Short-Term Climatic Catastrophes and the Collapse of the Liao Dynasty (907–1125): Textual Evidence

Harnessing high-resolution data enables the precise reconstruction of the causal chains connecting environmental catastrophes and societal changes. This article follows a series of publications about climate history in this journal and elsewhere within the last few years that illustrate this approach. It is based on the assumption that comparatively short-term disasters such as clusters of droughts or cold spells, lasting for just a decade or two, can induce food shortages, famines, and violence and create waves of refugees. Climatically enforced migrations can affect complex societies and, in extreme cases, even topple established bureaucracies. Relying on a wealth of measured contemporary data and real-time testimonies, scholars often explain the current mass migration out of Syria, Iraq, and East, North, and sub-Saharan Africa into the more stable regions of Western Europe as the result of severe drought. Similarly, we suggest that the events leading to the collapse of the Liao dynasty in Mongolia and northern China were caused by intense cold and other short-term climatic changes.¹

¹ For recent publications in climate history, see Richard W. Bulliet, Cotton, Climate, and Camels in Early Islamic Iran: A Moment in World History (New York, 2009); Sam White, The Climate of Rebellion in the Early Modern Ottoman Empire (New York, 2011); Michael McCormick et al., “Climate Change during and after the Roman Empire: Reconstructing the Past from...
We argue, however, that the accuracy of historical studies that depend on the measurement of indirect signals (proxies) is limited by the multidecadal range of radiometric dating, or by the poor distribution of the better-dated signals (such as series of tree-rings, lacustrine varves, ice-cores, etc.) in the Eurasian continent. The extended error range of experimental measurements prevents the precise dating, or even identification, of climatic events that lasted less time than the measurement error itself, and they certainly prevent the establishment of causal chains that begin with experimentally elusive short climatic disturbances, on the one hand, and end with the societal transformations that followed them, on the other. This article shows that the introduction of historical evidence can change the resolution of the reconstruction and enable a more balanced and comprehensive assessment of short-term, extreme, climatic events and the social transformations that occurred in their wake.

THE LIAO DYNASTY  The Liao dynasty ruled over one of the most formidable empires of the medieval world, encompassing a large expanse of northern China, including the northeast Bohai area in northeast China (known as Manchuria in later periods) and a huge part of the steppes of Mongolia and of southern Siberia.
The state stretched from the borders of Korea in the east to the Altai Mountains in the west. The empire was founded originally by the Khitan (Chinese, Qidan) people, who inhabited areas of northwest China and eastern Mongolia from the fourth century C.E., later establishing the independent state of Liao after the demise of the Tang dynasty. The Liao dynasty took advantage of the political instability of the era known in Chinese history as the period of Five Dynasties and Ten Kingdoms (907–960) to consolidate its reign. Eventually it established a fragile balance of power with the Song dynasty that ruled large parts of present-day China in 1005 through a peace treaty (the Chanyuan Treaty) that conferred the Liao emperors with a status equal to that of the Song (Chinese) emperors.

Although not controlling most of China proper, the Liao was one of the most powerful empires of the period. Medieval European sources identify north China as Cathay, a term derived from the name Khitan. Many European languages still use this name, despite the demise of the Liao dynasty. Circa 1025, Liao resolved a conflict with the Goryeo Kingdom (918–1392) in present-day Korea, thus securing the dynasty’s geopolitical position.
Its conflict with the Western Xia dynasty (1038–1227; Chinese, Xi Xia) exposed its weakness, but from the 1050s, a relatively stable tripartite (Song–Liao–Western Xia) balance of powers prevailed.\textsuperscript{2}

Against this background, the collapse of the Liao seems to have been especially fast and dramatic. The historical evidence depicts this collapse as the result of a rapidly escalating minor disagreement, in the winter of 1112, with the Jurchen tribes (Chinese, Nüzhen) who inhabited the areas of present-day Jilin and Heilongjiang and whose chieftains were previously Liao’s vassals.

Within ten years of this dispute, the previously unorganized Jurchen tribes unified and invaded the Liao, founding the Jin dynasty (1115–1234). The remains of the Liao dynasty had fallen by 1125 as the Jin continued their advance, defeating the northern Song and establishing themselves in the Yellow River basin. Many of the defeated Liao elite and the military joined the victorious Jin; others fled to Central Asia, where they established the Western Liao or Qara Khitai dynasty (1124–1218).\textsuperscript{3}

Earlier research advanced mainly political, cultural, and military reasons to explain the rapid demise of the Liao and the incursion of the northern tribes into the heartland of China (see below). This article, however, suggests a different explanation based on a thorough and systematic reading of the available contemporaneous Chinese historical records. An unusual concentration of historically well-documented climatic anomalies, including extended droughts but especially strong cold spells associated with the global climatic event known as the Medieval Climate Anomaly (MCA) are at the core of our understanding of this turbulent period during the twelfth century, especially the two decades that preceded the collapse of the Liao.

Analysis of past climatic events necessitates a proper grounding in the environmental conditions and geopolitical organization of the Liao. The Liao state was divided into five circuits (Figure 2). The upper-capital circuit was the traditional political and religious


center, identified with the origins of the Khitan people. However, the most important economic centers of the dynasty were in the eastern-capital circuit, middle-capital circuit, and the southern-capital circuit—the main producers of grain for the Liao. The southern-capital circuit was the home of the Han (Chinese) people, whereas the eastern-capital circuit had various non-Han tribes, including Bohai and Jurchen. Aside from agricultural zones located mainly in the Liao River basin, this eastern circuit included regions in the Amur River basin and areas to its north and west (including Sakhalin Island) sparsely populated by nomadic tribes. The establishment of the middle-capital circuit as the political center in 1007 marked the movement of the dynastic center southward. The western-capital circuit originated in 1044 as a military and transportation junction.

CONVENTIONAL REASONS FOR THE COLLAPSE OF THE LIAO  Most of the modern historical reasoning for the collapse of the Liao recalls the narrative that appears in the official history of the Liao, the Liao
Shi. The description of the events that preceded the rebellion against the Liao in 1112 in *The Cambridge History of China*, the standard English-language history of this period, also relies on that narrative:

In late winter the imperial entourage, according to custom, went on its seasonal fishing expedition to the Hun-t’ung River (the modern Sungari). The chieftains of the northeastern tribes, including the “wild” Jurchen from eastern Manchuria, came to pay homage. At the First Fish Feast at which they were entertained in the emperor’s camp, the chieftains were expected to get up in turn and dance, as a symbolic gesture of submission. When it came to his turn, one of them, A-ku-ta (Aguda), refused to do so, even after being bidden three times. Tientso (Liao emperor Tianzuo, r. 1101–1125) wanted to have him executed for his deliberate act of defiance, recognizing in him a potential enemy. But the influential chancellor Hsiao Fenghsien dissuaded him, belittling the harm that A-ku-ta could possibly do.4

Following this seemingly insignificant event, Aguda managed during the following year to unite the Jurchen tribes under his leadership. In 1115, after a war had erupted between the Jurchens and the Liao, Aguda declared himself emperor of the Jin dynasty (known posthumously as Emperor Taizu of Jin). Despite all diplomatic efforts, including promises of annual payments from the Liao to the Jin, the conflict continued, and the Jin quickly moved into Liao territory. Moreover, the Jins’ negotiations with the Song, which began in 1117, ended in the treaty of 1123. By this time, Jin forces were able to capture most of the Liao’s strongholds and capitals and turn the Liao emperor into a fugitive. Although Aguda died in 1123, his younger brother (Emperor Taizong of Jin) completely annihilated the Liao and later wrested the Yellow River Valley from the Song.5

Although the attribution of the Jurchens’ unification and their southward expansion to the impolitic behavior of the Liao is controversial, scholars have offered no better explanation to this point. They usually view Liao’s military decline purely within a political

4 Tuotuo (compiler), *Liaoshi (Liao History)* (Beijing, 1974; orig. compiled 1343); Twitchett and Tietze, “The Liao,” 140–141.

context—the weakness and incompetence of the Liao emperors. Many also point to internal struggles for power within the Liao court, commencing around 1075, that resulted in the erosion of Liao’s administration and army, as well as the series of rebellions at the time that drained the power of the Liao. Along with these conditions, others also cite the Liao emperors’ unwise diplomatic and military decisions, such as the two expeditions against the Western Xia and the undermining of the peace treaty with the Song, and increased Buddhist influences that tended to weaken the warlikeness of the Liao army.6

None of these anecdotal explanations, true as they may be, can account for a major and fundamental process like the annihilation of a mighty empire. Moreover, even if they accurately describe, on a certain level, the failure of the Liao army to cope with the threat of the Jin, they do not explain the rapid unification of the Jurchen and their urge to move southward. These processes—the weakening and disintegration of a previously solid bureaucracy and the violent southward migration of tribes residing in northern latitudes—are typical in periods of drastic climatic fluctuations. Witness the extreme cold spells of the eleventh century that led to the disintegration of the Buwayhid dynasty in Baghdad and to the contemporaneous southward migration of the Seljuks. The notion that climatic anomalies could also have induced (or partly induced) the Jin advance and the collapse of the Liao is worthy of careful consideration.7

CLIMATIC CONDITIONS AND SOCIETAL TRANSFORMATION DURING THE MEDIEVAL CLIMATE ANOMALY In recent decades, reconstructions of paleo-environmental and paleo-climatic conditions have become a popular field of research. Most of these studies depend on the measurement and analysis of indirect signals that reflect past

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7 See Ellenblum, Collapse of the Eastern Mediterranean.
conditions (proxy data). However, even though they provide important data and insights about broad climatic trends, these data are not totally accurate because of the multidecadal range of radiometric dating and the poor distribution of some of the better-datable signals, such as tree rings. The extended error range limits the ability to date, or even identify, historical climatic catastrophes that lasted less than the error range of the experimental data itself (that is, a decade or two). Therefore, although proxy data are undeniably useful for the reconstruction of major climatic changes in the past, they are not so for the reconstruction of shorter climatic disturbances; nor can they point to the societal transformations that followed in the wake of these changes. The absence of precise information often leads to the assumption that a crude temporal association between a climatic disturbance and a societal transformation is enough to establish a causal connection between the two.

The reconstruction of the climate in northern China during the last two millennia, as in any other place, is hampered by dependency on proxy data. Reconstructions made at the beginning of the present millennium (such as the one made by Yang et al.) could manage only a broad periodization of climatic conditions. For the period relevant to our research, these reconstructions generally argued for “a return to warm conditions from AD 800–1400, including the Medieval Warm Period between AD 800–1100.” According to the IPCC’s 2013 glossary definition, however, the Medieval Warm Period (MWP), now known as the Medieval Climate Anomaly (MCA), was an interval of not only relatively warm conditions but also such notable climatic anomalies as extensive drought. Recent proxy records and temperature reconstructions indicate that average temperatures during parts of the MCA were indeed warmer in the context of the last 2,000 years, though its warmth may not have been as ubiquitous across seasons and geographical regions as the twentieth-century warming.8

The 2014 study by Ge et al., which systematically integrated the results of twenty-eight data sets and used two regression

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models to calibrate them, identified the period between 1020 and 1120 as one of the four warmest epochs in the last 2,000 years and the period between 1081 and 1110 as the second-warmest period in the entire 2,000 years’ sequence. We claim (see below) that such precision is obtainable only when using well-dated written evidence, and that the results of Ge et al. sometimes contradict these records.9

The scientific-proxy data is even more problematical in the case of strong cold anomalies. Even precise and abundant proxy data cannot differentiate precisely between droughts and cold spells. In such cases, the identification and dating of the short-term events is difficult, and the definition of the nature of the anomalies themselves is doubtful. Hence, cold spells are often absent from scholarly discussions about climatic changes. In China, Central Asia, or northern Europe, however, cold anomalies had and have an extreme effect on the availability of food for agro-pastoral societies.

Previous studies based on written material that dealt with the effects of climatic changes on the great medieval (the Buyid dynasty of Iran and Mesopotamia) and early modern (Ottoman) civilizations of the region clearly show that a succession of climatic disturbances, such as droughts or cold spells, lasting only for a decade or two induced food shortages, famines, and violence. If continued, they escalated into series of rebellions, mass migrations, influxes of refugees, and finally the end of states.

The texts frequently refer to the connection between the climatic catastrophes themselves and the societal transformations that followed them in “causal chains” beginning with the climatic catastrophes and leading to sharp rises in food prices and ultimately demonstrations and riots. The populace tended to blame rising prices on the greed of merchants who hoarded food surpluses in their barns and warehouses, as well as on the corruption of government officials, who ostensibly cooperated with the merchants. When the scarcity persisted, it often led to famine and mass death.

All of the crises in western Asia during the eleventh century were accompanied by the crumbling of society and the deepening

of social, ethnic, and religious chasms, some of them previously in the open and others coming to light only after the crises began. The increasing violence caused migration from the affected regions. At first, only those with means fled, but, in time, others also tried to escape. Many of these would-be refugees discovered that they had nowhere to go, and many of them died. As is well documented in the literature, the climatic crises, especially the cold spells, triggered nomadic migrations to more stable regions. The idea that a decade of dearth (and conflict) can lead to such consequences became widespread during the recent mass migration out of the Middle East and North and sub-Saharan Africa across the Mediterranean into the more stable region of Western Europe.10

PREVIOUS VIEWS REGARDING CLIMATIC ANOMALIES AND THE COLLAPSE OF THE LIAO Although historians dealing with the Liao rarely focused on the effects of climatic conditions, sporadic mentions of them appear in the historical literature. A few studies identify the eleventh and early twelfth centuries as a period of climatic instability in northern China and the steppes, but few of them claim any direct or indirect connection between the anomalies and the collapse of the Liao. For example, Twitchett and Tietze note, “[From 1065] until the end of the reign, barely a year went by without some area of the Liao Empire being struck by some natural catastrophe. At first these problems mainly affected the southern agricultural regions; later, in the 1080s and 1090s the tribal areas, too, seem to have suffered greatly.” Yet, the authors do not analyze such reports in a systematic manner nor connect such catastrophes in any meaningful way with the rise of the Jin or the fall of the Liao. Wittfogel and Feng also enumerate natural catastrophes in their classic study of the Liao, but they too fail to draw any meaningful conclusions about the relationship of catastrophes to political events.11

Man and his colleagues use historical records to argue that the twelfth century was a period of cooling in China that caused

10 For historical studies, see Bulliet, *Cotton, Climate, and Camels*; White, *Climate of Rebellion*; Ellenblum, *Collapse of the Eastern Mediterranean*; for recent climatic anomalies and their consequences, Craine et al., “Global diversity”; De Châtel, “The Role of Drought and Climate Change”; Kelley et al., “Climate Change in the Fertile Crescent.”
the abandonment of the agricultural settlements established by the Liao in the Xilamulun River area. Although they maintained (without specific references) that exceptionally harsh winters between 1110 to 1113 could be related to the fall of the Liao, they did not elaborate on this notion or suggest any causal relationship between this weather and the political crisis. Others have also noted that c. 990, the climatic conditions of northern China changed from warm and humid to dry with several cold spells.\(^\text{12}\)

Pang, whose research is based on both written records and the increase of snowy and cold landscapes in paintings dated to the twelfth-century Song dynasty, identified a period of general cooling punctuated by a number of extremely cold events. Although she does not present a coherent argument about how such climatic conditions affected the collapse of the Liao and the northern Song, she provides an interesting observation: “[By 1110], the terrible snowstorms created a famine that turned millions into refugees. In the end, the Cold Period was a major contributing factor in the eventual collapse of the Northern Song.”\(^\text{13}\)

Support for the shift in re-naming the Medieval Warm Period of the eleventh and twelfth centuries to the Medieval Climate Anomaly and for the effect of cold spells on northern China and Mongolia during that time was strengthened by the study of Pederson and his colleagues. Focusing on the Mongol ascension, it was based on tree rings from Mongolia. Pederson et al.’s depiction of the periods between 1115 and 1139 C.E. and 1180 and 1190 C.E. as extremely dry is inconsistent with Wang’s more recent study, also based on dendrochronological data from northeast Asia, which identifies major periods of drought between 898 and 929, 1071 and 1096, and 1248 and 1296. Ge et al.’s study identifies the era between 1050 and 1150 as one of the five periods within the last 2,000 years that were most susceptible to drought. Thus, notwithstanding the concrete indications of droughts and cold spells in northern China and the Mongolian steppe regions during the

\(^{12}\) Man Zhi-min et al., “Qihou bianhua dui lishi shang mu guodu dai” (Case Studies on the Impact of Climatic Changes on the Farming-Pastoral Transitional Zone in Historical Periods), Acte Geographica Sinica, XIX (2000), 141–147; Ge Quansheng et al, Zhongguo Lichao Qihou Bianhua (Climate Changes of all Dynasties in Chinese History) (Beijing, 2011), 391.

\(^{13}\) Pang Huiping, “Strange Weather: Art, Politics, and Climate Change at the Court of Northern Song Emperor Huizong,” Journal of Song-Yuan Studies, XXXIX (2009), 1–41, 12.
eleventh and twelfth centuries, the evidence is not fine enough, and the societal consequences of the weather are not clear.¹⁴

HYPOTHESIS AND METHODOLOGY Our hypothesis is that the climatic conditions responsible for sociopolitical transformations are neither long-term changes in the average annual precipitation or temperature nor singular events. The clustering of such short-term but intense events as droughts, floods, and cold spells can catalyze the domino effect that lead to dramatic societal and political processes.

Following the methodology in Ellenblum’s *Collapse of the Eastern Mediterranean*, we systematically scrutinized the dynastic history of the Liao (the *Liao Shi*), supplementing it with relevant data recorded in the dynastic history of the Jin (the *Jin Shi*). We encoded and charted indications of climatic-environmental stress (including apparent climatic disasters and abrupt increases in food prices, food riots, and large-scale migrations). Every methodology has its shortcomings and error ranges; historians are well aware of the historiographical biases and other limitations in written sources like the Liao history. Nonetheless, the precision of the annalistic tradition of Chinese historiography, the continuity of many events throughout several consecutive years, and the mutual corroboration of the different dynastic histories all tend to vouchsafe the descriptions of the climatic conditions in the dynastic histories, as well as any reconstructions of specific events and any clustering of climatic anomalies and trends based on them.¹⁵

Our investigative work unfolded in three stages: The first stage was the identification and charting of the records directly mentioning climatic data (rain, snow, frost, ice, cold spell, etc.), direct calamities (flood, drought, plague, famine, etc.), governmental interventions and relief, and anti-governmental activities (food riots,


rebellions, etc.). The second stage was the organization of those records into chronological tables and the verification of their reliability. The third stage involved the calculation of each event’s magnitude and the use of statistical tools to analyze the patterns of climatic events throughout the history of the Liao dynasty.

Because the quantification of the data was based on descriptions in the texts, certain subjective decisions were necessary. Despite its shortcomings, however, this procedure is preferable to conferring the same magnitude on all of the events. In the analysis of the data, the numbers assigned to each event according to its magnitude increased or reduced the event’s effect on the statistics. Thus, for example, a cold spell marked as “level 2” counted as two events marked as “level 1” (see Table 1).

RESULTS As shown in Figure 3, the first eighty years of the Liao dynasty enjoyed stable climatic conditions. The critical years in the history of the Liao can be divided into two periods: The first period of climatic anomalies and societal responses to them occurred between c. 980 and 1030, when the Liao dynasty was able to cope with natural challenges through political, diplomatic, and agricultural means. During this period, the Liao and the northern Song were at peace; the Chanyuan Treaty came into effect in 1004/5. As Figure 3 shows, many of the climatic anomalies during this period were droughts and floods that affected agricultural productivity in the eastern and central capital circuits, but they were not strong enough to destabilize the Liao system. The Liao reaction to the shortage of food was a more intensive involvement of the government in relief and welfare activity. The Liao built granaries for emergency relief, decreased taxes, repaired public buildings, and improved transportation facilities. The figure indicates, for example, intensive drought in the year 1009 and again in 1012; disruptive floods in 1009, 1011, and 1012; and famine in 1007, 1010, 1012, and 1013, impelling the Liao government to launch a large-scale relief campaign. These policies were sufficiently effective to remove any need for further investment during the climatically stable period between c. 1030 and 1065.16

16 For Liao’s policies during these years, see Zhang Guoqing, “Liaodai de shuihuan ji xiangguan wenti yanjiu” (On Floods in the Liao Dynasty and Relevant Issues), in Liu Ning and Zhang Li (eds.), Liao-Jin lishi yu kaogu guoji xueshu yanto hui luwen ji (Liaoning, 2012), 208–221.
### Table 1  Quantification of the Historical Data

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<thead>
<tr>
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<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
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<tbody>
<tr>
<td>Rain</td>
<td>Rain that relieves drought</td>
<td>Normal rain</td>
<td>Continuous rain that impacts crops or human lives</td>
<td>Heavy rain that causes disasters</td>
</tr>
<tr>
<td>Drought</td>
<td>Drought without clear description</td>
<td></td>
<td>Widespread drought with description of harm or ensuing government action</td>
<td>Widespread drought with description of harm or ensuing government action</td>
</tr>
<tr>
<td>Flood</td>
<td>Flood without description or highly local</td>
<td></td>
<td>Widespread flood with description of harm or ensuing government action</td>
<td>Untimely (spring or autumn) cold anomaly or severe frost damage</td>
</tr>
<tr>
<td>Cold Spell</td>
<td>Winter cold anomaly</td>
<td></td>
<td>Famine with description of causes, effects, and relief</td>
<td></td>
</tr>
<tr>
<td>Famine</td>
<td>Famine without description</td>
<td></td>
<td>Famine without description</td>
<td></td>
</tr>
<tr>
<td>Food Price</td>
<td>Clear indications of a rapid increase in prices of basic foods</td>
<td></td>
<td>Local</td>
<td>Regional or national</td>
</tr>
<tr>
<td>Food Riot or Rebellion</td>
<td></td>
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The second period, from 1066 to 1130, underwent stronger and longer climatic anomalies requiring more intensive governmental intervention. The later years from 1109 to 1116 and 1125 to 1127 show evidence of extremely lengthy cold anomalies (Figure 4). In fact, ten of the sixteen reports of extraordinary cold anomalies recorded between 901 and 1130 occurred between 1109 and 1127. Droughts were also recorded in 1109, 1113, 1119/20, and 1123. The combination of droughts, floods, and cold anomalies severely limited the agricultural production of the southern and eastern Liao state, leading to dearth and famine reflected in the frequent reports of governmental relief efforts. The evidence suggests that the Liao government could not cope with the magnitude and the multitude of the catastrophes. The Liao record for the year 1118 states, “In the regions of Qian, Xian, Yi, Jin, and Xing-zhong one peck of grain cost several bolts of lustring. The people stripped the bark from elm trees and ate it. Later men even ate each other.”

Cold spells had devastating effects on areas not only in the Liao agricultural heartland but also even further to the south, at the political center of the Song. The Song history (Song Shi) reports that during the invasion of the Jin in November 1126, “the armies shivered so badly they could not hold their weapons, and some collapsed from numbness. The Emperor washed his feet in

the imperial palace and prayed for sun.” The nomadic pastoralists who inhabited the steppe and wooded environment, such as the “wild” Jurchen, suffered the most devastating effects of the intense cold spells, known as dzud in Mongolian.  

Similar events have occurred in recent years. Between 2000 and 2002 and in the winter of 2009/10, fiercely cold conditions caused the death of 10.8 and 10.3 million head of livestock, respectively. In some regions, 20 to 40 percent of all livestock perished during a single winter, causing a mass migration of herders to the city. Furthermore, an analysis of animal mortality in Mongolia from 1955 to 2013 clearly demonstrates that the decisive factor in mortality rates is winter cold. A combination of extreme cold anomalies and droughts, such as in the Liao records, is surely even more disastrous for the livelihood of nomads and semi-nomads.

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18 Tuotuo (compiler), Song Shi (Beijing, 1985; orig. compiled 1343), “Benji,” Chapter 23, (Biography of Emperor Qinzong).
The intensity and concentration of extremely cold anomalies in the Liao and Jin records from 1109 to 1127, which is much greater than those in Mongolia from 2000 to 2013, can explain the rapid influx of the Jurchen tribes southward into Liao and Song territories. The prolonged cold spikes that occurred in the years 1109 and 1113 can explain the willingness of the diverse tribes to unite under Aguda’s leadership shortly thereafter. The rapid march of these tribes southward corresponds with the severely cold events of 1116 and 1125–1127.

The spatiotemporal analysis of the well-dated and well-located climatic anomalies shows that the more severe anomalies affected the entire region of the Liao Empire, not just a specific circuit. The data suggest, however, that the northern areas populated by the Jurchen tribes underwent several decades of cold and dry winters that explain their growing unrest and their forceful movement southward. Extremely cold and dry anomalies in northern China are usually associated with the intensification of the winter Siberian High. Such conditions often cover regions that are far more extensive than those discussed in this article. For example, the spatial distribution of the Siberian High during the winter of 1968/9, which was the coldest in recorded climatic history, affected the entire central and northern parts of the Eurasian continent. Such widespread phenomena usually occur not only in the fragile regions of the north but also in the southern agricultural regions. They were certainly strong enough to weaken Liao’s southern agricultural tier and to spark Aguda’s rebellion in the southern regions.

To examine our hypothesis of strong, widespread cold anomalies, we tabulated the events according to the five Liao capital circuits (Figure 2). In many instances, the documents provide an even more refined location for the events, such as prefecture, county, or commandry, but for our purposes, the location of the anomalies on a circuit-scale division is adequate. Climatic catastrophes recorded in a few circuits were added to all the adjacent circuits. Events described as “severe droughts” or “great famines,” Livestock Mortality in Mongolia,” Environmental Research Letters, X (2015), available at http://iopscience.iop.org/article/10.1088/1748-9326/10/7/074012 (accessed October 2, 2018).

For the development of the event in 1968/9, see Amit Tubi and Uri Dayan, “The Siberian High: Teleconnections, Extremes and Association with the Icelandic Low,” International Journal of Climatology, XXXIII (2013), 1357–1366.
or any droughts and famines that affected many areas, were ascribed to every circuit, even though no specific location was mentioned. The category of “pray for rain” usually indicates a drought, but it appears in our analysis only when accompanied by other categories such as a famine or a relief.

Because the middle-capital and western-capital circuits were not established until the first part of the eleventh century, our tabulation for them is most relevant to the period between 1046 and 1126. The data, presented in Figure 5, clearly show that the distribution of climatic anomalies was relatively homogenous throughout the Liao Empire. Between 1046 and 1126, forty-six events occurred in the southern-capital circuit, fifty-four in the eastern-capital circuit, eighteen in the western-capital circuit, twenty-six in the central-capital circuit, and thirty-nine in the upper-capital circuit. Figure 5 reveals that during the crisis years of the late eleventh and early twelfth centuries, all areas, aside from the western-capital circuit (which is the least relevant for our purposes), were equally affected. The areas populated by the Jurchen and other nomadic tribes, in the eastern and upper circuit, were severely affected after 1100, supporting our explanation for the movement of those tribes southward. Since the areas populated by the Han also experienced these anomalies, they also could have been weakened by the natural disasters.
During the last years of the Jin offensive—1126 and 1127—severe cold events afflicted the Song capital area (Bian capital, present day Kaifeng). Because they happened after the collapse of the Liao, however, we cannot tell whether they stayed only in this area or, more likely, also afflicted the northern regions. In any case, although those cold anomalies may have weakened the resistance of the Song armies, they have no bearing on our understanding of the Jin’s rise and the Liao’s collapse.

The collapse of the Liao and later of the Song at the hands of the Jin to some extent shaped not only the history of China but also that of Central Asia. The common assumption is that such events are the culmination of a state’s long process of decline and the rise of new, more vigorous states to power and hence that internal struggles and incompetent emperors weakened the Liao Empire, making it vulnerable to surprise attacks by the Jurchens. Yet the Liao dynasty was at peak power shortly before the beginning of the crisis with the Jurchen. That the capabilities of the Liao army were not on the decline is evident in how the war unfolded. Even during the years 1122 to 1124, after heavy losses from continuous and severe attacks by the Jin, Liao troops under Yelü Dashi were able to defend against much larger Song armies that attempted to take advantage of the situation and conquer parts of Liao territory. Furthermore, when the final defeat of the Liao was inevitable, Dashi gathered a small group from the remaining Liao army and elite who were able to subdue a large part of Central Asia and establish the Qara Khitai or Western Liao dynasty (1124–1218). Clearly, with the rapid advance of the Jin, others who had previously served the Liao, including the Jurchens, who for a long time had inhabited the eastern-capital circuit within the Liao system, and the Khitans, joined the ranks of the Jin and contributed to their victories.²¹

The detailed evidence herein demonstrates that an exceptional concentration of climatic disasters could disrupt the balance of power and eventually cause the collapse of a geopolitical system. Frequent, extensive cold anomalies devastated the socioeconomic fabric of the nomadic Jurchen tribes. Recent examples of cold spells accompanied by drought show the potentially devastating

effects of such climate anomalies. According to the textual evidence, Aguda united previously divided tribes and pushed his coalition southward into areas also affected by the climatic disasters. This movement to the warmer and more fertile south was most likely the result of necessity.

The significance of this research goes beyond its contribution to a better understanding of the history of the Liao and the Jin dynasties. It illustrates the potential of the historical records of the literate societies of Eurasia to provide an accurate and detailed reconstruction of historical climatic events and their effect on human society. The movement of pastoral nomads from steppe and desert regions of Central Asia into the Middle East, Europe, or China has occurred throughout history, but no previous period has ever offered such detailed documentation about nomadic migration as the MCA. Earlier theories that advanced climate as the reason for population movements from the Asian steppes could rely only on intuition, but the medieval sources of the MCA describe nomadic migration in a manner that allows us to ascribe causality to climatic events.

Finally, a better understanding of the relationship between climatic disturbances, human migrations, and political outcomes is useful in present-day contexts. The dynamic interplay of polities and environments often becomes clearer in the light of history.