Formation of the Regular Astronomical Records in Early China

MA Liping, LIU Ciyuan

National Time Service Center, Chinese Academy of Sciences
18 Lintong, Shaanxi, China 710600

Abstract: Since the Western Han Dynasty, many astronomical events were recorded in Chinese history books systematically. The quantity of the astronomical records increased and the types of that completed gradually in the Han, Wei and Jin Dynasties. A comprehensive statistical analysis of the astronomical records for this period, including resources of literatures, catalogues and time distribution, was conducted. During the period of 625 years, 1 581 celestial phenomena were recorded, including 236 solar and lunar eclipses, 782 positions of lunar and planetary, and 563 other cosmic events. Almost all these records come from the official Histories such as astronomical treaties and imperial chronicles.
Key words: ancient astronomical record; history of astronomy; the Han, Wei and Jin Dynasties; statistical analysis

1 INTRODUCTION

There is a long Chinese tradition that celestial phenomena was observed and recorded, As a result of which, a large quantity of astronomical records are contained in extant literature. The early Chinese records did not have exact dates or clear meanings (Liu, 2003). The earliest record —the Sun and the Moon did not meet harmoniously in (lodge) *Fang* 房, during the *Zhongkang* period of the Xia dynasty—is retrievable in the "*Yinzheng* 胤征" chapter of the *Shangshu* 尚书 "*Book of Documents*". Thereafter, there are some clues to solar eclipses, such as "*Sanmiao*", "*Tian-da-yi*", double dawn, and the conjunction (of the Sun and Moon) in the month 10 (see Liu, 2003). Several records of eclipses and the record of "*Xin-da-xing* (supernova) *bing* (gain) *huo* (Scorpio α)" are found in the oracle-bone inscriptions of the Shang Dynasty (Zhang, 2009). The record of "Jupiter in *Chunhuo* 鹑火", "the five planets gathered in *Fang*", the comet, and the lunar eclipse are related to King Wu's conquest (Liu, 2006). Plenty of dated records with lunar phases are contained in the bronze inscriptions of the Western Zhou Dynasty (Expert Group, 2000).

The celestial phenomena were recorded with exact dates and descriptions from the Spring and Autumn period. The records of solar eclipses had been systematically inserted in chronicles from the *Chunqiu* 春秋 "*The Spring and Autumn Annals*". It was followed by later dynastic histories.

Many cosmic events were recorded in Chinese history books by the numbers since the Western Han Dynasty. The quantity of the astronomical records increased and the types of that completed gradually in the Han, Wei and Jin Dynasties, the formation period of the regular astronomical records in early China. We conducted a comprehensive statistical analysis of the astronomical records for this period, including resources of literatures, catalogues and time distribution. Our important reference is *General Collection of Ancient Chinese Astronomical Records* (Beijing Astronomical Observatory, 1988), in which an enormous amount of astronomical events are collected.

2 THE ASTRONOMICAL RECORDS OF THE WESTERN HAN DYNASTY (202 BC—AD 25)

Firstly in official history, the astronomical records were arranged in the special volume of the *Hanshu*, which was imitated in later historical books. A variety of natural disasters and oddities of the Spring and Autumn [SA] (770 BC—476 BC) and Western Han [WH] (202 BC—AD 25) period are recorded in the *wuxing zhi* 五行志 "*the five elemental-phases*" of the *Hanshu* 汉书 "*Han Annals*", including some kinds of astronomical records, which are divided into five parts: 1) solar eclipses, 37 accounts of SA and 54 accounts of WH, 2) *riyue bian* (solar and lunar variation), six accounts of WH, 3) meteor showers, respectively one account of SA and WH, 4) comets, three accounts of SA and nine accounts of WH, 5) aerolites, one account of SA and nine accounts of WH. The West Han Dynasty cosmic events, totally 79 accounts, are chronological, accompanied by a large number of astrology comments of Dong Zhongshu, Liu Xiang, Gu Yong, et al.

The astrological divination of stars and five planets are recorded in the anterior half volume of the *tianwen zhi* 天文志 "*monographs on astrology/astronomy*" of the *Hanshu*, which is nearly same to the *tianguanshu* 天官书 "*treatise on the celestial offices*" of the *Shiji* 史记 "*Grand Scribe's Record*". The astronomical records are recorded in the posterior half volume of it. These records are chronological and they are not classified, totally 84 accounts, including 45 accounts of the lunar and planetary positions, 31 accounts of y*ixing* 异星 "unusual stars" such as comets and meters, and eight accounts of clouds respectively. The format of these records, consisting of the event (the astronomical record), divination and *yan* 验 (the corresponding event happened later), was imitated by later age. It was not until the Five Dynasties(AD 907—960) that the divination and *yan* were basically canceled. For instance, the year *Qinglong* 4, month 7, day *jiayin*, Venus approached the big star of *xuanyuan*(轩辕) "α Leo". The divination prophesied: "The Empress should be worried". The year *Jingchu* 1, the Empress *Mao* died (Treatise 13, Volume 23 of the 1st astronomical treatise of the *Songshu* (*Song Annals*).

There are ten astronomical records in the Wang Mang *zhuan* "*biography of Wang Mang*" of the *Hanshu*, which are not given in the *wuxing zhi* and *tianwen zhi* of the *Hanshu*. Another three astronomical records related to the Wang Mang period are retrievable in the *tianwen zhi* of the *Hou Hanshu*. The *benji* "*imperial chronicle*" of the *Hanshu* includes some of the records of the *wuxing zhi*, basically the *benji* doesn't include the records of the *tianwen zhi*.

While some of cosmic events of the Spring and Autumn, Qin and early Western Han Dynasty are mentioned in the *tianguanshu* of the *Shiji*, these records are not illuminated with exact dates. Cosmic events are recorded in the *liezhuan* "*biographies*" of the *Shiji* and *Hanshu* occasionally, only different record and its details are not retrievable in the mentioned literature.

Some of the Western Han Dynasty cosmic events are recorded in the literature of later age, such as the *Tongzhi* 通志 "*General Chronicle*", *Wenxian Tongkao* 文献通考 "*Comprehensive Study of the Written Record*", and *Gujin Tushu Jicheng* 古今图书集成 "*Integration of Classic Books*", in which the cosmic events of previous dynasties are recorded. Even if there is individual difference from the *Hanshu*, it can be easily seen that it was caused by miscopying.

2.1 ECLIPSES

The Western Han Dynasty solar eclipses recorded in the official sources are summarized in Table 1. In this table we have listed column by column: the literature sources, total accounts, correct accounts, error accounts, and the accounts which are illuminated with the lunar mansion and degree (solar positions).

Table 1 Western Han Dynasty Solar Eclipses Recorded in the Official Sources

Literature sources	total accounts	correct accounts	error accounts	solar positions
the *wuxing zhi* of the *Hanshu*	54	38	16	33
the *benji* of the *Hanshu*	51	37	14	—
Wang Mang *zhuan* of the *Hanshu*	3	2	1	—

Notes: the "solar positions" mean the accounts which are illuminated with the lunar mansion and degree (solar positions).

In summary, there are 60 solar eclipses: 40 occurred and 20 are error according to modern astronomical computation. It is common for the same eclipse to be recorded both in the *wuxing zhi* and in the *benji*. These records were copied and recopied and for over 1,000 years, then carved and re-carved in mirror image onto wooden printing blocks (often by illiterates) for another 1,000 years (Pankenier, 2012). As Dubs (1938-1955, Ⅲ: 559) observed: "… it is but natural that the original records should have suffered errors of transmission; as a whole they are surprisingly correct." In 20 error eclipses, there are seven eclipses that can be corrected; one eclipse that is lunar eclipse; five eclipses that were derived from mistake; seven eclipses that remain to be investigated. The calculation results show that there are 87 solar eclipses visible from *Chang'an* (the capital), of which 47 are recorded. The coverage is 54% (see Liu and Ma, 2015).

It is recorded in the *benji* of the *Shiji* that "the year Emperor *Wen* 2, month 11, the last day of the lunar month, the Sun was eclipsed; the 15th day of the lunar month (full moon), the Sun was eclipsed again". It is obviously that the latter was lunar eclipse. It is recorded as solar eclipse by mistake. The Moon was really eclipsed in the evening of that day according to modern computation. It is the earliest lunar eclipse that can be proved, which is illuminated with exact date.

2.2 POSITIONS OF THE MOON AND FIVE PLANETS

Yan 掩 "occultation", *shi* 食 "eclipse", *fan* 犯 "approach", *shou* 守 "stationary", *he* 合 "conjunction" and *ru* 入 "access" are used to describe the positional relationship between the celestial bodies in ancient Chinese times. There are 47 positional records of the Moon and five planets in the Western Han Dynasty which are all retrievable in the *tianwen zhi* of the *Hanshu*. The terms of these records are various: one record of *ju* 聚 "gather", 11 records of *chu* 出 "appearance" and *xing* 行 "walk", six records of stationary, ten records of conjunction, five records of *zai* 在 "at", nine records of access, two records of approach, two records of eclipse, and one record of *yu* 逾 "cross". Only five records are associated with the Moon. While planetary motions were paid great attention in the Western Han Dynasty, the Moon movements were paid more attention later.

The events that "the five planets gathered in the lodge *Dongjing* 东井" during the beginning of the Western Han and "Mars stayed at the lodge *Xin* 心" during the end of the Western Han are all famous events, which are discussed frequently (Huang, 1990; Liu and Wu, 2008).

The names of the five planets are different from those of later age. The five planets are most called *Jin* 金 "metal", *Mu* 木 "wood", *Shui* 水 "water", *Huo* 火 "fire" and *Tu* 土 "earth" in the *tianwen zhi* of the *Hanshu*, while in later age, they are called *Taibai* 太白, *Suixing* 岁星, *Chenxing* 辰星, *Yinghuo* 荧惑 and *Tianxing* 填星.

The parlance of these records is casual, which belongs to description. The term with a strict specification had gradually formed since then. There are 35 accounts recorded with definite dates and locations. The calculation results show that 28 accounts are correct and seven accounts are error. The error rate is 20%, which is obviously superior to that of solar eclipses.

2.3 COMETS/GUEST STARS

The ancient records are too simple, especially ignoring the movements of special celestial bodies. It is no doubt that *hui* 彗, *bo* 孛, and long stars belong to comets, but guest stars and other nouns are difficult to determine. Accordingly, it often creates confusion regarding comets and novae/supernovae. Table 2 listed the literature sources of the records of the Western Han Dynasty comets/guest stars. There are 54 comets or guest stars retrievable from the literatures, corresponding to 34 comets or so, including 23 records of *bo* 孛, five records of *hui* 彗, five records of guest stars 客星, two records of long stars and *pengxing* 蓬星, one record of *baiqi* 白气, and one record of *tianchan* 天欃.

Table 2 Literature Sources of the Records of the Western Han Dynasty Comets/Guest Stars

Literature sources	accounts
the *wuxing zhi* of the *Hanshu*	11
the *benji* of the *Hanshu*	19
the *tianwen zhi* of the *Hanshu*	18
the *liezhuan* "biography" of the *Hanshu*	5
the *jiaosi zhi* "records of worship in the wild" of the *Hanshu*	1
the *benji* of the *Shiji*	4
the *fengchan shu* "sacrificial ceremonies" of the *Shiji*	1

Four records given in the *tianwen zhi* could be novas or supernovas. "The year *Yuanguang* 1, the month 6, the guest star was seen in the lodge *fang* 房", the first record of guest stars in historical literature. Due to special effect in stellar evolution, these records are paid great attention.

2.4 METEORS AND AEROLITES

Altogether 14 meteors have been found in the *tianwen zhi*, *wuxing zhi*, *benji* and the *Hanji* "*the Previous Hanshu*". Some are recorded in various documents; some are vivid and recorded in detail. Two records obviously belong to meteor showers. Meteor showers are associated with cometary evolution. Hence astronomers attach great importance to Meteor showers.

There are ten records of aerolites, which are all documented in the *wuxing zhi* of the *Hanshu*. Only one recorded more detailed is also founded in the *jiaosi zhi* of the *Hanshu.* The places of aerolites were usually recorded in the *wuxing zhi.*

2.5 OTHER ASTRONOMICAL RECORDS

There are four sunspots, and the record in the *wuxing zhi* of the *Hanshu* is the earliest in the world. The first year of *Heping* (28 BC), Month 3, Day *yiwei*, yellow sun rose and was centered by a black gas, which is as big as copper coin. The records of sunspots, which are documented very late in foreign countries, are of great importance to the study of solar activities.

There are some inexplicit records, eight records, which are suspected of auroras. There are some other records, which should be associated with the weather.

The features of the records during the Western Han Dynasty: the amount is less than that of later age; casual form (some in more detail); be short of date (mostly only year and month). All these show that the Western Han Dynasty is in the pioneering stage of the conventional celestial phenomena system.

3 THE CELESTIAL PHENOMENA DURING THE EASTERN HAN DYNASTY (AD 25—220)

The *wuxing zhi* of the *Hou Hanshu* has six volumes and celestial phenomena are given in the Volume six specially. These records are classified into seven types, totally 107 records, including 83 solar eclipses and 24 records of other solar and lunar variation. The *tianwen zhi* of the *Hou Hanshu* has three volumes containing 192 positions of the Moon/planets and 144 records of others, such as comets, meteors, clouds, seeing Venus in the daytime and other astronomical phenomena, totally 336 records. Four lunar eclipses are mentioned when discussing *lifa shumi* 历法疏密 in the *lüli zhi* 律历志"*calendar*" of the *Hou Hanshu* and these records are not retrievable in other literature.

3.1 ECLIPSES

The Eastern Han Dynasty solar eclipses are recorded in the text of the *wuxing zhi*, *benji* and *gujin zhu* 古今注 "annotation" of the *wuxing zhi* of the *Hou Hanshu.* The records in the *wuxing zhi* and *benji*, totally 74, are basically same (detail different). The records solar eclipses given in the *gujin zhu*, 11 accounts

are annotated in those of the *wuxing zhi*. There are 72 accounts in the *wuxing zhi*, including 55 accounts illuminated with the lunar mansion and degree, which (solar positions) are not recorded in the *benji* and *gujin zhu*. There are 83 solar eclipses retrievable from the various literatures. Sixty-eight eclipses occurred, 12 are error, and three eclipses are invisible in China according to modern astronomical computation. In 12 error records, there are four that can be corrected; four that are lunar eclipses; one that was derived from mistake; three that remain to be investigated. Therefore there are 72 solar eclipses, including 65 solar eclipses that were visible from the capital and seven records that were visible from other places. The calculations show that there are 70 solar eclipses visible from the capital. Sixty-five are recorded. The coverage is 93%.

The first invisible record of solar eclipse is given in the *gujin zhu*:

The year *Jianwu* 1, the month 1, the day *gengwu* (25-02-17), the solar eclipse occurred.

This eclipse occurred in North America and it could not be visible in any place of China. The record created a precedent for invisible solar eclipses.

The features of solar eclipses are: high coverage; few mistakes; few invisible eclipses; more details-solar position and magnitude. Just like D. W. Pankenier (2012) concluded: "… we can conclude, then, that the solar eclipse records for all four centuries of the Han Dynasty as a whole are remarkably accurate."

There are four records and two records of lunar eclipses in the *lüli zhi* and *wuxing zhi* of the *Hou Hanshu* respectively. However, it is recorded in the *lüli zhi* of the *Hou Hanshu* that there are 327 lunar eclipses obtained by calculation and 98 had been observed in 155 years. Our calculations show that 143 lunar eclipses occurred. It can be seen that the level of calculation is low; on the contrary, the observations are quite complete at the time considering interference from cloud, fog, rain or snow.

3.2 POSITIONS OF THE MOON AND FIVE PLANETS

When it comes to the Easter Han Dynasty, there are far more records of lunar and planetary positions than those in the Western Han Dynasty. The terms are also focused on approach, access, and other relatively standardized terminology. There are three records, 114 records of the lunar and planetary positions respectively in the text of the *tianwen zhi* of the *Hou Hanshu* and there are 37 and 38 records of those respectively in the *gujin zhu* "annotation" of the *tianwen zhi*. Obviously, the positions of the Moon are not recorded as calamity when compiling the *tianwen zhi* of the *Hou Hanshu* and they are supplemented in accordance with the *gujin zhu* by the posterity.

In the case of the records given in the text of the *tianwen zhi*, illuminated with complete dates and exact phenomena, 85 records are correct and 21 records are error according to modern computation. The error rate is 20% in common with that of the Western Han Dynasty. However for the records given in the annotation of the *tianwen zhi*, 35 records are correct and 33 records are error. The error rate is 49%, which is much higher than that of the text of the *tianwen zhi*.

3.3 COMETS/GUEST STARS

The comets records are often recorded twice—appearance day and disappearance day. There are 61 records, 11 records and one record respectively in the text of the *tianwen zhi*, annotation and *furui zhi* 符瑞志. These records correspond to 46 comets/guest stars or so. Historically, visible comets are identified by the date and or description of the record. Five records are suspected to be records of novas or supernovas.

3.4 METEORS AND AEROLITES

There are 41 records of meteors, which are mainly documented in the *tianwen zhi*. But only four records of aerolites.

3.5 OTHER ASTRONOMICAL RECORDS

It is recorded in the *tianwen zhi* that "the year *Yongchu* 2 (AD 108), month 1, day *wuzi*, Venus was seen during the day". This is the first record of seeing Venus in the daytime. From then on, the quantity of these records has been increased gradually (furthermore, seeing Jupiter in the daytime is retrievable occasionally). Whether Venus is seen in the daytime depends on the weather. Besides solar eclipses, comets and seeing Venus in the daytime are recorded most in official chronicles. Therefore they are paid great attention. There are 21 records and ten records of seeing Venus in the daytime respectively in the text and in the *gujin zhu* of the *tianwen zhi* of the *Hou Hanshu*. There are two records of sunspots in the *wuxing zhi* of the *Hou Hanshu*. There are some other records related to the weather, 22 records.

4 CELESTIAL PHENOMENA DURING THE WEI AND JIN DYNASTIES (AD 220—420)

There is no *tianwen zhi* in the *San Guo Zhi* 三国志 "*Records of Three Kingdoms*" completed before AD 297, including the *Weishu* 魏书, *Wushu* 吴书 and *Shushu* 蜀书. While many astronomical records are contained in the *benji* of the *Weishu*, little astronomical information of the Kingdom Wu and Kingdom Shu are contained in the *Records of Three Kingdoms*. Thenceforth, centralized astronomical records of the Three Kingdom and Jin Dynasties are retrievable in the *Songshu* 宋书 completed in AD 488 and the *Jinshu* 晋书 completed in AD 648.

The completed year of the *Songshu* is much earlier than that of the *Jinshu*. The two books have much cosmic events in common in regard to the *tianwen zhi*. While the records in the *Jinshu* are arranged by type of phenomena, those in the *Songshu* are chronological.

There are 852 records and 743 records of celestial phenomena in the *tianwen zhi* of the *Jinshu* and in that of the *Songshu* respectively. Most of the records that the *Jingshu* exceeded the *Songshu* are solar variations, seeing planets in the daytime, and so on. There are some records that the *Songshu* exceeded the *Jingshu*, while the quantity of these records is a little. We estimate that the two books might be derived from the same literature (Liu, 2009).

During the later Eastern Jin period, there are lots of cosmic events, which are

same to those of the North Wei Dynasty in the *tianxiang zhi* 天象志 "*treatise of celestial phenomena*" of the *Weishu*.

Many cosmic events, few of which are independent from the *tianwen zhi* and other treatises, are retrievable in the *benji* of the *Records of Three Kingdoms* and *Jinshu*. Most of them are solar eclipses. The independent records are rarer as to the *liezhuan*, other treatises and literatures.

We divide the Eastern Jin into two periods by the first year of the *Taihe* (366), the early Eastern Jin and the later Eastern Jin. Then, The time of the four periods, the Wei (220—264), Western Jin (265—316), early Eastern Jin (317—365), and the later Eastern Jin (366—419), is nearly same.

4.1 ECLIPSES

Three Kingdoms solar eclipses recorded in the official sources are summarized in Table 3. In Table 3, the following details are listed, column by column: the literature sources, total accounts, correct accounts, error accounts, and the accounts which are invisible in China.

Table 3 Three Kingdoms Solar Eclipses Recorded in the Official Sources

Literature sources	total accounts	correct accounts	error accounts	invisible accounts in China
the *benji* of the *Weishu* of the *San Guo Zhi*	11	10	1	
the *wuxing zhi* of the *Songshu*	18	9	7	2
the *tianwen zhi* of the *Jinshu*	20	12	6	2

There are 20 eclipses by synthesizing various literatures: 13 eclipses occurred, five eclipses are error, and two eclipses are invisible from China. In five error eclipses, there are three eclipses that remain to be investigated; one eclipse that can be corrected to be invisible eclipse from China; one eclipse that was derived from mistake. The calculations show that there are 20 solar eclipses visible from the capital. The coverage is 65%.

The Western Jin solar eclipses recorded in the official sources are summarized in Table 4. Altogether 33 solar eclipses: 16 eclipses occurred, 11 eclipses are error, and six eclipses are invisible in China. In 11 error eclipses, there are eight eclipses that remain to be investigated; one eclipse that can be corrected; two eclipses that were derived from mistake. The calculations show that there are 20 solar eclipses visible from the capital. The coverage is 85%.

Table 4 Western Jin Solar Eclipses Recorded in the Official Sources

Literature sources	total accounts	correct accounts	error accounts	invisible accounts in China
the *wuxing zhi* of the *Songshu*	23	15	3	5
the *tianwen zhi* of the *Jinshu*	30	14	10	6
the *benji* of the *Jinshu*	30	16	8	6

The Eastern Jin solar eclipses recorded in the official sources are summarized in Table 5, totally 31 solar eclipses: 22 occurred, six are error, three are invisible in China. Of six error eclipses, there are four eclipses that remain to be

investigated; one eclipse that can be corrected; one eclipse that is lunar eclipse. The calculations show that there are 40 solar eclipses visible from the capital. The coverage is 55%. Liu and Ma (2009) analyzed the solar eclipses of the Wei and Jin Dynasties.

Table 5 Eastern Jin Solar Eclipses Recorded in the Official Sources

Literature sources	total accounts	correct accounts	error accounts	invisible accounts in China
the *wuxing zhi* of the *Songshu*	25	21	2	2
the *tianwen zhi* of the *Jinshu*	28	22	6	2
the *benji* of the *Jinshu*	30	21	6	3

The features of solar eclipses during the Wei and Jin Dynasties: simple form; invisible solar eclipses—the normality. There weren't systematic records of lunar eclipses during the Wei and Jin Dynasties. Sporadic records are scattered everywhere.

4.2 POSITIONS OF THE MOON AND FIVE PLANETS

The positional records of the Moon and five planets (Venus, Jupiter, Mercury, Mars and Saturn) are the most type of astronomical records since ancient Chinese times. However, these records started later: the records of the planetary positions and the lunar positions are recorded relatively more since the Western Han Dynasty and Eastern Han Dynasty receptively (see Table 6). The lunar and planetary positions had accounted for 70% of all the astronomical records until the Eastern Jin Dynasty.

Table 6 the Records of Lunar and Planetary Positions during the Han, Wei and Jin Dynasties (AD 220—420)

Dynasty	Moon/planets accounts	correct accounts	error accounts	error rate
Cao Wei	41/41	49	23	32%
Western Jin	4/45	10	17	63%
early Eastern Jin	94/84	103	50	33%
late Eastern Jin	100/134	152	42	22%

Notes: the statistical records in table 9 are retrievable in the *tianwen zhi* of the *Songshu*.

Speaking of the Western Jin, less positional records of the Moon and planets, especially few of the Moon, are retrievable in official books. These records increased gradually until the Eastern Jin, becoming the main part of the ancient astronomical records. It always be there since then. Compared with before and after the period, the records of the Western Jin Dynasty are: smaller quantity, high error rate, and lacking of dates (most of them).

4.3 COMETS/GUEST STARS

During the Cao Wei, Western Jin, early Eastern Jin and later Eastern Jin periods, there are respectively 35, 32, nine and 21 comets or guest stars, totally 97, corresponding to 68 comets or so. Six records are suspected to be records of novas or supernovas.

4.4 METEORS AND AEROLITES

During the Cao Wei, Western Jin, early Eastern Jin and later Eastern Jin period, there are three, 13, 13 and five meteors respectively, totally 34 records of meteors. Some are vivid. Moreover, there are 11 aerolites during the Wei and Jin periods.

4.5 OTHER ASTRONOMICAL RECORDS

As for seeing Venus in the daytime, during the Cao Wei, Western Jin, early Eastern Jin and later Eastern Jin period, there are ten records, three records, 11 records and 44 records respectively, totally 68 records. Furthermore, there are four records of seeing Jupiter during the day.

Other astronomical records: two records, 30 records, 22 records and 28 records respectively, totally 82 records, which are mostly classified as *ribian* (solar variation such as solar halos), *yuebian* (lunar variation), and *yunqi* (cloudy obscured haze).

5 CONCLUSION

The systematic and numerous Chinese records started from the Western Han Dynasty. This practice is followed by later age. Firstly in official history, the astronomical records were arranged in special volume of the *Hanshu*, which was imitated in later historical books. The diction of records is casual and it is common that the record is short of date (mostly only year and month) in the Western Han Dynasty. All indications are that the Western Han Dynasty is in the pioneering stage of the conventional celestial phenomena system.

The extant systematic Chinese records of solar eclipses started from the Chunqiu period. The records of solar eclipses are quite complete since the Western Han Dynasty. Since the Eastern Han Dynasty, there are some invisible records of solar eclipses (some of solar eclipses occurred but they were invisible in China according to modern computation). Due to inaccurate calculation at the time or afterwards, some invisible solar eclipses sneaked into the observed records. The records in the Western Han and Eastern Han Dynasties are mostly illuminated with the lunar mansion and degree (solar positions). These may be annotated according to calculations in the late historical compilation (see Ma, 2008). The lunar eclipses were believed to be unimportant celestial phenomena in ancient China. Although there is evidence of the existing regular lunar eclipses calculation and observation system, few records of lunar eclipse are retrievable in history about the Han, Wei and Jin Dynasties.

The positional description of the Moon and planets, including occultation, approach, conjunction, gathering, et al, has been recorded in the largest number since ancient Chinese times. The records of planetary positions are always numerous. There are few records of lunar positions in history of the Western Han and Western Jin Dynasties, while there are more records in history of the Eastern Han, Caowei and Eastern Jin Dynasties, indicating that the lunar phenomena was paid attention gradually.

Since the Spring and Autumn period, the records of comets gradually increased. The distribution of these records is relatively uniform in past dynasties. Except for solar eclipses, comets are the most type recorded in *benji*. It can be seen that the ancients were shocked at comets, which occupy significant position in astrology. The records of novas and supernovas are of special importance to

scientific research. While such records are always mixed with comets and they are difficult to identify.

Seeing Venus in the daytime was recorded frequently Since the Eastern Han Dynasty. There are more records of seeing Venus during the day in *benji*. Sunspots were recorded in the Western Han Dynasty firstly. The records of sunspots and polar lights are of great importance to scientific research.

The Han, Wei and Jin Dynasties is in the formation period of the ancient Chinese astronomical records, the format, type, and quantity of records being formed the fixed pattern, which had little changes in late age. Fewer records of the late Southern and Northern Dynasties are retrievable; numerous celestial phenomena of the early-middle period of the Southern and Northern Dynasties and the Song, Yuan, Ming Dynasties are recorded.

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