国家重点基础研究发展计划项目（973）资助

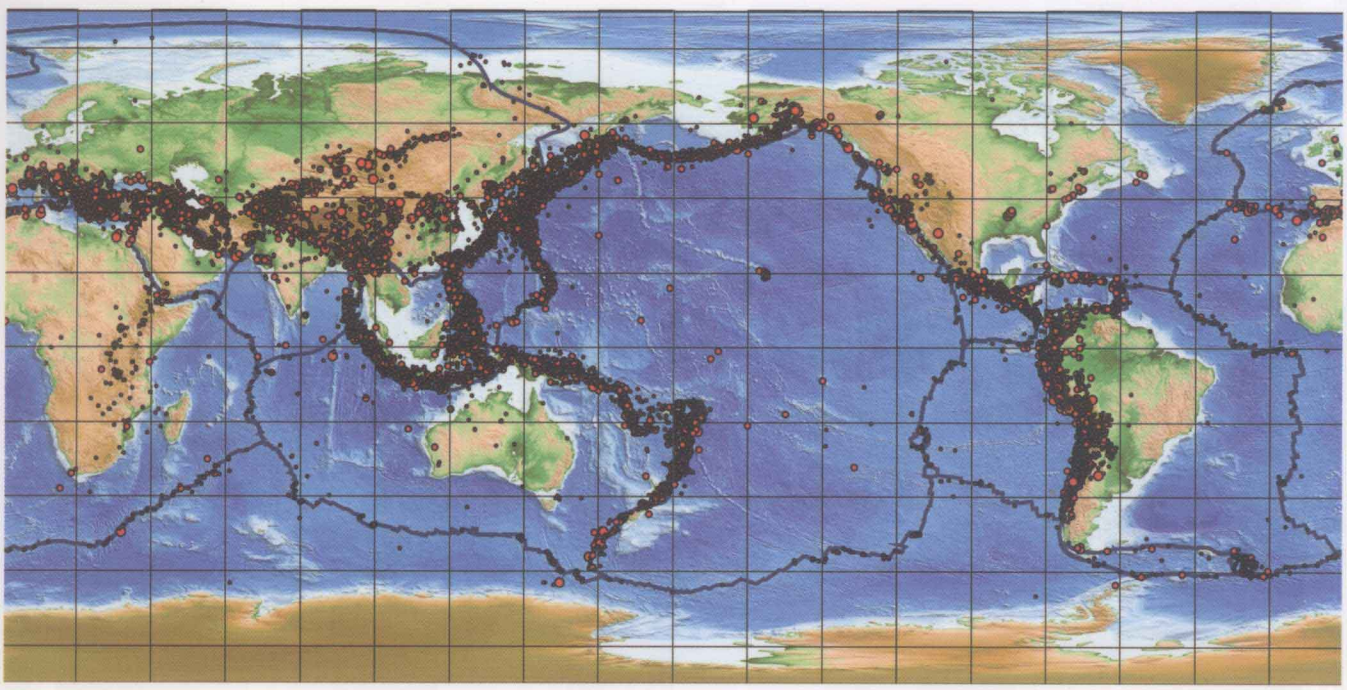
全球地震目录

GLOBAL EARTHQUAKE CATALOG

9999B.C.～1963A.D. $M \geqslant 5.0$

1964A.D.～2010A.D. $M \geqslant 6.0$

宋治平　张国民　刘　杰　尹继尧　薛　艳　宋先月　编著



地震出版社

国家重点基础研究发展计划项目(973)资助

Global Earthquake Catalog

全球地震目录

9999B. C. ～ 1963A. D. $M \geqslant 5.0$
1964A. D. ～ 2010A. D. $M \geqslant 6.0$

宋治平　张国民　刘　杰　尹继尧　薛　艳　宋先月　编著

地震出版社

图书在版编目(CIP)数据

全球地震目录/宋治平等编著. —北京:地震出版社,2011.9

ISBN 978-7-5028-3919-2

Ⅰ.①全… Ⅱ.①宋… Ⅲ.①地震—目录—世界
Ⅳ.①P316.1

中国版本图书馆 CIP 数据核字(2011)第 190695 号

地震版 XM2107

全球地震目录

宋治平 张国民 刘 杰 尹继尧 薛 艳 宋先月 编著

责任编辑: 江 楚

责任校对: 孙铁磊

出版发行:地震出版社

北京民族学院南路 9 号 邮编:100081

发行部:68423031 68467993 传真:88421706

门市部:68467991 传真:68467991

总编室:68462709 68423029 传真:68455221

专业部:68467982 68721991

网址:http://www.dzpress.com.cn

经销:全国各地新华书店

印刷:北京鑫丰华彩印有限公司

版(印)次:2011 年 9 月第一版 2011 年 9 月第一次印刷

开本:880×1230 1/16

字数:1397 千字

印张:28.75

书号:ISBN 978-7-5028-3919-2/P(4596)

定价:100.00 元

序

进入新世纪以来，全球巨大地震频发，如2004年12月26日印尼苏门答腊9.1级大震；2008年5月12日我国汶川8.0级大震；2010年2月27日智利8.8级大震；2011年3月11日日本本州东部海域9.0级大震等。在巨大地震频发的态势下，开展全球地震活动，特别是巨大地震的研究已成为全球地球科学领域关注的焦点。此类研究包括地震减灾研究和地震机理研究，其中地震减灾研究包括地震监测预报研究、震灾防御研究、地震工程研究等方面；地震机理研究包括地震孕育发生的深部地球物理环境，地震发生的深浅部构造条件，地震成因的地球动力学机制，地震破裂失稳的微观物理力学机制等内容。然而无论哪方面的研究都离不开地震的基础资料，地震目录就是地震研究的重要基础资料之一。

这部《全球地震目录》是国家重点基础研究发展计划项目（973）“汶川地震发生机理及其大区动力学环境研究”中第四课题的第五专题关于全球地震构造格局和地震活动性研究中一项基础性工作。专题组在汇编《全球地震灾害信息目录（9999B. C. ～ 2010A. D. ）》的基础上，通过全球不同网站和出版物收集、汇总各类地震目录资料，经过修订、加工而编辑成《全球地震目录》。全书含公元前9999年至公元1963年5级以上地震和公元1964～2011年6月6级以上地震目录共近3万条，包括地震发生时间、震中位置（经纬度、英文地名、中文地名）、震源深度、震级、震级标度以及资料来源等。

全书主要包括两部分。第一部分为全球地震目录，即全球公元前9999年至公元1963年5级以上地震和公元1964年至2011年6月6级以上地震目录（1964年之后汇编6级以上而不是5级以上目录，是因为随着台网发展1964年后5级以上地震数量很大，本书难以容纳）；第二部分为全球巨大地震目录，即全球大于等于7¾级的巨大地震目录，是从第一部分中抽取出来的缩编本。

需要说明的是本书所汇编的全球地震目录，对于不同时代、不同国家和地区、乃至同一地区的不同人文环境期，资料的完整性、可靠性和参数的精度等都有很大的差异。就地震的基本参数而言，尽管每条目录都包括发震时间、震中位置、震源深度、震级等参数，但由于不同时期地震事件的参数确定方法有很大差异，因而所定参数的误差和不确定性也有很大差别。公元1900年后的地震事件参数主要是由地震台网测定的，其参数相对完整和准确。从1900年之前一直追溯到公元前2000～3000年间的地震事件，通常是由历史记载的地震信

息资料确定的，由于历史资料的局限性，故地震事件的缺失（不完整性）和地震参数的误差（不确定性）都很大。而公元前2000年（或公元前3000年）前的地震事件，往往是通过地震考古即通常所说的古地震方法确定其参数的，如发震时间是用地质测年的方法确定的，其误差可达数百年。因此，早期的地震事件，其参数有很大的不确定性。另外，不同国家和不同地区的地震研究程度亦有相当大的差异，相应的地震资料的质量亦造成相当的差异。这些情况，均望读者在使用中注意。

然而本书作为地震研究的基础资料，仍不失其重要的科学价值，热忱期望《全球地震目录》在防震减灾的研究工作中发挥其应有的作用。

2011年8月

Preface

Since the beginning of the 21st century, huge earthquakes have occurred frequently in the world. Such examples include the Sumatra, Indonesia, M_S9.1 earthquake on December 26, 2004, the Wenchuan, China, M_S8.0 earthquake on May 12, 2008, the Chile M_S8.8 earthquake on February 27, 2010, the Japan M_S9.0 earthquake in the east coast of Honshu on March 11, 2011, and so on. In such a situation of frequent occurrence of great earthquakes in the world, to study the global activity of earthquakes, especially of huge earthquakes, has become a focus for earth science in the world. This kind of researches includes that of earthquake disaster reduction and that of earthquake mechanism. Among the two, the research of earthquake disaster reduction includes earthquake monitoring and prediction, earthquake disaster prevention, earthquake engineering, and so on; while the research of earthquake mechanism includes the deep – part geophysical environment for earthquake preparation, the deep – and shallow – part tectonic conditions for earthquake occurrence, the geodynamics mechanism of earthquake genesis, the microscopic physico – mechanical mechanism of rupture instability, and so on. But no matter which kind of research is concerned, the basic data of earthquakes are indispensable, while the earthquake catalog is one of the important basic materials for earthquake research.

This book, *Global Earthquake Catalog*, is part of the basic work in the research on the global seismotectonic pattern and seismic activity, which is the 5th special subject of the 4th project of the National Basic Research Program of China (973 Program), "Research on the Genetic Mechanism and Large District Dynamics Environment for the Wenchuan Earthquake". The special subject research group first compiled the *Disaster Information Catalog of Global Earthquakes* (9999 B. C. to 2010 A. D.). On such a basis and by collecting and synthesizing various kinds of earthquake bibliographic data coming from different websites and publications, this book, Global Earthquake Catalog was compiled after revision and processing. The entire book includes the catalog of nearly 30,000 earthquakes with $M_S \geqslant 5.0$ from 9999 B. C. to 1963 A. D., and earthquakes with $M_S \geqslant 6.0$ from 1964 to June, 2011. In the catalog, the occurrence time, epicentral location (latitude, longitude, as well as the place name in Chinese and English), focal depth, magnitude, magnitude scale, data source, and so on, are all listed.

This book mainly includes two parts. The first part gives the global earthquake catalog, namely, the catalog of global earthquakes with $M_S \geqslant 5.0$ in the period from 9999 BC to 1963 A. D. and those with $M_S \geqslant 6.0$ in the period from 1964 to June 2011. After 1964, only earthquakes with $M_S \geqslant 6.0$ rather than those with $M_S \geqslant 5.0$ were compiled; the reason is that, owing to the development of the network, the number of earthquakes with $M_S \geqslant 5.0$ recorded after 1964 is too large to be contained in this book. The second part gives the catalog of global huge earthquakes, namely, the catalog of huge earthquakes with $M_S \geqslant 7\frac{3}{4}$, which is an abstract drawn from the first part.

What should be noted about the global earthquake catalog compiled in this book is that there are rather large differences in completeness and reliability of materials, parameter precision, and so on. The reason of these differences lies in that the materials are of different time, from different countries or areas, or even from a same area with different humane environments.

Concerning the basic parameters of earthquakes, though the parameters of each event are all listed in the catalog, including the occurrence time, epicentral location, focal depth, magnitude, and so on, their errors and uncertainties have large difference; the reason is that the methods of earthquake parameter determination changed much in different time periods.

The parameters of earthquake events after 1900 are complete and precise in a relative sense for they were mainly determined by the seismological networks. The earthquake events traced back from 1900A. D. to 2000 B. C. or 3000 B. C. were usually determined by the earthquake information in historical records. Owing to the limitation of historical information, the incompleteness of earthquake events and uncertainty of seismic parameters are both very large

The parameters of earthquake events that occurred before 2000 B. C. (or 3000 B. C.) were often determined by earthquake archaeology, which is usually called the ancient earthquake method. For example, the occurrence time was determined by the geological dating method, with an error of one hundred years or more. Therefore, the parameters of early earthquake events are of very large uncertainty.

Moreover, the degrees of earthquake study in different countries and different areas also differ greatly from one another. The qualities of seismic data of the same kind but from different sources may also result in considerable difference. It is hoped that the readers pay enough attention to the above facts in using this book.

However, as the fundamental material for seismic research, this book still has an important scientific value. We are willing to see that theGlobal Earthquake Catalog could play a proper role in the research on earthquake resistance and disaster reduction.

Zongjin Ma
Aug2011

目　录

编辑说明

本书是在《全球地震灾害信息目录（9999B. C. ～2010A. D. ）》基础上，通过全球不同网站和出版物收集地震目录，再修订、编辑而成。

对于同一个地震事件，可能从不同渠道收集到不同信息，因此，在地震参数的修订过程中，以地震信息的信度高的地震参数为准的原则。首先考虑 Engdahl 给出的地震参数，然后再考虑各国家（地区）或全球资料中的信息资料作参考。如资料来源中标注“Engdahl，GSHAP”表示以 Engdahl 的结果为主的两个渠道收集资料共同修订结果；“Turkey”表示土耳其资料结果。

对于震中参考地名的修订问题，1900 年之前的地震事件没有仪器记录，因此，震中位置一般是根据遭受地震破坏情况确定的城市的经度和纬度。1900 年之后的地震震中一般是通过仪器测算的震中经度和纬度。因此，统一按照震中经度和纬度在 Google Earth 上修订地震震中参考英文地名，并翻译为中文。原则上震中参考地名为“国名：州名或县级地名”。

为了课题研究需要，修订、编辑了全球公元前 9999 年至公元 1963 年 3 级以上地震和公元 1964 ～2011 年 6 月 4 级以上地震目录 15 万余条。而本书编辑了全球公元前 9999 年至公元 1963 年 5 级以上地震和公元 1964 ～2011 年 6 月 6 级以上地震目录近 3 万条，包括地震时间、震中（经度、纬度、英文地名、中文地名）、深度、震级、震级标度以及资料来源。

地震的基本参数包括发震时间、震中位置、震源深度、地震震级。由于不同时期的地震事件其参数的确定方法有很大的差别，因此其内涵（所定参数的误差与不确定性）也有很大差别。1900 年后的地震事件参数主要是由地震台网测定的，其参数相对完整和准确。从 1900 年之前一直追溯到公元前 2000 ～3000 年间的地震事件，通常是从历史记载地震信息资料中确定的，被称为历史地震，其参数的不完整性和不确定性都较大。而公元前 2000 年或 3000 年之前的地震事件，往往是通过地震考古即通常所说的古地震方法确定其参数的，如发震时间是应用地质测年的方法确定的，其误差可达数百年，因此对于早期的地震事件，其参数具有很大的不确定性，望读者在使用时注意。本书地震目录参数如下：

1　日期和时间

世界标准时间（UTC）的年、月、日、时、分、秒。

2　震中

纬度（°）（Latitude）（北纬为正，南纬为负），经度（°）（Longitude）（东经为正，西经为负）。1900 年之前的地震事件没有仪器记录，因此，给出的震中位置是根据遭受地震破坏情况确定的城市的经度和纬度。1900 年之后的地震震中一般是通过仪器测算的震中经度和纬度。以震中经度和纬度在 Google Earth 上修订地震震中参考地名（中文或英文）。

3　震源深度（Depth）

震源深度（H）单位为公里（km）。深度小于 70km 的地震为浅源地震；深度在 70 ～299km 的地震为中源地震；深度大于等于 300km 的地震为深源地震。

4　震级（Magnitude）

在地震目录编辑和修订过程中，从多种渠道得到的同一条地震事件的震级，首先考虑 Engdahl 给出的

震级，其次是各地区收集的震级的最大震级，同时给出相应的震级标度（Scale）。对于无震级地震事件的震级则由本书确定。以下为本书涉及到的震级标度。

矩震级（M_W）：由标量矩（M_0）计算得到，$M_W = \frac{2}{3}\lg M_0 - 10.7$（Hanks and Kanamori，1979）。

面波震级（M_S）：对于仪器记录地震而言，深度通常小于50km在震中距20～160°记录到的周期18～22s的面波最大地面振幅计算而得。而对于无仪器记录的地震，震级标度为M_S的震级一般均是通过统计计算而得。

体波震级（m_b）：根据震中距大于或等于5°记录到周期为0.1～3s的地震体波最大地面振幅计算而得。

宽频带体波震级（m_B）：由Gutenberg和Richter（1956）定义的，根据震中距大于或等于5°记录到的周期为5～10s地震体波的最大地面振幅计算而得。

日本气象厅震级（M_j）：对于仪器记录地震而言，应用最大地面位移或最大地面速度计算而得。而对于无仪器记录的地震，由日本气象厅给出的震级其标度也用M_j表示。

能量震级（M_e）：根据宽频带P波能量谱密度得到的地震辐射能量（E_S）计算而得。$M_e = \frac{2}{3}\lg E_S - 2.9$（Choy and Boatwright，1995）。

地方性震级或近震震级（M_L）：震中距在100～1000 km范围内的地震，根据体波计算而到。

Lg波震级（M_{Lg}）：应用Lg地震波（短周期面波）周期为1s的垂直分量计算而得。

持续时间震级（M_d，Duration Magnitudes）：根据地震波持续时间和尾波长度计算而得。

断层面积震级（M_{fa}，Felt Area Magnitudes）：由断层面积计算而得，大约等效于M_b值。通常应用于无地震仪器时代发生的地震。

震源机制震级（M）：利用震源机制计算而得。

未知震级（M_{uk}）：计算方法不明或不能确定（Unknown）出版来源的震级。一般该震级是通过统计计算而得，该震级标度以“M_{uk}”表示，有些文献用“UK”表示。

灾害信息确定的震级（M_k）：对于无震级的地震事件，我们在对有震级的地震事件灾害信息的优势震级研究基础上，利用无震级地震事件的灾害信息确定了其震级，震级的确定方法与原则见《全球地震灾害信息目录（9999B. C. ～2010A. D.）》，这类地震的震级标度表示为M_k，在目录中“资料来源”以“Song”标注。

5　资料来源

全球历史地震及灾害信息收集来源于多种渠道，表1列出不同地区地震目录的资料来源及标注符号。

表1　全球历史地震与灾害性地震资料收集来源及标注

地　区	标注符号	资料来源（网址及出版物）
非洲地区地震目录	GSHAP	http：//www. seismo. ethz. ch/gshap/earift/
美国地震目录	USGS	http：//neic. usgs. gov/neis/epic/epic_ global. html
美国加州地震目录	CGS	http://www. conservation. ca. gov/CGS/rghm/quakes/Pages/eq_chron. aspx
南美洲地震目录	GSHAP	http：//www. seismo. ethz. ch/gshap/ceresis/
阿富汗地震目录	Afghan	http：//sgsingapore. com/earthquake - afghanistan
北欧地区地震目录	GSHAP	http：//www. seismo. ethz. ch/gshap/ceresis/
伊朗地震目录	Iran	http：//www. iiees. ac. ir/english/bank/irancat. txt
意大利地震目录	Italy	http：//emidius. mi. ingv. it/CPTI04/
中欧地区地震目录	GSHAP	http：//www. seismo. ethz. ch/gshap/cirpan/

续表

地　区	标注符号	资料来源（网址及出版物）
冰岛地区地震目录	Iceland	http：//hraun. vedur. is/ja/ymislegt/storskjalf. html
土耳其地震目录	Turkey	http：//www. seismo. ethz. ch/gshap/turkey/
东亚地区地震目录	GSHAP	http：//www. seismo. ethz. ch/gshap/eastasia/final – cata. txt
印度及邻区地震目录	GSHAP	http：//www. seismo. ethz. ch/gshap/ict/indcat. txt
印度地震目录	India	http：//www. imd. ernet. in/section/seismo/static/signif. htm
中国历史强震目录	China	国家地震局震害防御司编，《中国历史强震目录（公元前 23 世纪～公元 1911 年）》，北京：地震出版社，1995 顾功叙等编，《中国地震目录（公元前 1831 年至公元 1969 年）》，北京：科学出版社，1983
中国近代强震目录	Wang S.	汪素云等编，《中国近代地震目录（公元 1912～1990 年）》，北京：中国科学技术出版社，1999
中国历史有感地震目录（–618～1949）	Diao S	刁守中等编，《中国历史有感地震目录》，北京：地震出版社，2008
中国历史有感地震目录（1950～1969）	Jin X.	金学申研究成果，金学申提供的未出版的内部资料
世界地震目录	Shi Z.	时振梁等编，《世界地震目录：1900～1980（$M\geqslant6$）》，北京：地图出版社，1986
中国地震台网（CSN）地震目录	CSN	http：//www. csndmc. ac. cn/newweb/catalog_ direct_ link. htm
国际地震中心（ISC）地震目录	ISC	http：//www. csndmc. ac. cn/newweb/catalog_ direct_ link. htm
美国国家地震信息中心（NEIC）地震目录	NEIC	http：//www. csndmc. ac. cn/newweb/catalog_ direct_ link. htm
世纪地震目录	Engdahl	http：//earthquake. usgs. gov/research/data/centennial. php#cat22
全球重大灾害性地震目录	*	http：//neic. usgs. gov/neis/epic/epic_ global. html 或 http：//earthquake. usgs. gov/earthquakes/eqarchives/epic/
	* *	Paula K. Dunbar, Patricia A. Lockridge, and Lowell S. Whiteside. Catalog of significant earthquakes 2150 B. C. – 1991 A. D. U. S. Dept. of Commerce, National Oceanic and Atmospheric Administration. September 1992 罗伟等编译，《全球重大灾害性地震目录（2150B. C. ～ 1991A. D. ）》，北京：地震出版社，1996
全球地震灾害评估计划	GSHAP	http：//www. seismo. ethz. ch/GSHAP/index. html
菲律宾地震目录	Nakamura	http：//www. cseas. kyoto – u. ac. jp/seas/15/4/150406. pdf
菲律宾地震目录（1599～1909）	Maso	http：//www. gutenberg. org/files/18556/18556 – h/18556 – h. htm
菲律宾地震目录	Bautista	http：//www. sciencedirect. com/science/article/pii/S0040195199002723 Bautista, M. L. P. and K. Oike, Estimation of the magnitudes and epicenters of Philippine historical earthquakes, Tectonophys, 317, 137～169, 2000
朝鲜半岛地震目录	Korea	李裕澈编译，《朝鲜·韩国地震目录（公元 27～1985 年）》，北京：地震出版社，2001

Editorial Comments

Based on thebook *Disaster Information Catalog of Global Earthquakes* (9999 B. C. - 2010 A. D.), this book was compiled by collecting and revising earthquake catalogs from different websites and publications in the world.

For the same seismic event, information collected from different channels may be different; so, the principle applied to the revision of seismic parameters is to give priority to seismic parameters whose seismic information is of a higher believe. The seismic parameters given by Engdahl were considered first, and then the information coming from the national (regional) or global data was taken for reference. The mark "Engdahl, GSHAP" attached to the information source means that the result is a totalized revision of data from two channels, with the result of Engdahl dominating; "Turkey" means the results of the Turkish data.

The revision of the reference place name of the epicenter is as follows. The seismic events before1900 A. D. do not have instrumental records, so the epicentral location is generally given as the longitude and latitude of the city determined from the earthquake damage. The epicenters of earthquakes after 1900 A. D. are usually given as the longitude and latitude observed by instruments. For this reason, a unified revision of place names in English (and also the Chinese translation) was done on Google Earth according to the longitude and latitude of epicenter. In principle, the reference epicenter name is given in the form of "Country: state or county".

To meet the need of project research, more than 150,000 entries of the catalog of global earthquakes with$M_S \geqslant 3.0$ in the period from 9999 B. C. to 1963 A. D. and earthquakes with $M_S \geqslant 4.0$ in the period from 1964 to June, 2011, were revised and compiled. In the book, nearly 30,000 entries of the catalog of global earthquakes with $M_S \geqslant 5.0$ in the period from 9999 B. C. to 1963 A. D. and earthquakes with $M_S \geqslant 6.0$ from 1964 to June, 2011 were compiled; the contents include the occurrence time, epicenter (latitude, longitude, English place name, Chinese place names), focal depth, magnitude, magnitude scale and sources of data.

The basic parameters of earthquakes include the time of origin, epicenter location, focal depth, and magnitude. Because the seismic events occurred in different periods of time, the methods used to determine the parameters are quite different; therefore the connotations (the error and uncertainty) of the determined parameters also differ greatly. The parameters of earthquake events after 1900 A. D. are mainly determined by the seismic network, so the parameters are complete and precise in a relative sense. The seismic events before 1900 A. D. but after 2000 B. C. or 3000 B. C. are often identified by earthquake information recorded in history; they are called historical earthquakes. Their parameters are more incomplete and uncertain. The parameters of seismic events before 2000 B. C. or 3000 B. C. were often determined by seismic archeology or the so - called ancient earthquake method; for example, the occurrence time was determined by the geological dating method, with an error of hundreds of years or more. Therefore, the parameters of the early seismic events bear quite large uncertainty. It is hoped that the readers pay due attention when using this book. The parameters of earthquake catalog in this book are as follows:

1 Date and Time

Year, month, day, hour, minute and second in Coordinated Universal Time (abbreviated to UTC).

2 Epicenter

It is expressed as the latitude (with north latitude as positive, and south latitude as negative) and longitude (with east longitude as positive, and west longitude as negative) of the city struck by earthquake. Earthquake events before 1900 have no instrumental records; so the epicenter location is given as the latitude and longitude of the city determined from the destruction caused by earthquake. For earthquakes after 1900, the epicenter is usual-

Editorial Comments

Based on thebook *Disaster Information Catalog of Global Earthquakes* (9999 B. C. – 2010 A. D.), this book was compiled by collecting and revising earthquake catalogs from different websites and publications in the world.

For the same seismic event, information collected from different channels may be different; so, the principle applied to the revision of seismic parameters is to give priority to seismic parameters whose seismic information is of a higher believe. The seismic parameters given by Engdahl were considered first, and then the information coming from the national (regional) or global data was taken for reference. The mark "Engdahl, GSHAP" attached to the information source means that the result is a totalized revision of data from two channels, with the result of Engdahl dominating; "Turkey" means the results of the Turkish data.

The revision of the reference place name of the epicenter is as follows. The seismic events before1900 A. D. do not have instrumental records, so the epicentral location is generally given as the longitude and latitude of the city determined from the earthquake damage. The epicenters of earthquakes after 1900 A. D. are usually given as the longitude and latitude observed by instruments. For this reason, a unified revision of place names in English (and also the Chinese translation) was done on Google Earth according to the longitude and latitude of epicenter. In principle, the reference epicenter name is given in the form of "Country: state or county".

To meet the need of project research, more than 150,000 entries of the catalog of global earthquakes with$M_S \geqslant 3.0$ in the period from 9999 B. C. to 1963 A. D. and earthquakes with $M_S \geqslant 4.0$ in the period from 1964 to June, 2011, were revised and compiled. In the book, nearly 30,000 entries of the catalog of global earthquakes with $M_S \geqslant 5.0$ in the period from 9999 B. C. to 1963 A. D. and earthquakes with $M_S \geqslant 6.0$ from 1964 to June, 2011 were compiled; the contents include the occurrence time, epicenter (latitude, longitude, English place name, Chinese place names), focal depth, magnitude, magnitude scale and sources of data.

The basic parameters of earthquakes include the time of origin, epicenter location, focal depth, and magnitude. Because the seismic events occurred in different periods of time, the methods used to determine the parameters are quite different; therefore the connotations (the error and uncertainty) of the determined parameters also differ greatly. The parameters of earthquake events after 1900 A. D. are mainly determined by the seismic network, so the parameters are complete and precise in a relative sense. The seismic events before 1900 A. D. but after 2000 B. C. or 3000 B. C. are often identified by earthquake information recorded in history; they are called historical earthquakes. Their parameters are more incomplete and uncertain. The parameters of seismic events before 2000 B. C. or 3000 B. C. were often determined by seismic archeology or the so – called ancient earthquake method; for example, the occurrence time was determined by the geological dating method, with an error of hundreds of years or more. Therefore, the parameters of the early seismic events bear quite large uncertainty. It is hoped that the readers pay due attention when using this book. The parameters of earthquake catalog in this book are as follows:

1 Date and Time

Year, month, day, hour, minute and second in Coordinated Universal Time (abbreviated to UTC).

2 Epicenter

It is expressed as the latitude (with north latitude as positive, and south latitude as negative) and longitude (with east longitude as positive, and west longitude as negative) of the city struck by earthquake. Earthquake events before 1900 have no instrumental records; so the epicenter location is given as the latitude and longitude of the city determined from the destruction caused by earthquake. For earthquakes after 1900, the epicenter is usual-

ly given as its longitude and latitude measured by instruments. The reference place name (Chinese or English) of the epicenter has been revised on Google Earth according to the longitude and latitude.

3 Focal Depth

The focal depth (H) is measured in kilometers (km). Earthquakes with H less than 70km are called shallow earthquakes; those with H of 70km to 299km are called intermediate earthquakes; and those with H greater than or equal to 300km are called deep focus earthquakes.

4 Magnitude

During the compilation and revision of the earthquake catalog, for the same event, there were usually a number of magnitude values obtained from various sources. Among them, the value given by Engdahl was considered first, and then the largest magnitude values collected from relevant regions. Meanwhile, the corresponding magnitude scale (Scale) was given. The magnitude of earthquake events having no magnitude records was determined by the book. The magnitude scales involved in the book are as follows.

Moment magnitude (M_W): it is calculated from the scalar moment (M_0) by the formula $M_W = \frac{2}{3}\lg M_0 - 10.7$ (Hanks and Kanamori, 1979).

Surface wave magnitude (M_S): It is used for instrumentally recorded earthquakes; the depth is usually less than 50km. It is calculated from maximum ground surface amplitude of S – wave within a period range of 18 ~ 22s recorded in the epicentral distance range of 20 °~160 °. For earthquakes having no instrumental records, the magnitude of magnitude scale M_S is generally calculated by statistics.

Body wave magnitude (m_b): It is calculated from the maximum ground surface amplitude of P – wave within a period range of 0.1 ~3s recorded at the epicentral distance equal to or greater than 5 °.

Broadband body wave magnitude (m_B): It was defined by Gutenberg and Richter (1956). It is calculated from the maximum ground surface amplitude of P – wave within a period range of 5 ~10s recorded at the epicentral distance equal to or greater than 5 °.

Magnitude from Japan Meteorological Agency (M_j): It is used for earthquakes that have instrumental records, and is calculated from the maximum ground surface displacement or the maximum ground surface velocity. For earthquakes that have no instrumental records, the magnitude given by the Japan Meteorological Agency is also in M_j scale.

Energy magnitude (M_e): It is calculated from the seismic radiation energy (E_S) given by the broadband P-wave energy spectrum density. The formula is $M_e = \frac{2}{3}\lg E_S - 2.9$ (Choy and Boatwright, 1995).

Local magnitude or near shock magnitude (M_L): It is used for earthquakes whose epicentral distance is within the range of 100 to 1,000 kilometers, and is calculated from the body wave.

Lg wave magnitude (M_{Lg}): It is calculated from the vertical component of Lg seismic wave (short – period surface wave) with a period of 1s.

Duration magnitude (M_d): It is calculated from the seismic wave duration and tail wave length.

Fault area magnitude (M_{fa}): It is calculated from the fault area, approximately equivalent to the m_b value, and is often used for earthquakes in the age when seismic instruments did not appear.

Focal mechanism magnitude (M): It is calculated by use of the focal mechanism.

Unknown magnitude (M_{uk}): The magnitude is calculated by unknown method or is from uncertain publication source. Such magnitude is generally calculated by statistics; the magnitude scale is denoted by "M_{uk}", or "UK" in some of the literature.

Magnitude determined from the disaster information (M_k): This kind of magnitude is used for seismic events with no magnitude records. The predominant magnitude corresponding to definite disaster information has been obtained by studying the disaster information of earthquake events with known magnitudes. Based on the results of such study, the magnitude of seismic events with no magnitude records can be determined from the disaster information. For the method and principle of magnitude determination, see *Disaster Information Catalog of Global Earthquakes* (9999 B. C. to 2010 A. D.). The magnitude scale of this type of earthquakes is expressed as

M_k, and the "data source" given in the Catalog is labeled "Song".

5 Data Source

In the collection of global historical earthquakes and disaster information, the data source was of a variety of channels. The data sources of earthquake catalogs for different regions and corresponding labels are listed in Table 1.

Table 1 Data sources for the collection of historical earthquakes and disastrous earthquakes in the world and labels for the data sources

Areas	Label	Data Sources (Website and publications)
African Earthquake Catalog	GSHAP	http://www.seismo.ethz.ch/gshap/earift/
Earthquake Catalog of U. S. A.	USGS	http://neic.usgs.gov/neis/epic/epic_global.html
Earthquake Catalog of California, USA	CGS	http://www.conservation.ca.gov/CGS/rghm/quakes/Pages/eq_chron.aspx
South American Earthquake Catalog	GSHAP	http://www.seismo.ethz.ch/gshap/ceresis/
Afghanistan Earthquake Catalog	Afghan	http://sgsingapore.com/earthquake - afghanistan
Earthquake Catalog of Northern Europe Region	GSHAP	http://www.seismo.ethz.ch/gshap/ceresis/
Iran Earthquake Catalog	Iran	http://www.iiees.ac.ir/english/bank/irancat.txt
Italian Earthquake Catalog	Italy	http://emidius.mi.ingv.it/CPTI04/
Central Europe Earthquake Catalog	GSHAP	http://www.seismo.ethz.ch/gshap/cirpan/
Iceland Earthquake Catalog	Iceland	http://hraun.vedur.is/ja/ymislegt/storskjalf.html
Turkey Earthquake Catalog	Turkey	http://www.seismo.ethz.ch/gshap/turkey/
East Asia Earthquake Catalog	GSHAP	http://www.seismo.ethz.ch/gshap/eastasia/final - cata.txt
Earthquake Catalog of India and Its Adjacent Areas	GSHAP	http://www.seismo.ethz.ch/gshap/ict/indcat.txt
India Earthquake Catalog	India	http://www.imd.ernet.in/section/seismo/static/signif.htm
Historical Strong Earthquake Catalog of China	China	Department of Earthquake Disaster Prevention, China Seismological Bureau (ed.), 1995. *Historical Strong Earthquake Catalog of China* (from 2300 B. C. to 1911 A. D.), Seismological Press, Beijing. Gu Gongxu et al. (eds.), 1983. *China Earthquake Catalog* (from 1831 B. C. to 1969 A. D.), Science Press, Beijing.
Recent Strong Earthquake Catalog of China	Wang S.	Wang Suyun et al. (eds.), 1999. *Recent Strong Earthquake Catalog of China* (*from* 1912 *to* 1990), Science and Technology Press of China, Beijing.
Historical Felt Earthquake Catalog of China (from 618 B. C. to 1949 A. D.)	Diao S.	Diao Shouzhong et al. (eds.), 2008. *Historical Felt Earthquake Catalog of China*, Seismological Press, Beijing.
Historical Felt Earthquake Catalog of China (1950 - 1969)	Jin X.	Research Result of Jin Xueshen, unpublished internal information offered by Jin Xueshen.
World Earthquake Catalog	Shi Z.	Shi Zhenliang et al. (eds.), *World Earthquake Catalog*: 1900 - 1980 ($M \geq 6.0$), Sinomap Press, Beijing, China, 1986.
Earthquake Catalog of China Seismic Networks	CSN	http://www.csndmc.ac.cn/newweb/catalog_direct_link.htm
Earthquake Catalog of International Seismological Center (ISC)	ISC	http://www.csndmc.ac.cn/newweb/catalog_direct_link.htm

续表

Areas	Label	Data Sources (Website and publications)
Earthquake Catalog of the National Earthquake Information Center (NEIC)	NEIC	http://www.csndmc.ac.cn/newweb/catalog_direct_link.htm
Century Earthquake Catalog	Engdahl	http://earthquake.usgs.gov/research/data/centennial.php#cat22
Catalog of Significant Earthquakes	*	http://neic.usgs.gov/neis/epic/epic_global.html　http://earthquake.usgs.gov/earthquakes/eqarchives/epic/
	* *	Paula K. Dunbar, Patricia A. Lockridge, andLowell S. Whiteside, September 1992. *Catalog of Significant Earthquakes* 2150 *B. C.* – 1991 *A. D.*, U. S. Dept. of Commerce, National Oceanic and Atmospheric Administration. Luo Wei et al. (eds.), 1996. *Catalog of Significant Earthquakes* (2150 *B. C.* – 1991 *A. D.*), Seismological Press, Beijing.
The Global Seismic Hazard Assessment Program (GSHAP)	GSHAP	http://www.seismo.ethz.ch/GSHAP/index.html
Philippines Earthquake Catalog	Nakamura	http://www.cseas.kyoto-u.ac.jp/seas/15/4/150406.pdf
Philippines Earthquake Catalog (1599 – 1909)	Maso	http://www.gutenberg.org/files/18556/18556-h/18556-h.htm
Philippines Earthquake Catalog	Bautista	http://www.sciencedirect.com/science/article/pii/S0040195199002723. Bautista, M. L. P. and K. Oike, 2000. Estimation of the magnitudes and epicenters of Philippine historical earthquakes, Tectonophys., 317: 137 – 169.
Korean Peninsula Earthquake Catalog	Korea	Li Yuche et al. (eds.), 2001. *North Korea · South Korea Earthquake Catalog* (A. D. 27 – 1985), Seismological Press, Beijing.
Japan Earthquake Catalog	Usami	http://repository.dl.itc.u-tokyo.ac.jp/dspace/bitstream/2261/12734/1/ji0543001.pdf
	Japan	Lu Zhenheng (ed.), 1991. *Overview of the Destructive Earthquakes in Japan*, Seismological Press, Beijing, pp. 159 ~ 334.
Australian Earthquake Catalog	Australia	http://www.seismicity.see.uwa.edu.au/welcome/seismicity_in_australia#impotEQ
China Earthquake Disaster Information	Dis	http://www.china-disaster.cn/ Reference materials include: Xie Yushou and Cai Meibiao (eds), 1983. *Compilation of Historical Earthquake Data of China*, *Vol.* 5, Science Press, Beijing. Editorial Board of China Earthquake Yearbook, 1990. *China Earthquake Yearbook* (1949 – 1981), Seismological Press, Beijing. Gao Jianguo, 1990. *Summary of Earthquake Losses*, Seismological Press, Beijing. Guo Zengjian and Chen Xinlian (eds.), 1986. *Earthquake Countermeasures*, Seismological Press, Beijing. Zhang Zhaocheng, Luo Lange, Li Haihua et al. (eds.), 1988. *Earthquake Cases in China* (1966 – 1975), Seismological Press, Beijing. Zhang Zhaocheng, Luo Lange, Li Haihua et al. (eds.), 1990. *Earthquake Cases in China* (1976 – 1980), Seismological Press, Beijing. Zhang Zhaocheng, Luo Lange, Li Haihua et al. (eds.), 1990. *Earthquake Cases in China* (1981 – 1985), Seismological Press, Beijing. Zhang Zhaocheng, Zheng Dalin, Xu Jinghua et al. (eds.), 1999. *Earthquake Cases in China* (1986 – 1988), Seismological Press, Beijing.

续表

Areas	Label	Data Sources (Website and publications)
China Earthquake Disaster Information		Zhang Zhaocheng, Zheng Dalin, Xu Jinghua et al. (eds.), 2000. *Earthquake Cases in China* (1989 – 1991), Seismological Press, Beijing. Chen Qifu, Zheng Dalin, Che Shi et al. (eds.), 2002. *Earthquake Cases in China* (1992 – 1994), Seismological Press, Beijing. Chen Qifu, Zheng Dalin, Liu Guiping et al. (eds.), 2002. *Earthquake Cases in China* (1995 – 1996), Seismological Press, Beijing. Chen Qifu, Zheng Dalin, Gao Rongsheng et al. (eds.), 2003. *Earthquake Cases in China* (1997 – 1999), Seismological Press, Beijing. Chen Qifu, Zheng Dalin, Che Shi et al. (eds.), 2008. *Earthquake Cases in China* (2000 – 2002), Seismological Press, Beijing.
Global Earthquake (Volcanic) Tsunami Information	NOAA	Information on global tsunami disaster collected by the U. S. National Oceanic and Atmospheric Administration (NOAA) Website. (http://www.nesdis.noaa.gov/)
Global Earthquake Catalog	USGS	http://earthquake.usgs.gov/earthquakes/eqarchives/epic/

6 Description of Headings in the Catalog

(1) Universal Time (UTC): year (Year), month (Mo), day (Dy), hour (Hr), minutes (Mn), seconds (Sec).

(2) The latitude (Latitude) and longitude (Longitude) of epicenter.

(3) Depth (Depth), magnitude (Mag) and magnitude scale (referred to as Scale).

(4) Place name (in English), or Name (in English) and place name (in Chinese), or Name (in Chinese).

(5) Data source (Information).