Climatic impacts on the rise and decline of ‘Mulan Qiuxian’ and ‘Chengde Bishu’ in North China, 1683–1820

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Abstract

Mulan Qiuxian (the autumn hunt in Mulan) was an important imperial activity in the Qing dynasty (1644–1911). It was instituted for the purpose of intensifying the alliance between the Manchus and the Mongols and improving riding and shooting skills of the Bannermen. Along with another activity, Chengde Bishu (escaping the summer heat in Chengde), Mulan Qiuxian was frequently held during the early and mid Qing dynasty (1683–1820). Many factors have been discussed to explain the decline of Mulan Qiuxian at the turn of the 19th century, but not the impact of climate. In this study, historical documents were used to reconstruct annual time series for the duration of Qiuxian and Bishu from 1683 to 1820 to quantitatively describe their rise and decline and analyse the correlation with climate change. It was found that Qiuxian and Bishu were originally instituted by the Kangxi emperor in 1683–1722 and flourished in the reign of the Qianlong emperor in 1741–1787, both included in a relatively warm period of the Little Ice Age in North China. Qiuxian and Bishu declined from 1788 to 1820 when the climate turned sharply colder and wetter. The impacts of long-term climate change and abrupt bad weather on Qiuxian and Bishu were analysed respectively, and it was concluded that although climate was not the decisive factor, compared with the political Intentions of the decision makers, the economic and financial situation of the empire, and the personal devotion of the emperors, climate change did play an important role as an accelerator in the rise and decline of Qiuxian and Bishu. To some extent, some of the behaviours and decisions of the Qing court during this historical period could also be regarded as human adaptations to climate change. Thus, this study not only adds detail to a well-known historical event, but it also adds benefit to the scientific understanding of the interactive mechanisms between climate and humans in the past.

Keywords: Mulan Qiuxian; Chengde Bishu; Climatic impacts; Human adaptation

The reconstruction of climatic impacts on society and human adaptation in different historical periods has become a hot topic in global change research because it could provide a better understanding of the nature of climate—human—ecosystem interactions and knowledge of the vulnerability and sustainability of society in the context of changing climate. Due to the lack of historical records, most existing case studies focus on the correlations between climate change and those significant historical events for which the records are relatively detailed, such as mass migrations, large-scale wars, population crises, and the collapse of pre-historical civilisations.

China is a country with a long history of climate—human interactions. Over the last several thousand years, abundant information on climatic impacts and human responses has been recorded in the historical literature. This literature could provide scholars with many details on how climate has impacted the lives of humans, and on how humans have adapted to climate change, especially during times of peace. In this study, Mulan Qiuxian (the

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6 木兰秋狝.
autumn hunt in Mulan) and Chengde Bishu\(^7\) (escaping the summer heat in Chengde), which were two important imperial activities during the Qing dynasty (1644–1911), were selected and their relationships with climate change were analysed.

Similar to other peoples, such as the Mongols, living in the historic frontier zone of northern China, the hunt played a very important role in the life of the Manchu. The hunt was inextricably linked not only to economic production but also to social and military organisation.\(^8\) After the Manchu conquest of China in the mid 17th century, large-scale hunts were considered by the emperor to be a form of training, meant to be held every season, to maintain the martial skills of the Manchu Bannermen (especially riding and shooting).\(^9\)

In 1683, the leader of the Kharchin Mongols presented the area known by the Chinese name of Rehe\(^10\) (‘hot river’, which is a reference to the area’s thermal springs) to the Kangxi emperor (r. 1662–1722), who subsequently built an imperial hunting preserve in the area’s northern reaches.\(^11\) The hunting preserve was named Mulan, which is actually the Manchu name for a method of hunting deer that uses a whistle and decoy deer heads to lure deer into shooting range. Every year thereafter (mostly in autumn), the emperor, accompanied by a large number of banner troops, left Beijing and proceeded north to the Mulan hunting preserve via Gubeikou\(^12\) (a pass in the Great Wall, Fig. 1) to hold the activity of Qixian (the autumn hunt).

The rise of Mulan Qixian was also closely connected with the Kangxi emperor’s wars against the Western Mongols led by Galdan who was finally defeated and died in 1697. With the participation of Mongol princes and tribesmen from the surrounding districts, Mulan Qixian was combined with diplomatic duties designed to intensify the alliances with the Eastern Mongols.\(^13\) Additionally, the terrain and the placement of the hunting preserve were politically attractive, and also symbolically attractive, since this had also been a royal preserve of the Kitan (Liao) emperors and Khubilai (1215–1294), who was the first emperor of the Yuan dynasty (1271–1368) and built his capital at Shangdu in around 1260, approximately 160 km to the northwest of Mulan.\(^14\)

After the beginning of the 18th century, when the Rehe travelling palace had been built, the emperor changed his schedule and more frequently left Beijing in May or June to spend the entire summer in the palace before Qixian began. Thus, the Rehe travelling palace was renamed Chengde Bishu shanzhuang (Mountain Villa to Escape the Heat). The construction of the Mountain Villa also offered opportunities for face-to-face contact between the court and various frontier peoples (Tibetans, Muslims, and Mongols), many of whom feared travelling to China proper lest they fall victim to smallpox, which was largely unknown on the steppe and to which they had little natural immunity.\(^15\) During the early Qing dynasty, the Kangxi, Qianlong (r. 1736–1795), and Jiaqing (r. 1796–1820) emperors travelled to Rehe (Chengde) more than 100 times for the purposes of hunting or escaping the heat; during these visits, Mulan Qixian was held on more than 80 occasions. The twin centres of Chengde and Mulan thus developed in the 18th century into a true summer capital.\(^16\)

However, at the turn of the 19th century, Mulan Qixian and Chengde Bishu both went into decline. The Qing court more and more frequently delayed, reduced or even cancelled the travelling schedule. After 1820 and the death of the Jiaqing emperor, Mulan Qixian was finally terminated by the emperor’s successor. Scholars have determined a comprehensive list of factors contributing to the decline of the activity including the attenuated interest of the Qing emperors and Manchu nobility in keeping national traditions, the decline of Mongol power that made the alliance no longer necessary, financial crises caused by bureaucratic corruption and popular peasant rebellions, and the rapid depletion of animal resources in Mulan due to illegal logging and poaching.\(^17\) Considering the distinctive feature of seasonality to Qixian (in autumn) and Bishu (in summer), climatic factors might also have affected policy decisions during this period of more than 100 years; however, climatic factors have not been discussed previously.

In this study, the Qing shilu (The Veritable Records of the Qing dynasty)\(^18\) was used to construct annual time series from 1683 to 1820 regarding the duration of the emperor’s stay outside the Great Wall and in the Chengde Bishu shanzhuang, and the duration of Mulan Qixian; from this series, the rise and decline of Mulan Qixian and Chengde Bishu could be quantitatively described. Records explaining why Qixian was cancelled, halted or delayed were also found. Combined with related historical information and studies, we can compare the reconstructed time series with climate change during the corresponding period and then analyse the effects of climate on the historical sequence and human adaptation to climate change. This study not only adds detail to a well-known historical event, but it also adds benefit to the scientific understanding of the interactive mechanisms between climate and humans in the past.

**Materials and methods**

The main source of historical information used in this study was the Qing shilu, a collection of official records that were edited on a daily basis. It contains 4433 volumes and is the most important original source document for studying the Qing dynasty. The raw data extracted from the Qing shilu include records on each emperor’s daily itinerary during the journey associated with Mulan Qixian and Chengde Bishu. These records are divided into three categories.

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\(^7\) 蒙德贡采。


\(^10\) 热河，此地区名与现代承德（118°E, 41°N）在河北省及周边地区的分布重叠。


\(^12\) 吉北口。

\(^13\) Millward, Dunnell, Elliot, et al., New Qing Imperial History (note 8), 76.

\(^14\) Millward, Dunnell, Elliot, et al., New Qing Imperial History (note 8), 71–72.

\(^15\) Millward, Dunnell, Elliot, et al., New Qing Imperial History (note 8), 75.

\(^16\) Millward, Dunnell, Elliot, et al., New Qing Imperial History (note 8), 76; E.S. Rawski, The Last Emperors: A Social History of Qing Imperial Institutions, California, 1998, 19–23.


\(^18\) Qing shilu 清实录 (The Veritable Records of the Qing Dynasty), reprinted in 60 vols in Beijing (Zhonghua shuju 中华书局) in 1986. In this paper, the Qing shilu is cited by the volume and page number of the 1986 modern edition.
The duration of each emperor’s stay outside the Great Wall (SOGW) for hunting or to escape the heat (Fig. 2a). The duration was calculated using the dates that the emperor travelled outward and inward across a pass (usually the Gubeikou) in the Great Wall in a single year.19

The duration of each emperor’s stay in the Chengde Bishu shanzhuang (CDBS) (Fig. 2b). The duration was calculated using the dates that the emperor arrived at and left the Mountain Villa.

The duration of Mulan Qiuxian (MLQX) (Fig. 2c). In the early period, it is difficult to determine the beginning and ending dates of Qiuxian. Once travelling palaces were completed outside the Great Wall, the emperor would choose a palace (Boluohetun, Zhangsanyin or Amuhulangtu, Fig. 1) as the forward camp and supply base for Qiuxian. The duration could then be estimated using the dates when the emperor left and returned to the palace.

The historical information extracted from the Qing shilu also included the words and deeds of the emperors and ministers regarding Qiuxian and Bishu, as well as the reasons why the activities were cancelled, halted or delayed. Other historical documents from this period and modern historical research were also consulted to add and correct details.

19 Jing Ai 景爱, Qingdai Mulan Weichang de jiaotong 清代木兰围场的交通 (The routes to the Mulan hunting preserve during the Qing dynasty), Zhongguo Lishi Dili Luncong 中国历史地理论丛 3 (1993) 181–222.
Climate change for the corresponding period was described using existing research, especially the temperature anomaly series for North China from the 1380s-1980s (Fig. 2d), the annual precipitation series for Beijing from 1724 to 1904 (Fig. 2e), and the average temperature series for Beijing in July from 1724 to 1903 (Fig. 2f). In this paper, a subset of each time series was employed.

Warm climate: the background of the ‘Golden Age’ (1683–1787)

1683–1722: the Kangxi Emperor’s Original Institution

As the founder of Mulan Qiuxian, the Kangxi emperor had travelled north of the Great Wall several times to hunt before the Mulan

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20 S.W. Wang, Reconstruction of temperature series of North China from 1380s to 1980s, *Science in China Series B* 34, 6 (1991) 751–759. In the series, the average temperature from 1880s to 1970s was used as a reference, and the resolution of the data was equal to 10 years.


Agricultural development in Eastern Inner Mongolia and its climatic background during 1644 and its relevant historical facts, (initially named the Rehe travelling palace), which was sited in 1702, initiated in 1703, and roughly completed in 1707. After this time, the duration of SOGW noticeably increased. From 1702 to 1722 (Fig. 2, Stage ①), the duration of SOGW was 146 days on average, and SOGW reached a peak of 178 days, almost half a year, in 1721. Meanwhile, the duration of MLQX was 30–40 days (33 on average), and the duration of CDBS was 91 days on average. All three indicators were the longest of the Qing dynasty.

The construction and maintenance of the travelling palaces (particularly the Mountain Villa) north of the Great Wall, as well as the provision of food and accommodations for the numerous retinues, required large amounts of grain and other material supplies. These provisions were largely available because of local agricultural development organised directly by the Qing court since 1670 when a large amount of land in Rehe was assigned to the Manchu Eight Banners to build agricultural manors. These manors were owned by the imperial family (managed by the Imperial Household Department), royal clans and banner soldiers, and reclaimed by Han tenants who came from south of the Great Wall.

By the late 17th century, the Imperial Household Department had established 138 imperial manors on cultivated land totalling more than 100,000 mu. When Kangxi inspected the northern terrain in 1681, all the needs for food and accommodation could be attentively met by the imperial manors on the way. By the beginning of the 18th century, the Han people who had temporarily or permanently engaged in cultivation or trade in the area had increased to more than 100,000. The Qing court could ensure the logistics of construction and ceremony not only by land rent from imperial manors but also with local purchases from Han farmers and merchants.

This rapid agricultural development occurred against a background of climatic warming during the transition from the penultimate cold period of the Little Ice Age (the 17th century) to a warm stage in the 18th century. The districts surrounding Chengde are located in the march between the North China Plain and the Mongolian Plateau. As one part of the agro-pastoral transitional zone in North China, land use in this area is very sensitive to climate change, which means more pasture in cold periods and more agriculture in warm periods. According to modern studies in south-central Inner Mongolia near Chengde, a 1 °C decrease in annual mean temperature leads to a 200-metre fall of crop upper limits, a 150 °C reduction of >10 °C accumulated temperature and an 8 day reduction of the frost-free season. During most of the 17th century, which was the coldest century of the last 2000 years, Rehe was a pastoral region ruled by Mongols. The agricultural zone in Rehe expanded north late in the 17th century as the climate warmed (Fig. 2d), and increasing numbers of Han settlements began to provide more and more taxes and labourers, which certainly accelerated the development of Qixian and Bishu.

The climatic warming of the 1700s also affected the Kangxi emperor’s sensory experiences. During the journey to Qixian in 1703, he said, “It’s as hot as the 6th lunar month (roughly corresponds to July) this autumn. I have never had this feeling before because it’s usually much colder than Beijing in Mulan.” It is noteworthy that construction of the Chengde Bishu shanzhuang began in this year, when the duration of SOGW significantly increased and that Kangxi sought to escape the summer heat in Chengde every year.

1741–1787: prosperity during the reign of Qianlong

After the Kangxi emperor died, Mulan Qixian and Chengde Bishu were both discontinued for 18 years (1723–1740) (Fig. 2, Stage ②). Kangxi’s successor, the Yongzheng emperor (r. 1723–1735) never went to Mulan during his reign because he had little interest in hunting, as his son the Qianlong emperor, who temporarily suspended Qixian and Bishu to mourn his father during the first 5 years of his reign, afterwards explained, “My father often told me, ‘I do not go to the Bishu shanzhuang and Mulan hunting preserve because of too many affairs of state and my personality of hating killing. It is my fault for discontinuing the activity (Qixian).’ I hope descendants will reestablish it, and keep it as a family tradition.”

The Qianlong emperor reestablished Qixian in 1741. The activity experienced several stages of development during his reign according to the reconstructed time series (Fig. 2).

(1) 1741–1750 (Fig. 2, Stage ②): Qixian was held every 2 years, and as a travel midpoint, the Chengde Bishu shanzhuang was used for only a few days each time.

24 The Imperial Household Department (Neiwufu 内务府) managed all palace affairs and resembled a miniature government within the Forbidden City.
28 Han Maoli and Li Chunjian, Chengde daqiao de jingji kaifa guocheng jia quyu tezheng (Three hundred years of economic development and regional features of Chengde area during the late 300 years), Dili Yanjiu (2003) 50–57.
29 Deng Hu, Cong jianli de zui xin renli jingji jingji (The evolution of the man-land relationship in the agro-pastoral transitional zone north of the Yanshan Mountains from the perspective of historical geography), Beijing, 2005.
31 Q.S. Ge, J.Y. Zheng, X.Q. Fang, et al., Winter half-year temperature reconstruction for the middle and lower reaches of the Yellow River and Yangtze River, China, during the past 2000 years, Holocene 13 (6) 2003: 933–940.
Because of his lack of scientific knowledge, Qianlong’s speculation about why the climate was warming was not correct, but his sense of climate change generally fit the facts, except that the 1720s were overall not as cold as his description because he participated only once in Qiuxian in 1722. If we trisect the 60 years from the 1720s–1770s, we find that the average temperature of the 1720s–1730s, 1740s–1750s and 1760s–1770s rose successively (Fig. 2d). Reflecting this, Qianlong spent more and more time escaping the summer heat. The longest duration of CDBS during his reign happened in the two warmest decades of the 18th century (1770s–1780s).

Although the decisions made on Chengde Bishu were not simply based on climatic conditions, the correlation mentioned above might not be accidental. In the mid 18th century, along with climatic warming, summer heat waves hit North China more frequently and severely (Fig. 2f). In July 1743, the highest temperature reached 44.4 °C in Beijing, exceeding the maximum climate record in the 20th century; the summer of 1743 was the hottest in North China over the last 700 years.⁴¹ Even in Chengde Bishu shanzhuang where it was cooler than Beijing, poems written by Qianlong with titles concerning ‘hot’ appeared quite frequently.⁴² A reasonable hypothesis might be that the increasingly hot summers intensified the willingness of the Manchu nobility to escape the heat and influenced the emperor’s decisions to some degree.

**Bad weather: an acceptable ‘excuse’ for the decline (1788–1820)**

The decline of Mulan Qiuxian began with an unexpected rainstorm in 1788. Although that autumn was abnormally rainy and the road to Mulan had become very miry, the Qianlong emperor ignored the suggestion of his ministers to delay or cancel Qiuxian and left the Mountain Villa as usual. Along with a few attendants, he arrived at the hunting preserve via Zhangsanying on September 19th, but the rest of his retinue was blocked by the rapidly rising Yixun River following a day-long heavy rain.

As one witness said, ‘The emperor spent a very special night there (in the travelling camp in Mulan). The heavy rain not only blocked them off but also cut off the network of routes linking Chengde and Mulan. The eunuchs who were left behind sent messengers to Chengde for help so that the persons besieged midway could be saved, yet many people lost their lives in this short distance.’⁴³ In this chaos, Qianlong cancelled Qiuxian and returned to the Mountain Villa. The return journey, which was roughly 100 km, took them 9 days.

Qianlong appeared calm after this event, but the uncomfortable experience had left a shadow on his mind. After 1788, Qiuxian was held only twice in Qianlong’s last 10 years. In 3 of these years (1790, 1793, and 1795), Qiuxian was cancelled for other rituals or activities, while in the remaining 5 years, the reasons for cancelling were all related to bad weather (too much rain, early frost and snow), suggesting that concerns over safe travel weakened Qianlong’s interest in hunting (Table 1).

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35 Ji Xin 维欣 and Zhao Fei 赵飞, Mulan Qiuxian yu ‘Kang-Qian Shengshi’ 木兰秋狝与‘康乾盛世’ (Hunting in the Mulan Hunting Ground in autumn to the politics of the Qing dynasty), Baoding Xueyuan Xuebao 保定学院学报, 2 (2009) 48–53; Rawski, The Last Emperors (note 16), 21.

36 熊

37 州县


39 Xiao, Qingdai Dongmeng nongye zhengzhi zhuanli de xiaozhang jiqi qihou bianhua (note 32).

40 Qing DAOZONG Yuzhishi Sij 大清高宗御制诗四集 (The fourth collection of the Qianlong emperor’s poems), Vol. 23, Guanhe youzuo 观荷有作 (Viewing Lotus), written on 1774-07-05.


42 Zou, Ming Qiushi Beibu Nongmuguaodudai de tuiyi he qihou hanmuan bianhua (note 32).

43 Luo, Qingdai Mulan Weichang de tantao (note 17), 105–106.
<table>
<thead>
<tr>
<th>Year</th>
<th>Decision on Qixian</th>
<th>Reasons and details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1788</td>
<td>Cancelled</td>
<td>Heavy rain destroyed the bridge in Mulan.</td>
</tr>
<tr>
<td>1789</td>
<td>Held</td>
<td></td>
</tr>
<tr>
<td>1790</td>
<td>Cancelled</td>
<td>The emperor went back ahead of time to celebrate his 80th birthday.</td>
</tr>
<tr>
<td>1791</td>
<td>Held</td>
<td></td>
</tr>
<tr>
<td>1792</td>
<td>Cancelled</td>
<td>It had snowed in Mulan in the 8th lunar month because there was a leap month in this year, thus it was too cold to hunt. The Mongol princes sincerely appealed to the emperor to cancel the hunt for the sake of his health.</td>
</tr>
<tr>
<td>1793</td>
<td>Cancelled</td>
<td>Too much rain and muddy roads in Mulan.</td>
</tr>
<tr>
<td>1794</td>
<td>Cancelled</td>
<td>To prepare the celebration in honour of Qianlong's 60th year on the throne.</td>
</tr>
<tr>
<td>1795</td>
<td>Cancelled</td>
<td>The Mongol princes appealed to cancel the hunt because of too much rain and muddy roads in Mulan.</td>
</tr>
<tr>
<td>1796</td>
<td>Cancelled</td>
<td>There was too much rain this year, and a leap month made winter come earlier on the calendar. It would have frosted in Mulan by the end of the 8th lunar month.</td>
</tr>
<tr>
<td>1797</td>
<td>Cancelled</td>
<td>Too much rain and early frost in Mulan.</td>
</tr>
<tr>
<td>1798</td>
<td>Cancelled</td>
<td>Qianlong died.</td>
</tr>
<tr>
<td>1799</td>
<td>Cancelled</td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td>Cancelled</td>
<td>Mourn for Qianlong.</td>
</tr>
<tr>
<td>1801</td>
<td>Cancelled</td>
<td>Severe flood in the districts surrounding Beijing.</td>
</tr>
<tr>
<td>1802</td>
<td>Held</td>
<td>Very few deer were found in several of the biggest clearings of Mulan.</td>
</tr>
<tr>
<td>1803</td>
<td>Cancelled</td>
<td>It was so cold that grass had wilted in Mulan. Very few deer could be found.</td>
</tr>
<tr>
<td>1804</td>
<td>Cancelled</td>
<td>Scarcely any deer could be found in more than 40 clearings (out of a total of 67) in Mulan.</td>
</tr>
<tr>
<td>1805</td>
<td>Cancelled</td>
<td>The emperor went to Mukden to worship the Manchu ancestors.</td>
</tr>
<tr>
<td>1806</td>
<td>Held</td>
<td>There was too much rain, and bridges around Miyun were damaged by floods. Thus, the emperor delayed the departure date for 3 days.</td>
</tr>
<tr>
<td>1807</td>
<td>Held</td>
<td></td>
</tr>
<tr>
<td>1808</td>
<td>Held</td>
<td></td>
</tr>
<tr>
<td>1809</td>
<td>Cancelled</td>
<td>Too much rain in the spring and summer in Mulan damaged the road.</td>
</tr>
<tr>
<td>1810</td>
<td>Held</td>
<td>Weather conditions were fairly comfortable (sunny), but there was still little game.</td>
</tr>
<tr>
<td>1811</td>
<td>Held</td>
<td>The game increased. We got as much game as last year just in the first 4 days.</td>
</tr>
<tr>
<td>1812</td>
<td>Held</td>
<td>Very little game.</td>
</tr>
<tr>
<td>1813</td>
<td>Held</td>
<td>The lack of game in recent years was mostly attributed to illegal logging and poaching.</td>
</tr>
<tr>
<td>1814</td>
<td>Cancelled</td>
<td>Because of continuous rain, Jiaqing finished Qixian ahead of time.</td>
</tr>
<tr>
<td>1815</td>
<td>Held</td>
<td>There were several heavy snows in the spring in Mulan, which did not completely melt until the beginning of the 4th lunar month. On the 19th day of the 3rd month (May 8) heavy snow came again. Roads were extremely muddy. Considering more precipitation in summer and autumn, the coming of Qixian would be a very rough journey. In addition, cancellation would provide the animals in Mulan some extra time for breeding.</td>
</tr>
<tr>
<td>1816</td>
<td>Held</td>
<td>Weather conditions were rarely good (warm and sunny) during Qixian.</td>
</tr>
<tr>
<td>1817</td>
<td>Held</td>
<td>Some poachers were arrested in Mulan.</td>
</tr>
<tr>
<td>1818</td>
<td>Cancelled</td>
<td>The emperor went to Mukden to worship the Manchu ancestors.</td>
</tr>
<tr>
<td>1819</td>
<td>Cancelled</td>
<td>It continuously rained in the autumn. The bridges on the way to Chengde were repeatedly destroyed by floods and could not be repaired before the day of departure from Beijing, the 12th day of the 7th month. Thus departure was delayed for 8 days. To celebrate his 60th birthday, Jiaqing finally cancelled Qixian due to the tight schedule.</td>
</tr>
<tr>
<td>1820</td>
<td>Cancelled</td>
<td>Jiaqing died in Chengde Bishu shanzhuang just before Qixian was held.</td>
</tr>
</tbody>
</table>

Note: All references are from the Qing shilu, Vol. 27-32, except for the specific years listed.
Due to the frequent cancelling of Qiuxian, the emperor left the Mountain Villa ahead of schedule and the duration of SOGW (101 days) was remarkably reduced in 1788–1798.

The bad weather that the Qing court frequently suffered in the late 18th century was the result of climatic shift. Beginning in the 1780s, North China experienced increased annual precipitation and an overall wetter period (Fig. 2e). Subsequently, temperatures dropped sharply, starting in the 1790s, and reaching their lowest point in the 1810s (Fig. 2d).

The Jiaqing emperor, successor of Qianlong, attempted to reinstitute Mulan Qiuxian after a lapse of 10 years, just as his father had in the 1740s, but found it much more difficult.

After living south of the Great Wall for more than 150 years, the Manchu nobility had been largely attenuated from the Manchu language and customs. Upholding national traditions such as hunting no longer attracted enough interest. Even the emperor Jiaqing admitted that his shooting and riding skills fell far short of his father's. To mobilise support from his own ethnic group, Jiaqing recalled the words of the Kangxi emperor, 'the sons and grandsons of later generations must respect the customs of their imperial ancestors by practicing the martial arts at Mulan so as to not forget the ways of the family,' and reaffirmed the political importance of Mulan Qiuxian as a family law of the Bannermen. Thus, its legality and necessity were unarguable.

However, at the beginning of the 19th century, the Qing court was confronted with unprecedented financial crises caused by rampant bureaucratic corruption (e.g., Heshen, the most famous corrupt officer in Chinese history, was sentenced to death in 1799) and popular peasant rebellions (particularly the White Lotus family law means hunting preserve in Chinese.

As Diamond has summarised, many past human societies that have collapsed, such as the Maya in Mexico’s Yucatan Peninsula and the Vikings in Greenland, often flourished in a benign climate with rapid population growth and depletion of environmental resources, and then found themselves with a larger population than could be supported when climate deterioration occurred in the next decades (drier in the case of the Maya; colder in the case of the Vikings). Similarly, in Chengde, the prosperity of the last warm century was followed by the remarkable cold of the late 18th century. Agriculture declined and the expansion of Han immigrant settlements slowed as indicated by the fact that since 1778, no counties were established for nearly a hundred years in and around Chengde (this would last until 1876 when a new county named Weichang was established on the site of the Mulan hunting preserve).

Meanwhile, Mongol pastureland was also in decline because of reclamations according to the ‘Memorial of cutting expenditure’ (written by Yinghe, the Minister of Personnel, in 1814). Although Mulan Qiuxian is an important activity of our empire, it’s too often to hold it annually. The Mongols who supply livestock for it are not as willing as before to participate according to my field survey because their horses are much less and they can no longer afford the loss in service. It would be of much benefit to local Han and Mongols who serve labours and livestock to hold Qiuxian every two years. In fact, in the last several years of Qianlong’s reign, the suppletion of the Mongol princes was another factor in the decision to cancel Qiuxian (Table 1).

As a result of financial difficulties and the suggestions of his ministers, Jiaqing substantially reduced the scale of Qiuxian. In the 25 years of his reign, the duration of SOGW and MLQX were 47 and 21 days on average, respectively, much less than during the reigns of Kangxi or Qianlong, and Chengde Bishu was terminated at the time of Qianlong’s death.

A by-product of the economic depression in Chengde was the increase in illegal logging and poaching around the Mulan hunting preserve committed by poor residents and new immigrants who could no longer earn a living there, which severely damaged the local natural environment and biological resources. Failure of the hunting office to manage the preserve properly because it was too deeply involved in the theft and resale of timber made conditions worse. On several occasions, the emperor had to cancel Qiuxian because there was not enough game to hunt (Table 1). Jiaqing repeatedly upbraided his ministers, but with little improvement.

Despite these major negative factors, schedules were frequently disturbed by unexpected bad weather during Jiaqing’s reign. In 1801, Jiaqing had to cancel his first hunting plan because of the most severe flooding disaster in the surrounding districts of Beijing of the Qing dynasty. In three other years when Qiuxian was cancelled (1803, 1809 and 1814), bad weather was also, more or less, to blame (Table 1). In 1806, the schedule was delayed because floods damaged bridges; in 1813, Qiuxian lasted for only 11 days and was finished ahead of time due to continuous rain; and in 1819, Jiaqing’s departure from Beijing was delayed for 8 days due to floods.

As shown in Table 1, from 1788 to 1820, bad weather (too much rain or too cold) had become the most common reason for cancelling Qiuxian (which occurred 11 years out of 20). Two reasonable deductions can be made from this. First, in some years, such as 1788 and 1801, bad weather was indeed the force majeure that caused the cancellation of Qiuxian. Second, in some

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45 Millward, Dunnell, Elliot, et al., *New Qing Imperial History* (note 8), 78.
46 Millward, Dunnell, Elliot, et al., *New Qing Imperial History* (note 8), 79.
48 Zou, Ming Qiuxian Bishu beibu nongmugouduadi tu yi he qiou hanman biaihu (note 32); Xiao, Qingsai Dongmeng nongye kaifa de xiaoqiang ji qiou biaihu beijing (note 22).
49 休场，which means hunting preserve in Chinese.
50 英和。
51 ⑵ 郡县志Liu Shangshu.
53 Niu, Qingdai shouliequ Mulan Weichang de xingshu he ziranziyuan de baohu yu pohuai, 1984 (note 17); Han Guanghui 刘桂林, *Bishu Xingwei* 历代狩猎 (Shanghai Education Press, 1992) 3–5.
years when it was neither very rainy nor especially cold (particularly when considering that in the reign of the Kangxi emperor (the late 17th century) winter hunting was sometimes held as a part of rigorous training), bad weather served more like an 'excuse'.

Confronted with the realistic difficulties of the turn of 19th century, the ministers were never as eager as the emperor to uphold the hunting tradition. Given the precedents of 1788 and 1801, it was easier for the emperor's ministers to use bad weather as an excuse for cancelling Qixian than to point out the lack of game in Mulan that was largely due to poor management and may have exasperated the emperor.

Such inference can be detected in a statement issued by Jiaqing on October 18, 1816.55

Mianke56 (the minister of managing court affairs57) presented a memorial last year to stop me from hunting with the excuse that bridges were damaged by floods. As punishment, I discharged him. After the departure from Beijing this year, there are still many people who take cold in Mulan as an excuse to disturb hunting. But in fact, the pleasant weather of 1816 was not necessarily normal during that cold and wet period. The inquisition to make ‘no mention ‘rain’ or ‘cold’ any more’ indicates that the tactic of the ministers to use ‘bad weather’ had attracted the emperor's attention, and the smooth journey in this year provided him with the chance to block dissenting voices and prevent Qixian from being cancelled for the reason of ‘rain’ or ‘cold’ in the future.

However, just 3 years later, flooding disturbed his schedule once again.

In 1820, the Jiaqing emperor died tragically on his last journey to Mulan. Thereafter, Mulan Qixian and arguments about it were terminated forever.

Conclusion and discussion

Mulan Qixian, together with Chengde Bishu, was a very important cultural phenomenon during the Qing dynasty. Its development over more than 100 years was a complicated product of political, economic, traditional and religious factors. In this study, we quantitatively described the rise and decline of Qixian and Bishu using a time series of their yearly duration from 1683 to 1820, and analysed the relationship with climate change. The conclusions are as follows.

(1) Qixian and Bishu were originally instituted by the Kangxi emperor in the late 17th and early 18th centuries (1683–1722), and they flourished in the mid 18th century during the reign of the Qianlong emperor (1741–1787). These were both relatively warm periods in the Little Ice Age in North China. The decline of Qixian and Bishu occurred between 1788 and 1820 when the climate turned sharply colder and wetter.

(2) In the warm period, the agro-pastoral transitional zone shifted northwards over the Great Wall, and the agricultural development around Chengde remarkably expanded the local environmental capacity, which allowed sufficient provisions and large-scale MLQX and CDBS. Meanwhile, frequent summer heat waves in Beijing most likely intensified the willingness of the Manchu nobility to escape the heat in Chengde.

(3) At the turn of the 19th century, climate deterioration brought local agricultural decline and overpopulation, which subsequently caused lower logistical capacity for Qixian and Bishu, and more illegal logging and poaching around the Mulan hunting preserve. Increasingly bad weather (e.g., too much rain in autumn, early frost or snow) forced the emperor to cancel Qixian in some years (e.g., 1788, 1801), which then served as a precedent for persuading the emperor to cancel Qixian in other years. Considering the various realistic difficulties to upholding Qixian, bad weather became an acceptable excuse for both the emperor and his ministers to evade the guilt of betraying ancestral traditions.

(4) Climatic impacts existed in different timescales and processes (Fig. 3). In the long term, climate change made an asymptotic impact on Qixian and Bishu by controlling the location of the agro-pastoral transitional zone, which subsequently affected local land use and environmental capacity, and finally the scale of the imperial activities. In the short term, bad weather conditions directly impacted the decision to hold Qixian and Bishu by restricting human activities (e.g., travel difficulties caused by heavy rain and floods) and stimulating sensory perceptions (e.g., severe cold); the experience and lessons learnt then influenced decision making in the following years. In conclusion, although climate was not the decisive factor compared with the political intentions of the decision makers, the economic and financial situation of the empire, and the personal devotion of the emperors, climate change (the variation of temperature and precipitation on different timescales) nonetheless

56 仰春．
57 聿前大臣 Yuqian Dachen.
played an important role in accelerating the rise and decline of Mulan Qixian and Chengde Bishu from 1683 to 1820. To a certain extent, some of the human behaviours and decisions in this historical period (e.g., extending the time to escape the heat in Chengde in the early and mid 18th century) could also be regarded as adaptations to climate change.

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