22.2* | 113.6* | | | 4¾* | | |
| | | 22.1* | 113.5* | | | 5½* | | |

## B. BRIEF DESCRIPTIONS

| | | |
|---|---|---|
| Hong Kong | 21:00 (11th) | - Felt |
| | 00:00 (12th) | - Felt |

*Guangdong Province*

| | | |
|---|---|---|
| Macao | 21:00 (11th) | - Many frightened and ran outdoors |
| | to 06:00 (12th) | - 4 houses collapsed |
| | | - Strong vibrations |
| Guangzhou | 21:05 (11th) | - Felt |
| | 23:00 (11th) | - Felt |
| Zhongshan | (12th) | - Felt |
| | | - Noise heard |
| Enping | (12th) | - Felt |
| | | - Noise heard |

# SUMMARY SHEET ON THE 1918 FEB 13 EARTHQUAKE (SHEET 1 OF 3)

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| GUT | 060713 | 24.0 | 117.0 | Sh. | | 7.3 | | |
| ISS | 060710 | 24.0 | 116.5 | | | | | |
| CH | 060713 | 24 | 117 | | 7.2 | 7.4 | | |
| | | | | | | 7¼ | | |
| | 060713 | 23.5* | 117.2* | | | 7¼ | | |
| | 0608 | 24 | 116 | | | 8.0* | | |
| | 060713 | 24.0 | 117.0 | Sh. | | 7.3 | | |
| | 060713 | 24.0 | 117.0 | | 7.2 | 7.4 | | |
| | 060713 | 23.5 | 117.0 | | | 7.3 | | |
| ABE | | 24.0 | 117.0 | | 7.2 | 7.4 | | |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | $\Delta$ | $M_s$ |
|---|---|---|---|---|---|---|
| UPP | 48 | 90 | 48 | 240 | 74.4 | 7.17 |
| | 12 | 42 | 12 | 98 | | 7.40 |
| DBN | 32 | 404 | | | 84.1 | 7.41 |
| | 20 | 390 | | | | 7.49 |
| POT | 30 | 190 | 30 | 320 | 79.8 | 7.33 |
| | 10 | 80 | 10 | 110 | | 7.37 |
| OSA | 24 | 5750 | | | 19.5 | 7.66 |
| BUD | 18 | 115 | 18 | 87 | 77.6 | 7.54 |
| | | | | | Mean = | 7.42 |
| | | | | | S.D. = | 0.15 |
| | | | | | n = | 8 |

## C. BRIEF DESCRIPTIONS

This earthquake was felt in many provinces in China. Only the observations in Guangdong Province are covered in the following descriptions.

*Guangdong Province*

| | | |
|---|---|---|
| Guangzhou | 14:05 | - Many frightened and ran outdoors<br>- Cracks in many houses<br>- Many masonry houses collapsed<br>- Waves on ponds |

## SUMMARY SHEET ON THE 1918 FEB 13 EARTHQUAKE (SHEET 2 OF 3)

| | | |
|---|---|---|
| Huizhou | 14:00 | - Felt |
| Foshan | 14:00 | - Felt |
| Taishan | 14:00 | - Felt |
| Xinhui | 14:00 | - Felt |
| Kaiping | 14:00 | - Felt |
| Enping | 14:00 | - Felt |
| Zhongshan | | - Two old damaged houses collapsed |
| Sanshui | | - Hanging objects swung |
| Qingyuan | | - Felt |
| Taishan | | - Vibrations<br>- Noise sounds like thunder |
| Zhaoqing | | - Felt<br>- No injury |
| Gaohe | | - Felt |
| Lechang | | - Felt |
| Renhua | | - Felt |
| Chenghai | | - Several tens of houses collapsed<br>- Over ten people killed |
| Shantou | 14:00 | - Nearly all houses collapsed<br>- Nearly 1 000 people killed (another report said 200 to 300)<br>- All houses damaged; many collapsed<br>- Hot water ejected from the ground<br>- Many landslides<br>- Cracks in the ground |
| Haifeng | | - Hanging objects swung<br>- Little damage to houses |

SUMMARY SHEET ON THE 1918 FEB 13 EARTHQUAKE (SHEET 3 OF 3)

| | | |
|---|---|---|
| Heyuan | | - Falling of tiles<br>- Damage to some old walls |
| Heping | | - Strong vibrations |
| Chaozhou | 14:00 | - Many houses damaged and collapsed<br>(total collapse 20%)<br>(partial collapse 40%)<br>(slight damage 80%)<br>- Conspicuous cracks in the ground |
| Fengliang | | - Many people killed<br>- 2 to 3% of houses collapsed<br>- Many houses damaged |
| Chaoyang | | - Many houses damaged and collapsed<br>- Conspicuous cracks in the ground |
| Jieyang | | - 90% houses damaged<br>- 50% houses collapsed |
| Raoping | | - Over 100 people killed<br>- Numerous people injured |
| Huilai | | - Some houses collapsed<br>- No injury |
| Dabu | 14:00 | - Many houses collapsed<br>- Cracks in walls |
| Puning | | - Many houses collapsed |
| Nanao | | - Nearly all houses collapsed<br>- Many people killed and injured |
| Meixian | | - Many houses collapsed<br>- Cracks in many walls |
| Xingning | | - Many houses collapsed |
| Jiaoling | | - Caving in on flat ground; water flowed out |

# SUMMARY SHEET ON THE 1921 MAR 19 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISS | 081945 | 24.0 | 116.5 | | | | | (26) |
| CH | 081945 | 24.0 | 116.5 | | | 6.5 | | |
| | 081945 | 23.5* | 117.0* | | | 6¼ | | |
| | 081945 | 23.5* | 117.2* | | | 6¼ | | |
| | 081945 | 23.5 | 117.0 | | | 6.25 | | |
| | 081950 | | | | | 6½ | | |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | $\Delta$ | $M_s$ |
|---|---|---|---|---|---|---|
| UCC | 18.5 | 15 | 18.5 | 10 | 84.4 | 6.38 |
| UPP | 10 | 4 | 15 | 5 | 73.7 | 6.41 |
| PAR | 20 | 15 | 20 | 11 | 86.5 | 6.39 |
| ALG | 16 | 2 | 16 | 2 | 92.7 | 6.31 |
| OSA | 10 | 97 | | | 19.7 | 6.27 |
| DBN | 18 | 18 | 19 | 28 | 82.9 | 6.45 |
| | | | | | Mean = | 6.37 |
| | | | | | S.D. = | 0.07 |
| | | | | | n = | 6 |

## C. BRIEF DESCRIPTIONS

Hong Kong 16:21 - Strongly felt

*Jiangxi Province*

Nanchang - Felt

Jian - Felt

Ganzhou - Strong vibrations
- Noise heard
- Persons walked unsteadily

*Zhejiang Province*

| | |
|---|---|
| Zhenhai | - Windows rattled<br>- Liquids disturbed |

# SUMMARY SHEET ON THE 1922 MAY 20 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| Source | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| CH | | 24.7* | 116.5* | | | 5* | | |
| | | 24.7* | 116.5* | | | 5* | | |
| | | 24.7* | 116.5* | | | 5* | | |
| | | 24.7* | 116.5* | | | | | Landslide (?) |

## B. BRIEF DESCRIPTIONS

*Fujian Province*

Shanghang

- Hundreds of houses collapsed, including Government offices
- Many casualties (about 20 dead)
- No landslide due to the earthquake

# SUMMARY SHEET ON THE 1926 JUN 13 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISS | 020300 | 20.0 | 116.5 | | | | | |
| CH | 020300 | 20.0 | 116.5 | | | (5¼) | | |
| | 020300 | 20.0 | 116.5 | | | (5½) | | |
| | 020300 | 20.0 | 116.5 | | | (5½) | | |

# SUMMARY SHEET ON THE 1931 SEP 21 EARTHQUAKE (SHEET 1 0F 2)

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| GUT | 102717 | 19¾ | 113 | Sh. | | 6¾ | | |
| ISS | 102722 | 19.5 | 113.2 | | | | | |
| CH | 102720 | 19.8 | 113.1 | 20 | | 6¾ | | |
| | 102720 | 19.8 | 113.1 | | | 6¾ | | |
| | 102720 | 19.8 | 113.1 | | | 6¾ | | |
| | 102720 | 19.8 | 113.1 | | | 6.75 | | |
| | 102640 | | | | | 7.0 | | |
| | 102720 | 19.8 | 113.1 | 20 | | | | |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | Δ | $M_s$ |
|---|---|---|---|---|---|---|
| LEI | 18 | 15 | 20 | 20 | 81.1 | 6.58 |
| | 16 | 21 | 16 | 29 | | 6.82 |
| VIE | 10 | 9 | 13 | 10 | 79.7 | 6.70 |
| UCC | 19 | 27 | 18 | 22 | 85.9 | 6.70 |
| JEN | 17 | 5 | 17 | 3 | 81.7 | 6.13 |
| | 13z | 7 | | | | 6.32 |
| POT | 14 | 32 | 14 | 55 | 80.3 | 6.90 |
| GOT | 20 | 22 | 20 | 30 | 82.4 | 6.70 |
| BUD | 15 | 14 | | | 78.2 | 6.71 |
| BOM | 15 | 132 | | | 37.9 | 6.98 |
| IRK | 12 | 61 | | | 33.2 | 6.70 |
| TAC | 14 | 42 | | | 42.8 | 6.70 |
| BAK | 18 | 29 | 18 | 70 | 57.2 | 6.70 |
| KUC | 15 | 31 | 17 | 17 | 65.4 | 6.58 |
| | 16z | 61 | | | | 6.81 |
| PUL | 15 | 37 | 15 | 27 | 69.4 | 6.71 |
| | 15z | 43 | | | | 6.68 |
| UPP | 15 | 26 | 12 | 7 | 75.6 | 6.76 |
| STR | 14 | 31 | 14 | 25 | 84.9 | 6.76 |
| | 14z | 30 | | | | 6.63 |
| PAR | 28 | 40 | 25 | 25 | 87.9 | 6.69 |
| ALG | 20 | 4 | 20 | 6 | 93.2 | 6.78 |
| DBN | 18 | 36 | 17 | 50 | 84.9 | 6.76 |
| | 12z | 24 | | | | 6.51 |
| | | | | | Mean = | 6.68 |
| | | | | | S.D. = | 0.17 |
| | | | | | n = | 24 |

## SUMMARY SHEET ON THE 1931 SEP 21 EARTHQUAKE (SHEET 2 OF 2)

### C. BRIEF DESCRIPTIONS

| | | | |
|---|---|---|---|
| Hong Kong | 16:30 | | - Felt |
| *Guangdong Province* | | | |
| Guangzhou | 18:28 | 6 min | - Hanging objects swung<br>- Many frightened and ran outdoors |
| | 18:30 | 4 min | - Many frightened and ran outdoors<br>- 4 houses collapsed<br>- No injury |
| Sanshui | 16:20 | 3 min | - Hanging objects swung<br>- Windows rattled<br>- Unstable objects upset<br>- Liquids disturbed, some spilled<br>- No injury<br>- No buildings collapsed |
| Zhaoqing | 16:27 | 3 min | - Felt |
| Kaiping | | | - Felt |

# SUMMARY SHEET ON THE 1936 APR 23 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| CH | | 22.7* | 113.2* | | | 5* | | |
| | | 22.7* | 113.2* | | | 5* | | |

## B. BRIEF DESCRIPTIONS

*Guangdong Province*

| | | |
|---|---|---|
| Zhongshan | 01:50 | - Vibrations of walls<br>- Many frightened and ran outdoors<br>- Two houses collapsed<br>- Three people injured |

# SUMMARY SHEET ON THE 1941 SEP 21 EARTHQUAKE (SHEET 1 OF 4)

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| CH | 061945 | 25.1* | 115.7* | | | 5¾* | | |
| | | 25.1* | 115.8* | | | 5¾* | | |
| | | 25.1* | 115.7* | | | 5¾* | | |

## B. BRIEF DESCRIPTIONS

*Jiangxi, Hunan, Fujian, Guangdong Provinces*

Intensity was assessed based on Mercalli Intensity Scale. Felt at many places including south Jiangxi, south Fujian, east Guangdong and east Hunan. The felt area is elliptical, measured 530 km east-west and 450 km north-south. The total area is about 200 000 km$^2$.

Intensity III zone included: (incomplete)
- Anchi, Dongshan, Xianyou of Fujian
- Zixing, Lingxian of Hunan

Intensity IV zone included:
- Jianning, Mingxi, Qingliu, Ninghua, Longyen, Zhangping, Yongan, Huaan, Pinghe, Zhangzhou, Longhai of Fujian
- Dabu, Meixian, Fengliang, Chaozhou, Jieyang, Wuhua, Zijin, Heyuan, Lianping of Guangdong
- Longnan, Dayu, Nankang, Ganxian, Shangyou, Yudu, Suichuan, Xingguo, Taihe, Guangchang, Shicheng of Jiangxi

Intensity V zone included:
- Changding, Shanghang of Fujian
- Jiaoling of Guangdong
- Dingnan of Jiangxi

Intensity VI zone included:
- Wuping of Fujian
- Ruijin, Huichang of Jiangxi

Intensity VII zone included:
- Xunwu of Jiangxi

| | |
|---|---|
| Anchi | - Felt by persons at rest<br>- Windows rattled<br>- Hanging objects swung |

## SUMMARY SHEET ON THE 1941 SEP 21 EARTHQUAKE (SHEET 2 OF 4)

| | | |
|---|---|---|
| Dongshan | | - Felt by persons at rest<br>- A few people heard noise<br>- Hanging objects swung slightly |
| Xianyou | | - Felt by persons at rest<br>- Hanging objects swung slightly |
| Lingxian | | - Felt by persons at rest |
| Zixing | ~½ min | - About 1/10 population heard noise<br>- Felt by persons at rest and on upper floors<br>- Tiles rattled |
| Qingliu | | - Hanging bells rang |
| Meixian | | - Falling of plaster dust from roof<br>- Pendulum clocks stopped |
| Dabu | | - Falling of plaster dust from roof<br>- A few walls cracked |
| Shicheng | | - Falling of plaster dust from roof |
| Yudu | | - Falling of plaster dust from roof |
| Pinghe | | - Falling of plaster dust from roof |
| Lianping | | - Falling of plaster dust from roof |
| Mingxi | | - Falling of plaster dust from roof |
| Shangyou | | - Falling of plaster dust from roof |
| Taihe | ~5 sec | - Vibrations felt like passing of heavy trucks<br>- Felt indoors |
| Changding | 13:50 | - Felt outdoors<br>- Many ran outdoors<br>- Hanging objects swung<br>- Falling of plaster from old damaged walls<br>- Noise heard |

# SUMMARY SHEET ON THE 1941 SEP 21 EARTHQUAKE (SHEET 3 OF 4)

| | | |
|---|---|---|
| Shanghang | ~20 sec | - Felt nearly by all people<br>- A few people frightened<br>- Hanging objects swung<br>- Vibrations felt like passing of trucks<br>- Noise heard |
| Jiaoling | | - Felt outdoors<br>- Nobody frightened<br>- No falling of plaster dust<br>- Noise sounds like overturning of heavy trucks |
| Dingnan | | - Felt indoors<br>- Hanging objects swung<br>- Falling of plaster dust<br>- Noise sounds like passing of heavy trucks |
| Wuping | ~30 sec | - Felt by all<br>- Many frightened<br>- Hanging objects swung heavily<br>- Falling of plaster<br>- Windows, doors, etc. rattled<br>- No houses collapsed<br>- Noise sounds like passing of trains |
| Ruijin | | - Felt indoors<br>- Strong vibrations<br>- Windows, doors and tiles rattled<br>- Falling of unstable tiles<br>- Noise sounds like explosion<br>- One house collapsed |
| Huichang | | - Felt by all people<br>- Some frightened<br>- Hanging objects swung<br>- Falling of plaster dust<br>- Vibrations from south-east<br>- No damage to houses<br>- Noise sounds like passing of trucks |
| Xunwu | ~2 min | - Felt by all<br>- Many frightened<br>- Hanging objects swung<br>- Hanging bells rang |

SUMMARY SHEET ON THE 1941 SEP 21 EARTHQUAKE (SHEET 4 OF 4)

| | | | |
|---|---|---|---|
| | | | - Falling of plaster dust<br>- About 10 houses collapsed, mainly masonry<br>- Little damage to wooden houses<br>- No injury<br>- No landslide |
| Shaoguan | 13:25 | | - Strong vibrations |
| Nanxiong | | 3 min | - Strong vibrations |
| Heping | 14:00 | | - Felt |
| Chaozhou | 15:00 | | - Felt |

# SUMMARY SHEET ON THE 1962 MAR 18 EARTHQUAKE (SHEET 1 OF 5)

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISS | 201851 | 23.88 | 114.62 | 0 | | | | |
| OBM | 201838 | 23.8 | 114.7 | | | | 6.38 | |
| MOS | 201850 | 23.0 | 115.0 | | | | 5.0 | |
| PEK | 201853 | 23.8 | 114.7 | | | | 6.0 | |
| CH | 201853 | 23.72 | 114.67 | 5 | | 6.1 | | |
| | 201853 | 23.72 | 114.67 | 5 | | 6.4 | | |
| | 201853 | 23.8 | 114.7 | | | 6 | | |
| | 201855 | 23.8 | 114.6 | 25 | | | | |
| | 201850 | 23½ | 114½ | | | 5½ | | |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | $\Delta$ | $M_s$ |
|---|---|---|---|---|---|---|
| BOM | 12 | 3 | 13 | 3 | 39.2 | 5.49 |
| HYD | 15 | 10 | 15 | 8 | 34.6 | 5.77 |
| KEW | 19 | 5.5 | 20 | 4.5 | 85.6 | 5.77 |
| RIV | 15 | 0.5 | | | 67.4 | 5.77 |
| DUR | 18 | 7 | | | 84.4 | 5.77 |
| JEN | 16 | 7 | 18 | 4 | 79.4 | 6.25 |
| KYO | 10.5 | 2 | 8 | 1.8 | 21.2 | 5.77 |
| UPP | 21 | 7.3 | | | 72.9 | 6.07 |
| | 17z | 3.8 | | | | 5.78 |
| KIR | 19 | 8.1 | 19 | 3.9 | 69.5 | 5.91 |
| | 13z | 5.3 | | | | 5.85 |
| MAT | | | | | | 5.77 |
| MOS | | | | | | 5.69 |
| | | | | | Mean = | 5.82 |
| | | | | | S.D. = | 0.18 |
| | | | | | n = | 13 |

## C. BRIEF DESCRIPTIONS

Maximum felt distance was 570 km.

After the impounding of Xinfengjiang Reservoir in October 1959, earthquakes became stronger and more frequent.

# SUMMARY SHEET ON THE 1962 MAR 18 EARTHQUAKE (SHEET 2 OF 5)

*Guangdong Province*

Heyuan

| | | |
|---|---|---|
| Type I houses | : | Built of weak materials; poor workmanship |
| Type II houses | : | Built of ordinary materials, e.g. stone; no structural frame or framed structures with no maintenance |
| Type III houses | : | Good workmanship and design |

Intensity VIII zone

- Major axis N70°E, 12 km long; minor axis 6 to 10 km long; area about 65 $km^2$
- Nearly all type I & II houses damaged, a few collapsed
- Most type III houses damaged, some collapsed
- Near Xinfengjiang
  90 houses collapsed ) 60 to 70%
  1 500 heavily damaged ) of total
- Heyuan town
  1 200 houses collapsed ) 70%
  2 400 heavily damaged ) of
  7 000 damaged ) total
- About 70 cracks in the ground
- Flow from springs increased

Intensity VII zone

- Major axis N45°E, 40 km long; minor axis about 30 km long
- Sleepers wakened
- Many frightened and ran outdoors
- Less than 0.5% type I & II houses collapsed; 40 to 60% damaged
- Cracks in the ground near Heyuan fault

Intensity VI zone

- Major axis N50°-70°E, 180 km long; minor axis about 100 km long
- Less than 2% houses damaged
- Some rockfalls

Intensity V zone

- Major axis NE, about 400 km long; minor axis about 250 km long

SUMMARY SHEET ON THE 1962 MAR 18 EARTHQUAKE (SHEET 3 OF 5)

| | |
|---|---|
| Zijin | - 93 houses collapsed ) 6.7% of<br>793 heavily damaged ) total<br>26% damaged<br>- Cracks in wet ground |
| Longmen | - 730 houses collapsed<br>- 1 200 houses damaged |
| Heping | - One house collapsed<br>- Windows broken |
| Longchuan | - Most walls cracked; some collapsed<br>- Some rockfalls |
| Boluo | - Most houses damaged; walls cracked<br>- Closer to Heyuan, 1 to 2% houses collapsed<br>- Flow from springs changed<br>- Some ground depressions |
| Zengcheng | - Some walls cracked<br>- Chimneys damaged |
| Liuxi | - Walls cracked |
| Shaoguan | - Some walls cracked |
| Wengyuan | - Some houses collapsed<br>- Walls cracked<br>- Ground depressions |
| Yingde | - 2 houses collapsed<br>- Some walls cracked |
| Guangzhou | - A few walls collapsed<br>- Concrete houses cracked<br>- Chimney collapsed<br>- About 0.7% houses damaged |
| Foshan | - 198 houses damaged<br>- 6 houses partially collapsed<br>- Some old houses collapsed<br>- Walls and chimneys damaged |
| Dongguan | - A few brick walls cracked |

## SUMMARY SHEET ON THE 1962 MAR 18 EARTHQUAKE (SHEET 4 OF 5)

| | |
|---|---|
| Qingyuan | - One toilet and one kitchen collapsed |
| Meixian | - 5 houses slightly cracked<br>- Sleeper wakened<br>- Dishes rattled |
| Shunde | - Some houses cracked |
| Zhongshan | - Some concrete houses cracked |
| Kaiping | - 4 type III houses cracked |
| Wuhua | - Some old houses collapsed |
| Lufeng | - Cracks in some walls widened |
| Nanxiong | - Walls cracked<br>- Falling of tiles |
| Dianbai | - One old house collapsed |
| All other areas in Guangdong province except Hainan Dao | - Felt |

*Guangxi Province*

| | |
|---|---|
| Dayu | - Felt |
| Nankang | - Felt |
| Xinfeng | - Felt |
| Longnan | - Felt |
| Quannan | - Felt |
| Anyuan | - Felt |

*Fujian Province*

| | |
|---|---|
| Longhai | - Felt |

SUMMARY SHEET ON THE 1962 MAR 18 EARTHQUAKE (SHEET 5 OF 5)

| | |
|---|---|
| Wuping | - Felt |
| Shanghang | - Felt |
| Yongding | - Felt |
| Nanjing | - Felt |
| Pinghe | - Felt |
| Yunxiao | - Felt |
| Dongshan | - Felt |

# SUMMARY SHEET ON THE 1962 APR 05 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| PEK | 131012 | 23.75 | 114.5 | | | | 4.5 | |
| CH | 131012 | 23.8 | 114.5 | 6 | | 4.9 | | |
| | 131012 | 23.8 | 114.5 | 6 | | 4.9 | | |
| | 131012 | 23¾ | 114½ | | | 4½ | | |

# SUMMARY SHEET ON THE 1962 JUL 19 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| PEK | 093029 | 23.75 | 114.5 | | | | 4.0 | |

# SUMMARY SHEET ON THE 1962 JUL 29 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| PEK | 085741 | 23.75 | 114.5 | | | | 4.75 | Felt |
| CH | 085741 | 23.8 | 114.4 | 8 | | 5.3 | | |
| | 085741 | 23.8 | 114.4 | 8 | | 5.3 | | |
| | 085741 | 23¾ | 114½ | | | 4¾ | | |
| | 085746 | 23.6 | 114.3 | 65 | | | | |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | $\Delta$ | $M_s$ |
|---|---|---|---|---|---|---|
| KIR | 17 | 0.5 | 16 | 0.5 | 69.6 | 4.72 |

## C. BRIEF DESCRIPTIONS

*Guangdong Province*

| | |
|---|---|
| Zengcheng | - Felt indoor<br>- Windows and doors rattled |
| Huizhou | - Felt by a few persons<br>- Slight vibrations |
| Fogang | - Felt by persons at rest<br>- Windows rattled |
| Heping | - Felt by a few persons<br>- Hanging objects swung |
| Wengyuan | - Felt by a few persons indoors<br>- Windows and doors rattled |

# SUMMARY SHEET ON THE 1962 AUG 30 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| CH | 134352 | 23.8 | 114.5 | 8 | | 4.8 | | |
| | 134352 | 23.8 | 114.5 | 8 | | 4.8 | | |
| | 134352 | 23¾ | 114½ | | | 4¼ | | |

# SUMMARY SHEET ON THE 1962 NOV 06 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| CH | 091432 | 23.8 | 114.5 | 6 | | 4.8 | | |
| | 091432 | 23.8 | 114.5 | 6 | | 4.8 | | |
| | 091432 | 23¾ | 114½ | | | 4½ | | |

## B. BRIEF DESCRIPTIONS

*Guangdong Province*

| | |
|---|---|
| Zijin | - Generally felt indoors, some felt outdoors<br>- Windows rattled<br>- Hanging objects swung |
| Xinfeng | - Felt indoors and outdoors<br>- Windows and doors rattled |
| Lianping | - Felt indoors |

# SUMMARY SHEET ON THE 1964 SEP 23 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 000439 | 23.74 | 114.71 | 33 | | | | (16) |
| MOS | 000442 | 24.2 | 114.6 | | | | | |
| CH | 000439 | 23.73 | 114.70 | 8 | | 5.1 | | |
| | 000439 | 23.73 | 114.70 | | | 5.1 | | |
| | 000434 | 23¾ | 114¾ | | | 4¾ | | |

## B. BRIEF DESCRIPTIONS

*Guangdong Province*

Heyuan

Intensity VI zone
- Many frightened and ran outdoors
- Many houses cracked
- Falling of tiles

Intensity V zone
- Felt indoors
- Falling of plasters
- Some unstable objects upset

Intensity IV zone included Heping, Lianping, Longchuan, Xinfeng, Yangcun.

Guangzhou - Felt

# SUMMARY SHEET ON THE 1969 JUL 25 EARTHQUAKE (SHEET 1 OF 3)

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 224939 | 21.61 | 111.83 | 18 | 5.5 | | | (170) |
| USC | 224941 | 21.5 | 111.9 | 33 | 5.4 | 5.9 | | Slight damage in Hong Kong. 3 000 reported to have been killed in China. |
| MOS | 224948 | 22.8 | 111.6 | | | 6.1 | | |
| CH | 224943 | 21.75 | 111.75 | 5 | | 6.4 | | |
| | 224943 | 21.75 | 111.75 | 5 | | 6.4 | | |
| | 224943 | 22.32 | 111.80 | 5 | | 6.4 | | |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | $\Delta$ | $M_s$ |
|---|---|---|---|---|---|---|
| UPP | 18 | 4.4 | 18 | 16 | 73.5 | 6.40 |
| | 15z | 7.1 | | | | 6.11 |
| KIR | 18 | 6.7 | 18 | 18 | 70.6 | 6.28 |
| | 16z | 7.7 | | | | 5.93 |
| PRU | 16 | 10 | | | 78.1 | 6.29 |
| PRA | 13.5 | 6.7 | | | 78.1 | 6.21 |
| MOX | 14.5 | 9.6 | | | 79.6 | 6.28 |
| | 16z | 9.3 | | | | 6.13 |
| DBN | 14 | 16 | | | 82.3 | 6.35 |
| FUR | 15 | 2.95 | | | 80.6 | 6.21 |
| USC | | | | | | 6.21 |
| MOS | | | | | | 6.29 |
| | | | | | Mean = | 6.22 |
| | | | | | S.D. = | 0.12 |
| | | | | | n = | 12 |

## C. BRIEF DESCRIPTIONS

*Guangdong Province*

Yangjiang

Type I houses : Built of weak materials
Type II houses : Built of brick and timber
Type III houses : Built of brick and mortar

## SUMMARY SHEET ON THE 1969 JUL 25 EARTHQUAKE (SHEET 2 OF 3)

| | |
|---|---|
| Intensity VIII zone | - East-west about 20 km long; north-south about 10 km long<br>- 10 762 houses collapsed<br>35 965 heavily damaged<br>90 840 damaged<br>- 33 people died<br>236 seriously injured<br>762 slightly injured<br>- Most type I houses collapsed, others heavily damaged<br>- A few type II houses collapsed, others damaged<br>- Some type III houses had no damage<br>- Cracks in the ground<br>- Flow from springs changed<br>- One landslide (225 $m^3$) |
| Intensity VII zone | - Major axis ENE, about 6 km long; north-south about 20 km wide<br>- Most type I houses damaged, some collapsed<br>- Most type II houses damaged, some heavily damaged<br>- Most type II houses remained intact, a few damaged<br>- Cracks in the ground<br>- Hundreds of cases of sand and water ejection<br>- Some landslides (max. 160 $m^3$) |
| Intensity VI zone | - Major axis ENE, about 100 km long<br>- A few type I houses heavily damaged and collapsed<br>- No major damage to type II houses |
| Xinyi | - Over 10 houses collapsed<br>- 1 200 houses partially collapsed |
| Deqing | - Felt by many persons<br>- Hanging objects swung<br>- Windows and doors rattled<br>- Cracks in 6 houses widened |
| Fengkai | - Roof tiles rattled |

## SUMMARY SHEET ON THE 1969 JUL 25 EARTHQUAKE (SHEET 3 OF 3)

| | |
|---|---|
| Xinxing | - Hanging objects swung<br>- Vibrations |
| Gaohe | - Felt by all<br>- Windows rattled<br>- Hanging objects swung |
| Panyu | - Vibrations<br>- Hanging objects swung |
| Conghua | - Felt by some persons<br>- Roof tiles rattled<br>- Doors slightly vibrated |
| Zengcheng | - Felt by many persons<br>- Vibrations felt like passing of trucks |
| *Guangxi Province* | |
| Xiangzhou | - Felt by persons at rest<br>- Vibration of houses |
| Cangwu | - Vibration of houses<br>- Hanging objects swung |
| Beihai | - Felt by many persons<br>- Hanging objects swung<br>- Dishes and windows rattled |
| Zhaoping | - Felt by some persons<br>- Hanging objects swung<br>- Doors and windows rattled |

# SUMMARY SHEET ON THE 1977 MAY 11 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| CH | 203130 | 23.70 | 114.65 | | | 4.7 | | |
| | 203131 | 24.0 | 114.7 | 20 | | 4.6 | | |
| | 203130 | 23.7 | 114.65 | | | 4.7 | | |

# SUMMARY SHEET ON THE 1980 JUL 24 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 090013 | 22.485 | 111.825 | 0 | | | 4.0L | (6) |

# SUMMARY SHEET ON THE 1981 APR 09 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 010344 | 22.971 | 115.434 | 0 | | | 4.0L | (5) |

# SUMMARY SHEET ON THE 1981 MAY 04 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 110504 | 23.821 | 114.699 | 0 | 4.8 | | | (15) |

# SUMMARY SHEET ON THE 1982 FEB 25 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | $t$ | *Lat.* | *Long.* | $h$ | $m_b$ | $M_s$ | $M$ | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 003907 | 24.799 | 114.764 | 5 | 4.4 | | | (46) |
| NES | 003908 | 24.786 | 114.775 | 8 | 4.5 | 4.1 | | Felt; (34) |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | $\Delta$ | $M_s$ |
|---|---|---|---|---|---|---|
| HFS | 19 | 0.064 | | | 74.1 | 4.03 |
| NES | | | | | | 4.1 |
| | | | | | Mean = | 4.07 |
| | | | | | n = | 2 |

# SUMMARY SHEET ON THE 1985 SEP 03 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 235814 | 21.855 | 111.775 | 15 | 4.3 | | | (13) |
| PEK | 235813 | 21.8 | 111.8 | 15 | | 4.2 | | |
| NEC | 235815 | 21.796 | 111.740 | 33 | 4.3 | | | (8) |

# SUMMARY SHEET ON THE 1986 JAN 27 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | 231350 | 21.672 | 111.752 | 0 | 4.5 | | | (17) |
| HKC | 231348 | 21.7 | 111.6 | | | | 5.1 | Felt |
| NEC | 231351 | 21.978 | 111.517 | 33 | 4.1 | | | Felt; (9) |
| PEK | 231352 | 21.7 | 111.9 | | | 5.0 | | |

# SUMMARY SHEET ON THE 1987 FEB 25 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | | | | | | 4.7 | | (22) |
| NES | 142805 | 21.730 | 111.643 | 33 | 4.1 | | | Felt; (16) |

# SUMMARY SHEET ON THE 1987 AUG 02 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| NES | 090735 | 24.924 | 115.608 | 29 | 4.9 | | | Casualties; (97) |
| | 090736 | 25.009 | 115.596 | 33 | 4.9 | | | 41 people injured; over 300 houses collapsed and 700 damaged in the Guangzhou Xunwu area; (50) |

## B. DATA USED IN THE CALCULATION OF SURFACE-WAVE MAGNITUDES

| *Source* | $T_N/T_Z$ | $A_N/A_Z$ | $T_E$ | $A_E$ | $\Delta$ | $M_s$ |
|---|---|---|---|---|---|---|
| PRU | 16z | 0.4 | | | 78.0 | 4.79 |
| ZBO | 24z | 0.1 | | | 171.1 | 4.88 |
| Mean $M_S$ quoted by 13 seismological stations | | | | | | 4.9 |
| | | | | | Mean = | 4.88 |
| | | | | | n = | 15 |

# SUMMARY SHEET ON THE 1987 SEP 15 EARTHQUAKE

## A. SUMMARY OF SEISMIC PARAMETERS

| *Source* | *t* | *Lat.* | *Long.* | *h* | $m_b$ | $M_s$ | *M* | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| ISC | | | | | | 4.7 | | (46) |
| NES | 020434 | 23.783 | 114.496 | 33 | 4.7 | | | Intensity = III (Modified Mercalli Scale); (39) |

# GLOSSARY OF TERMS

# GLOSSARY OF TERMS

| | |
|---|---|
| Body-wave magnitude | earthquake magnitude determined from the high frequency body waves of an earthquake, as measured by seismographs at distances that are large compared with the source size |
| Epicentral intensity | intensity assigned to the area at the macroseismic epicentre |
| Epicentre | point on the ground surface vertically above the focus of an earthquake |
| Epicentral distance | distance between a site in question and the epicentre of an earthquake |
| Focal depth | distance between the focus and the epicentre of an earthquake |
| Focus | underground point, or cluster of points, from which the seismic disturbance originates |
| Instrumental data | seismic data obtained by instruments |
| Instrumental magnitude | earthquake magnitude derived from instrumental data |
| Intensity | degree of shaking at a specific place during a given earthquake; this 'degree' of shaking is a rating assigned by means of a descriptive scale |
| Isoseismal | contour line drawn to separate areas of the same earthquake intensity |
| Local magnitude | earthquake magnitude determined from the maximum amplitude recorded on a Wood-Anderson seismograph, adjusted to a value corresponding to that at an epicentral distance of 100 km (also known as the Richter Scale magnitude) |
| Macroseismic data | seismic data based on observations of the effects of an earthquake |
| Macroseismic epicentre | point on the ground surface at which isoseismals of an earthquake appear to converge |
| Macroseismic magnitude | earthquake magnitude derived from macroseismic data |
| Magnitude | rating of a given earthquake, usually based on measurements from seismograph records, expressing the amount of energy released by an earthquake in the form of seismic waves |

| | |
|---|---|
| Moment magnitude | earthquake magnitude derived from the seismic moment of an earthquake |
| Seismic moment | measure of the energy radiated from the source of an earthquake in the form of very long period seismic waves, determined either from seismograph records or from field observations |
| Seismograph | instrument for recording ground displacements during an earthquake |
| Surface-wave magnitude | earthquake magnitude determined from the long period (approximately 20 seconds) surface waves of an earthquake, as measured by seismographs at distances that are large compared with the source size |

# GLOSSARY OF SYMBOLS

# GLOSSARY OF SYMBOLS

$A$ amplitude of surface wave measured from the trace recorded by a seismograph

$A_E$ amplitude of surface wave in the horizontal east-west direction

$A_N$ amplitude of surface wave in the horizontal north-south direction

$A_Z$ amplitude of surface wave in the vertical direction

$C$ station correction in the Prague formula for calculating the surface-wave magnitude of an earthquake

$I_i$ earthquake intensity of rating i

$I_m$ maximum earthquake intensity observed in an earthquake event

$I_o$ epicentral intensity of an earthquake event

$M$ magnitude of an earthquake event

$M_L$ local magnitude of an earthquake event

$M_S$ surface-wave magnitude of an earthquake event

$M_{SC}$ macroseismic surface-wave magnitude of an earthquake event

$R_i$ radius of isoseismal corresponding to earthquake intensity of rating i

$T$ period of surface wave measured from the trace recorded by a seismograph

$T_E$ period of surface wave in the horizontal east-west direction

$T_N$ period of surface wave in the horizontal north-south direction

$T_Z$ period of surface wave in the vertical direction

$h$ focal depth of an earthquake event

$d$ distance between an instrumental epicentre and a macroseismic epicentre

$j$ number of isoseismals constructed for an earthquake event

$m_b$ body-wave magnitude of an earthquake event

$n$ number of data sets used in the calculation of surface-wave magnitude

$t$ time of occurrence of an earthquake event

$\Delta$ distance between a seismological station and an earthquake epicentre

$\phi_1$ latitude of a seismological station

$\phi_2$ latitude of an earthquake epicentre

$\lambda_1$ longitude of a seismological station

$\lambda_2$ longitude of an earthquake epicentre

# GLOSSARY OF CHINESE NAMES

# GLOSSARY OF CHINESE NAMES

| | |
|---|---|
| Academia Sinica, Institute of Geophysics | 中國科學院地球物理研究所 |
| Academia Sinica, Seismological Committee | 中國科學院地震工作委員會 |
| Catalogue of Earthquakes in Guangdong | 廣東省地震目錄 |
| Chronological Tables of Earthquake Data of China | 中國地震資料年表 |
| Compilation of Historical Materials on Chinese Earthquakes | 中國地震歷史資料滙編 |
| Editional Committee on Historical Materials on Chinese Earthquakes | 中國地震歷史資料編輯委員會 |
| Guangdong Bureau of Seismology | 廣東省地震局 |
| Journal of South China Seismology | 華南地震 |
| Seismological Brigade of Guangzhou, State Seismological Bureau | 國家地震局廣東地震大隊 |
| Summary of Large Earthquakes in China from 780 B.C. to 1973 with Magnitude ≥ 6 | 中國強地震簡目 (公元前780年－公元1973年) (震級等於大於6級) |
| Summary of Large Earthquakes in China from 780 B.C. to 1976 with Magnitude ≥ 6 | 中國強地震簡目 (公元前780年－公元1976年) (震級等於大於6級) |