

# A STUDY OF CORRELATION BETWEEN HISTORICAL ASTRONOMICAL RECORDS AND POLITICAL EVENTS<sup>1</sup>

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## Abstract

We study the correlation between distributions of astronomical records and historical events using historical meteor (shower) records. Planets and meteor (shower) records are the most abundant astronomical phenomena in Korean, Chinese and Japanese chronicles. And they represent a general tendency of the number distribution of whole astronomical observations. Thus, we examine the correlation for the number distribution between meteors (showers) and planets during A.D. 1200-1700 and find that both records have a similar distribution. We classify historical events into three grades according to the social impact, and investigate the correlation between distributions of meteor (shower) records with social events, such as, new King's accession to the throne, foreign invasions, and domestic turmoils. From the statistical analysis, we cannot find any correlation between the meteor (shower) records and the political events. Therefore, we conclude that Korean historical records have not been influenced by the political events. We also examine the correlation between Chinese and Japanese meteor (shower) records and political events for A.D. 1200-1700, respectively, but cannot find any correlations between them.

## I. Introduction

Korea has a long history of astronomy and remains various and amount astronomical relics. Astronomical observation is one of the most valuable heritages in Korean historical astronomy. Korean historical observations are mainly recorded in representative history books such as

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<sup>1</sup> The original paper was published in Publications of the Korean Astronomical Society.

(Yang & Choi, 2012, PKAS, 27, pp.411-418)

Samguksagi(三國史記<sup>2</sup>), Goryeosa(高麗史<sup>3</sup>), and Joseonwangjosillok(朝鮮王朝實錄<sup>4</sup>), and they cover about 15-30% of the total articles. Astronomical observations were carried out by royal astronomers systematically over two thousand years in Korea (Jo 1998; Lee 2008). Moreover, royal astronomers observed astronomical phenomena at the royal observatory in each capital of dynasty. Since astronomers were special profession who can calculate astronomical bodies, they were reemployed by new dynasty at the royal observatory when a dynasty replaced by new one. Therefore, observational terminology and description of the phenomena are consistent in recording in Korean chronicles. There are many astronomical phenomena in the history books such as solar(lunar) eclipse, two of three Suns appeared together, Venus seen at daylight, comet, meteor, guest star, aurora, and so forth.

It is already known that Korean historical observations reflect real phenomena (Park & La, 1994; Yang et al., 1998, 2005b; Lee et al., 2009). Yang et al.(1998) analyze sunspot and aurora records in Goryeosa and found 11.3-yr short period and ~97-yr long period of solar activity using power spectrum and monte-carlo simulation analysis. The 11.3-yr short period is well known solar activity in modern astronomy and the long-term period is also been mentioning in solar physics. It means that sunspot and aurora records in Goryeosa are based on the real observation and royal astronomer recorded astronomical phenomena faithfully in Goryeo dynasty (Yang et al. 1998; Park 2008). Some astronomical phenomena can be seen periodic such as motions of planet, meteor, etc. and they should be recorded in the history books repeatedly by their period. However, astronomical observation should be affected by environmental conditions such as climate, social event, observational condition and so forth.

Yang et al. (2005a) analyze Korean historical meteor and shower records for over two thousand years and found that periodic meteor showers such as Perseids, Orionids, north-Taurids and Leonids and examined the variation of meteor showers during 2,000 years. And they also analyze Chinese and Japanese meteor and shower records for the same period as Korea and compare the results with Korean one (Beijing Obs. 1988; Kanda 1935; Ohsaki 1994). Most of records in Korea are accord with other countries but partly there are discrepancies in the distribution of meteor

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<sup>2</sup> An official history book which contains the history of Silla (新羅, 57BC – AD935), Baekje (百濟, 18BC – AD663), and Goguryeo (高句麗, 37BC – AD668).

<sup>3</sup> An official history book of Goryeo dynasty (高麗, AD918 – 1392).

<sup>4</sup> An official chronicles of Joseon dynasty (朝鮮, AD 1392 – 1910)

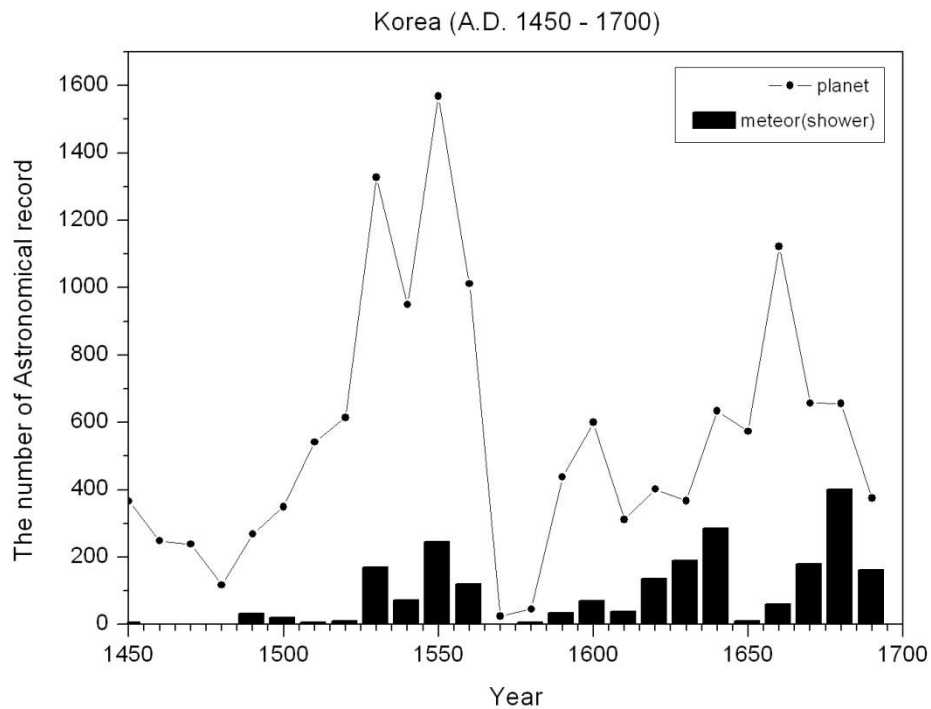
and shower records. It shows that historical records are incomplete and discontinuous although they reflect real observational phenomena.

In order to know which environmental conditions affect astronomical records, we examine the correlation between some plausible political events which can influence observation and distribution of astronomical records. In this study, we use meteor and shower records which can stand for total distribution of astronomical records in order to understand the correlation between astronomical records and political events. We also examine Chinese and Japanese historical records and compare them with their political events, respectively.

## II. Distributions of historical observations and political events

The largest astronomical record is motion of planets in Korean chronicles. Most planetary records describe normal phenomena of planet except only a few records such as occultation of planet, seen at daylight, and so forth. The second largest observational record is meteor and shower phenomena. Meteor is one of the frequently phenomena in the night sky and we can see meteors all year around. Meteor can be classified with sporadic meteor and shower according to number density seen on the ground. Meteor showers are caused by periodic comet and it appears repeatedly at a given sidereal date annually. Thus meteor and shower are good candidates to examine the distribution of astronomical observation. Meanwhile, it is known that historical meteor and shower records show periodic showers correspond to Periods, mixture of Leonids, north-Taurids, and Orionids during past one thousand years in Korean, Chinese and Japanese chronicles (Yang et al. 2005a). Although the historical records in the three countries show same periodic showers, observational distributions of meteor and showers are quite different among the three countries. Therefore, in this study, we examine correlation between distribution of astronomical observation and political events using the historical meteor and shower records.

Since many astronomical in the Three Kingdoms period of Korea does not have date and month information, we limit the period from A.D. 1200 to A.D. 1700 in this study. We compare the distribution of meteor and shower with motion of planet for A.D. 1200-1700 years. Figure 1 shows the number distribution of planet (dash-line) and meteor (bar-histogram) and they have similar tendency in number distribution.



**Figure 1** Number distribution of motion of planets (dotted line) and meteor and shower records (histogram) in Korean chronicles.

In order to compare astronomical records with political events, we select some main events which might influence on royal observatory. We investigate the year of new King's accession to the throne and political events such as foreign invasion, domestic turmoil, and so forth (Ha 1998). We also classify political events with three grades according to their influence with the observation. Grade of each historical event is based on the influence of astronomical observations. Table 1 shows list of major political events of Korea.

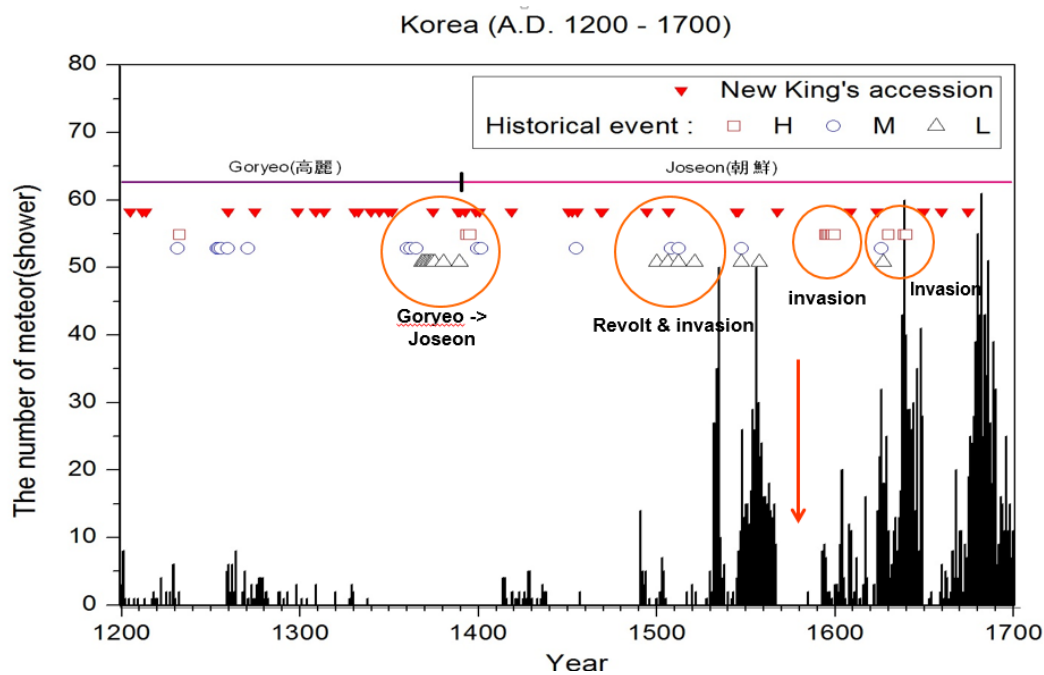
Table 1. Historical major events of Korea from A.D.1200 to 1700. (Ha 1998)

Year	Events	
1231-1232	蒙古 1,2次 高麗 侵入, 高麗 首都(江華) 遷都	Mongol invasion, transfer the capital
1253-1255	蒙古 5,6,7次 高麗 侵入	Mongol invasion
1259	江華 內外城 破壞, 宮 建築 (開城 遷都)	Returning to the capital
1270	對 蒙古 抗爭 始作	Struggle against the Mongol
1359, 1361	紅巾賊 1,2次 高麗 侵入	Thief's attack from China
1364	高麗 王族(德興君) 元 軍隊 聯合 高麗 反亂	Revolt of royal family
1367-1374, 1379	倭賊 朝鮮 侵略	Japanese invasion
1388-1392	高麗滅亡 朝鮮建國	Dynasty changed, Joseon dynasty birth
1394-1453	漢陽 遷都, 1,2次 王子 亂, 癸酉靖難	Several throne competitions
1498, 1504	戊午士禍, 甲子士禍	Political troubles

1506	中宗反正, 燕山君 死亡	revolt
1510	三浦倭亂	Japanese revolt
1519, 1545	己卯士禍, 乙巳士禍	Political troubles
1555	乙卯倭變	Japanese revolt
1592-1597	壬辰倭亂	Japanese invasion of Korea
1623-1624	仁祖反正, 李适 亂	Political troubles
1627	丁卯胡亂	Chinese invasion, transfer the capital
1636-1637	丙子胡亂	Chinese invasion, transfer the capital

We examine the cross-correlation between distribution of astronomical records and political events during 500 years from 1200 to 1700 of Korea. We calculate the cross-correlation coefficient between distribution of astronomical records and political events and cannot find any correlation( $r=-0.034$ ) between them. We also calculate the cross-correlation coefficient using considering weighted value for the political events but we cannot find direct correlation between them. Moreover, we calculate the cross-correlation coefficient between distribution of astronomical records and new King's accession and also cannot find any correlation( $r=-0.062$ ) between them.

Figure 2 shows the distribution of meteor records and political events. Inverse red-filled triangles indicate the year of new King's accession and historical events are showing as open quadrangle, circle and triangle according to their weight value. During the 500 years there are four notable periods which have intensive and serious political events in Korean history. The red open circles indicate the four periods. The first period around year of 1364-1394 has many political events including change of dynasty while there are few meteor records. The second period of 1504-1510 and the third of 1592-1597 have relatively small observations. However, the last period of 1623-1637 has a lot of observations. The year of 1670-1590 (around the arrow point) shows that former period of the Japanese invasion of Korea (1592-1597) has fewer observations rather than during the invasion. It means that political events have no direct effect on the astronomical observation in Korean history.



**Figure 2. Distribution of Korean historical observation and political events.**

We also examine the cross-correlation between distribution of astronomical records and political events for the same period in China and Japan (Sim 2002; Park 2011). We calculate the cross correlation coefficient between astronomical distribution and political events and find that  $r=0$  for Chinese records and  $r=0.083$  for Japanese one. In the case of cross correlation between observational distribution and new King's accession, we cannot find any correlation in China and Japan. As a result, we cannot find any correlation between astronomical observation and political events both in Chinese and Japanese records. Table 2 shows list of major political events in Japan and figure 3 shows the distribution of Japanese historical observation and political events.

Table 2. Historical major events of Japan from A.D.1200 to 1700. (Park 2011)

Year	Events	
1221	承久の 亂	Jobu's revolt
1333	鎌倉 幕府 亡	End of Kamakura
1428	農民暴動	Jacquerie
1467-1477	應仁の 亂	Onin's revolt
1485	山城の 蹶起	Yamasiro's rise up
1488	加賀 蹶起	Gaga's rise up
1560	桶狭間 戦闘	Battle of Okehasima
1582	本能寺の 政變	Honnosa's revolution
1583	賤ヶ岳の 戦い, 大阪城 築城	Battle of Sizkatake
1592-1597	文祿慶長 役 (朝日戦争)	Japanese invasion of Korea

1600	關ヶ原 戦闘	Battle of Sekigahara
1637	島原の 亂	Simabara's revolt

In figure 3, we can find four periods in which are concentrated observations. They are located in the years of 1450-1480, 1490-1525, 1600-1630, and 1660-1680 and indicated by orange boxes. In the Japanese history of the 500 years, the three major political events were End of Kamakura (1333), Onin's revolt (1467-1477) and Japanese invasion of Korea (1592-1597). The period of end of Kamakura has few astronomical observation while observations are concentrated in the period of Onin's revolt. Hence, we know that there is no direct correlation between astronomical observation and political events in Japan.

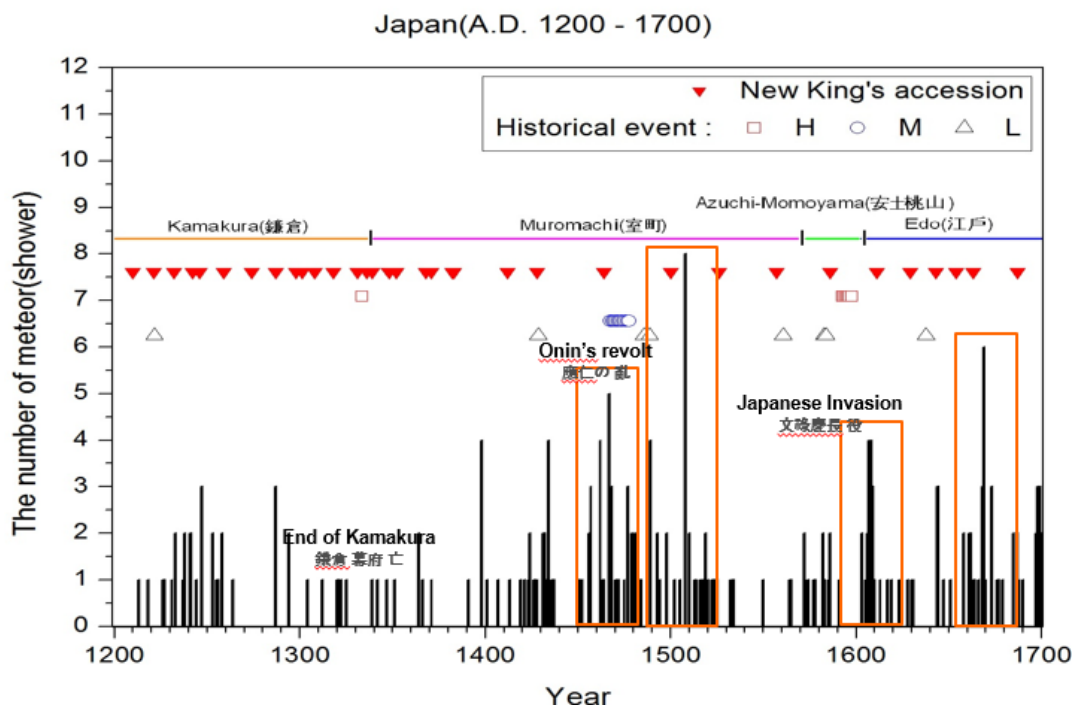


Figure 3. Distribution of Japanese historical observation and political events.

### III. Summary and discussions

Astronomical observations in history books are discontinuous and incomplete in Korea, China, and Japan. However, when we analyze historical records using statistical methods for periodic phenomena, we need to calibrate weight value for each record. Hence, many people want to know what kind of elements influence the observational condition in the history. In general, we

think that political events might be most plausible elements for astronomical observations because observations were carried out by royal astronomers in the past. Thus we examine correlation between the observational distribution and political events.

Yang et al. (2005a) studied historical meteor and shower records in Korean, Chinese and Japanese chronicles and found that historical records in each chronicles reflect the real observations. They found that common peaks of Perseids and mixture of Orionids, Leonids and north-Taurids last 1000 years in the three countries' chronicles. However, observational distribution of the each country is not the same for a given period. Thus we examine the correlation between the number of astronomical records and political events using the meteor records.

We survey historical events which can influence astronomical observations from A.D.1200 to 1700 from Korean, Chinese and Japanese history. We examine the correlation between political events and meteor records and find that there are no direct correlation between them. We also examine correlation between new King's accession and meteor records, and cannot find any correlation. As a result, we know that historical observations in Korean, Chinese and Japanese chronicles were not affected directly by political events or new King's accession. Therefore, when we analyze historical observations we have to consider weight value of records based on the distribution of astronomical records.



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