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Source: Persica Antiqua, January 2022, VOL. 2, NO. 2: 61-76.

Published by: Tissapherness Archaeological Research Group

Stable URL: https://www.persicaantiqua.ir/article_138159_c2925173cdd8be26f16a0d5dfde73379.pdf

Ministry of Science Research & Technology
Tissaphernes Archaeological Research Group

The International Journal of Ancient Iranian Studies
January 2022, VOL. 2, NO. 2: 61-76. OPEN ACCESS
https://doi.org/10.22034/PA.2021.138159

PERSICA ANTIQUA

RESEARCH ARTICLE

Climate Change and Challenges of the Last Ancient Dynasty of Iran: The Decline and Fall of the Sassanid Empire

Esmaeil Matloubkari[1], **Babak Shaikh Baikloo Islam**[2]

Abstract

Climatic events, especially severe droughts, have played a key role in cultural evolution and the challenge of civilizations. Climate change, which affects the natural resources and, consequently, the health and subsistence system of human societies, can lead to increased violence, migration, war, and the spread of epidemics. The main purpose of this study is to investigate the possible effects of climate on important events of the Sassanid era. Extensive regions of the Near East and Central Asia have been more vulnerable to droughts, which often recurred during cooling periods, due to semi-arid to hyper-arid environmental conditions. From the second half of the fifth century AD with the beginning of the cold event of the early Middle Ages, the occurrence of droughts and cold waves caused famines and epidemics. These tensions seem to have triggered many social and political events in the Sassanid realm and neighboring regions. These conditions in the sixth and seventh centuries AD caused the gradual decline and eventual fall of the Sassanid government due to Arab invasions. Historical and paleoclimate studies show that successive wars with Central Asian invaders in dry periods, and the frequent outbreak of plague associated with falling temperatures, especially following the floods of the Tigris and Euphrates rivers in AD 628, were affecting factors in the dynasty's weakness and collapse. Besides, some civil wars and revolts, such as the Mazdaki movement, can be considered as indirect effects of climate tensions that contributed to the gradual decline of the Sassanid Empire.

Keywords: Sassanid; Climate Change; Drought; Famine; Plague.

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Article info: Received: 8 August 2021 | Accepted: 3 Otober 2021 | Published: 1 January 2022
Citation: Matloubkari, Esmaeil; Shaikh Baikloo Islam, Babak. (2022). "Climate Change and Challenges of the Last Ancient Dynasty of Iran: The Decline and Fall of the Sassanid Empire". *Persica Antiqua*, Vol. 2 (2): 61-75.
https://doi.org/10.22034/PA.2021.138159

Introduction

The consequences of climate change are one of the most attractive subjects in historical and archaeological researches and have been considered by many researchers in recent decades (McCormick et al., 2012; Kerner et al., 2015; Büntgen et al., 2016; Weiss, 2017; Kaniewski et al., 2019; Shaikh Baikloo et al., 2020). The socio-political events of the Sassanid era have been greatly influenced by climatic conditions. The emergence of the Sassanid dynasty in the first half of the third century AD changed the balance of power between the west and the east, which had turned in favor of the Roman Empire a hundred years earlier. In the first century AD, all the shores of the Mediterranean Sea were under Roman rule, which was called "Mare Nostrum" or "our sea" (Abulafia, 2011). The presence of numerous and long-standing ports in various parts of the Mediterranean had enabled the empire to carry out a high capacity of sea transport for the transfer of troops and logistical supplies, which was an important factor in its growth and gave it a great advantage over rivals. This allowed the empire to grow rapidly between 100 BC and AD 200, despite many civil wars and riots. This period is covered by optimal climatic conditions called Roman warming (Harper and McCormick, 2018). The first century of Sassanid rule also coincided with the end of this period, and it seems that this climatic event played a significant role in the rapid growth of the Sassanid state. From the fourth century onwards, a series of historical events are observed that may have been influenced by widespread climatic change.

It is important to note that the main feature of periods of climate change is, in fact, an increase in climatic anomalies and the frequent occurrence of extreme weather events. For example, the nature of warming periods is not defined simply by an increase in average temperature and humidity everywhere. Not only is geographic location influential in how the weather conditions are, but during such warming periods, extreme cold waves may occur for a variety of reasons, such as a change in the jet stream pattern and transfer of cold polar air to mid-latitudes (Gershunov and Douville, 2009; Woollings, 2019). The main purpose of this study is to identify the possible effects of climate on important historical events of the Sassanid era. We seek to answer the question of what role climate change played in the socio-political changes of the Sassanid era? Doing this research required a detailed study of the history of the Sassanid empire and climatic archives of various geographical areas, such as Greenland, South-west Asia, and Central Asia. It is hypothesized that many events in this period of Iranian history were influenced by specific climatic conditions.

Climate Reconstruction in the Sassanid Era

The Iranian plateau, located in South-west Asia, is affected by various air masses in several ways, and this has complicated the climatic conditions of this land. Low-pressure air masses (precipitation cyclones) mainly enter Iran from the north-west, the west, and the south-west in the cold seasons of the year, and from June to September, often; the dominance of subtropical high pressure creates a stable atmosphere. Monsoons also affect the south-east region of the country during the warmer months.

Although Iran is in the early stages of high-resolution paleoclimate research, the reconstruction of Iran's ancient climate is not impossible. The climatic

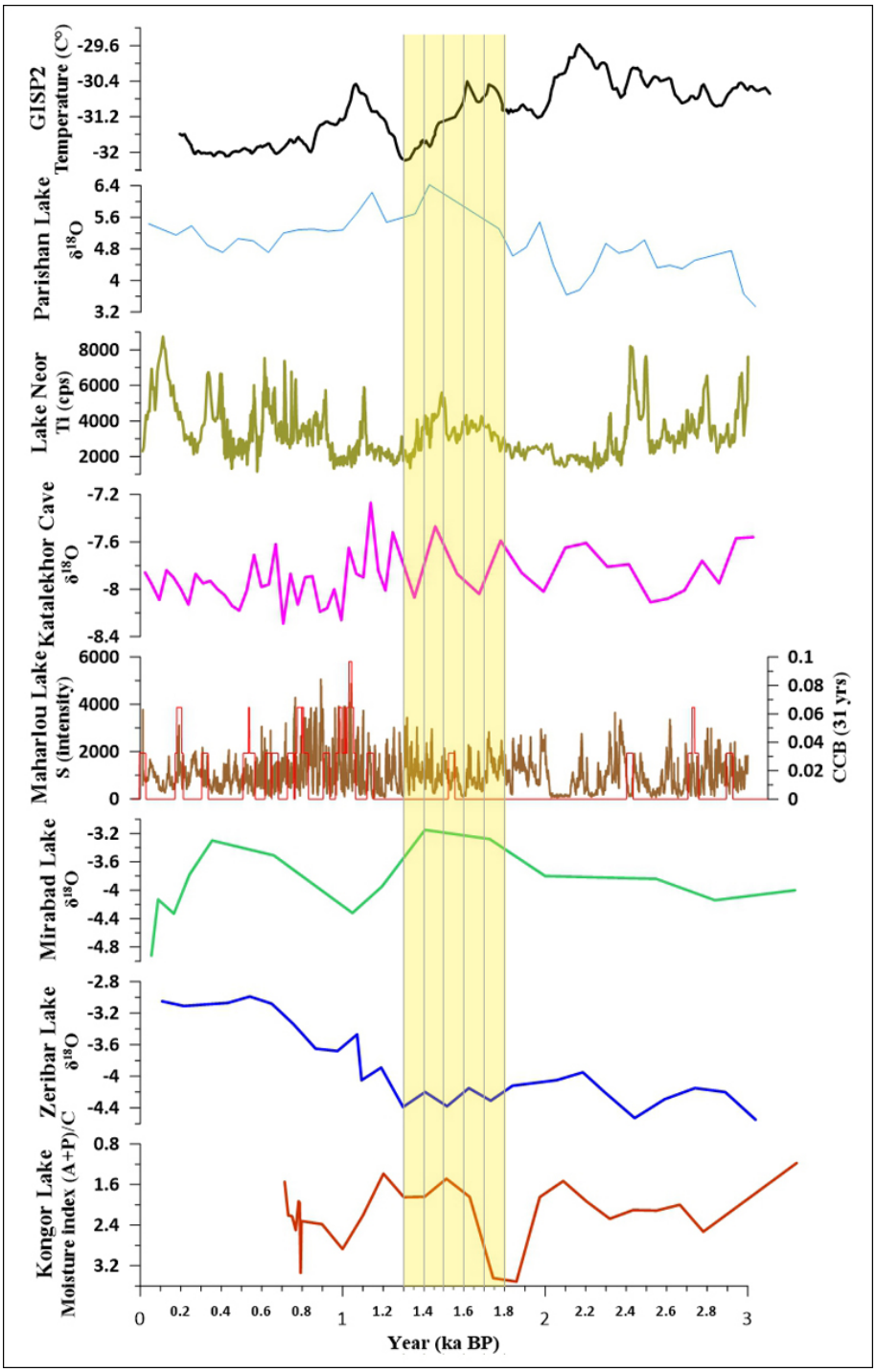

Fig. 1. Greenland Center Temperature Changes (Based on GISP2) and Humidity Oscillations Based on Iranian Paleoclimate Research

archives examined in this paper have been extracted from Lake Neor in Ardabil (Sharifi et al., 2015), Lake Parishan (Djamali et al., 2015), Lake Mirabad in Lorestan and Lake Zeribar in Kurdistan (Roberts et al., 2008), Lake Kongor in Gorgan plain (Shumilovskikh et al., 2016), and Katalekhor Cave in Zanjan (Andrews et al., 2020). Furthermore, to reconstruct the climate of the neighboring regions of the Iranian plateau, reference has been made to the studies of Kunaba cave in northern Iraq (Sinha et al., 2019), Sofular cave in northern Turkey (Göktürk et al., 2011), Jeita cave in the east Mediterranean (Cheng et al., 2015), Hoti Cave in Oman (Fleitmann and Matter, 2009), the north bed of the Red Sea (Arz et al., 2006), and in Central Asia from Uluu-too Cave in Kyrgyzstan (Wolff et al., 2017), Kesang Cave in West China (Cheng et al., 2016; Cai et al., 2017), tree rings of the north-east Tibetan Plateau (Zhang et al., 2003; Sheppard et al., 2004; Shao et al., 2010) and other paleoclimate proxies in China (Yang et al., 2009). Besides, to study temperature changes, GISP2 (Greenland Ice Sheet Project) research, which has a high resolution (Alley, 2004), has been used. Accordingly, attempts have been made to reconstruct temperature and humidity fluctuations from AD 200 to 700 in Central and South-west Asia (Figs. 1-3). The reconstruction of the climate of each century can be summarized as follows:

1. AD 200 to 300: Temperature changes in central Greenland indicate an increase in temperature at the beginning of this century. The trend of rising temperature peaks in the middle of this century, and then, a drop in temperature occurs. Humidity changes based on South-west Asia paleoclimatic proxies indicate favorable climatic conditions and relatively humid during this century, but the humidity in Central Asia appears to have been relatively low. Studies of tree rings in the north-east Tibet show a drop in humidity in the second half of this century.

2. AD 300 to 400: At the beginning of this century, the trend of decreasing temperature continues. From AD c. 330, the temperature begins to rise, which continues until the late of this century, but from AD c. 390, the temperature drops sharply. Studies of Jeita Cave in Lebanon show that the climate of this region is dry, which peaks AD c. 300-330. Examination of tree rings in the Dulan region of the north-east Tibet determines severe droughts between AD 340 and 380. Kesang Cave studies also confirm the arid climatic conditions in this century. However, paleoclimate research shows that Mediterranean and Sudanese low-pressures have not weakened over this period.

3. AD 400 to 500: The trend of temperature decline, which began in 390 AD, intensified in the fifth century. Climatic cooling in this century caused a decrease in the humidity in Iran. Lake Maharlou's research indicates a severe drought from AD c. 450 to 480, which peaked AD c. 470. According to tree ring studies in the north-east Tibet, from AD c. 430 to 500 (in another study up to AD 550), there were drier-than-average climates that peaked between 470 and AD 490. Speleothem studies in northern Turkey indicate a decrease in rainfall and humidity between AD 430 and 450, and Tree Ring Studiess in Central Asia illustrate a dry climate from AD c. 420 to 500. The study of Uluu-Too Cave also shows an increase in arid climate in the second half of the fifth century with a peak AD c. 480, and it seems that in the first half of this century, the Kyrgyzstan climate was humid. Still, in

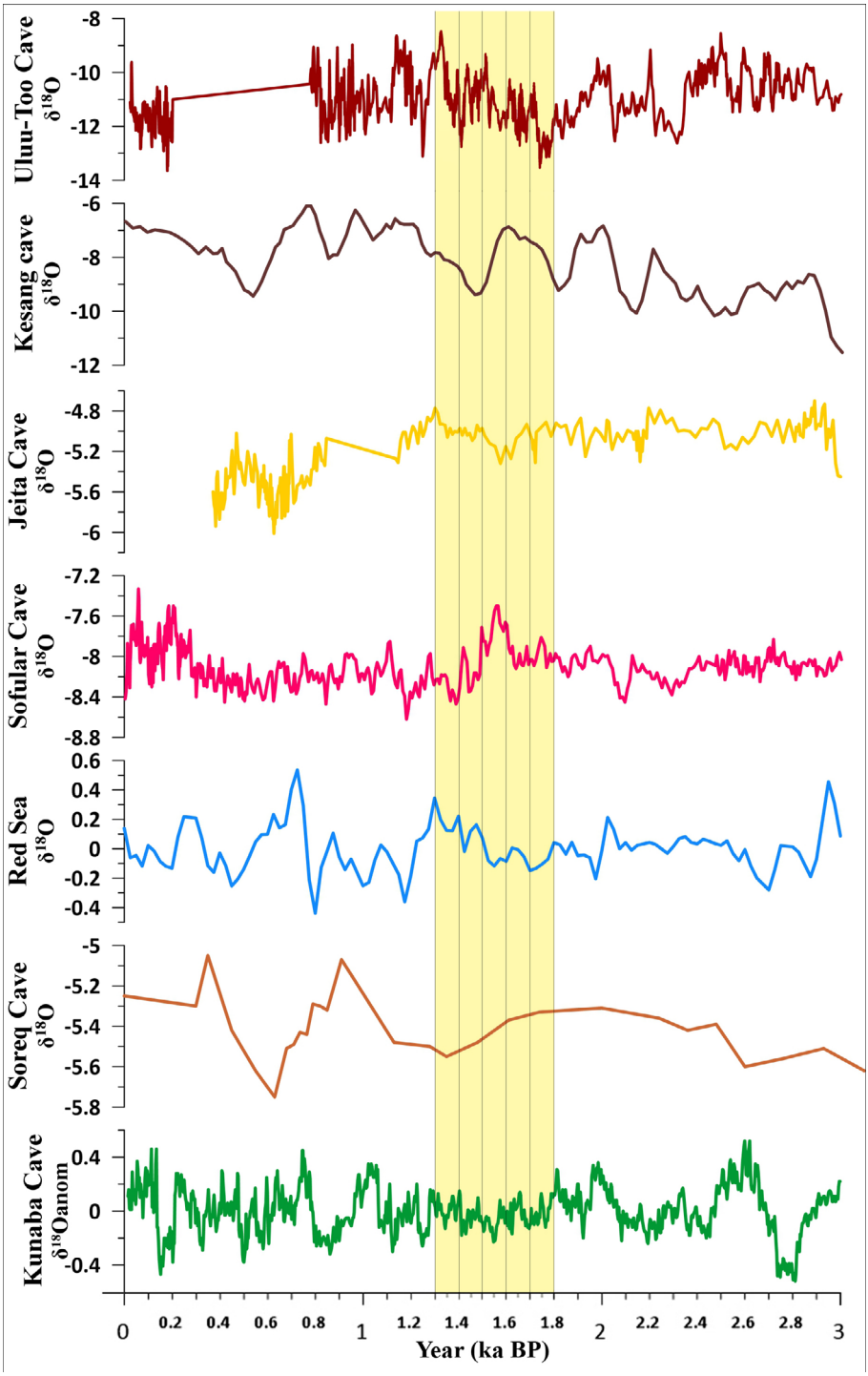

Fig. 2. Humidity Oscillations in Central and South-west Asia

the second half of the century, the arid climate prevailed. Jeita Cave's research also shows the generally dry conditions during this century. The Red Sea studies indicate relatively wet conditions until the second half of the fifth century, but it seems that in the second half of this century, the humidity in this region has decreased. This is different from the results of studies of Kunaba Cave (the north of Iraq) and Lake Zaribar. However, according to studies of Hoti Cave in Oman, the monsoons weakened between AD 400 and 700.

4. AD 500 to 600: The trend of decreasing temperature continues in this century and especially intensifies from AD c. 540. Paleoclimate researches in Iran show the existence of dry conditions during the sixth century AD. Studies of tree rings in the north-east Tibet indicate a drought in AD 550s and increasing humidity in AD 590s. While the east Mediterranean and the Red Sea had a dry climate, Anatolia, according to the Sofular Cave, appeared to have been in humid conditions. Studies of Jeita Cave, Kunaba Cave, and the Red Sea show the peak of dry conditions AD c. 600. Kyrgyz Speleothems studies also show this peak in drought. Sofular cave's research has also identified this drought about a decade earlier.

5. AD 600 to 700: Humidity appears to have increased gradually during this century, according to paleoclimate research. The Tree Ring Studies of Central Asia characterize a wet period between AD 600 and 650.

Historical Events

Third Century AD: The Emergence of the Sassanid State

The optimality of climatic conditions during the establishment and expansion of the Sassanid Empire by Ardashir I (Bābakān) (AD 224-241) and Shapur I (AD 241-272) is visible. Ardashir's uprising c. 205 AD, victory over Ardavan IV at the Battle of Hormezdagan in AD 224, the conquest of most of the Kushan territory in Takharistan and expansion of the Sassanid frontier to Chach (ŠKZ, §3), the defeat of the Romans at Meshik (AD 243/4) and the killing of Gordianus III (ŠKZ, §6), another victory of Shapur I over the Romans at Harran (AD c. 260) and the capture of Valerian (ŠKZ, §22) all occurred during this period (Huyse, 1999: 23, 26, 37). Stable climatic conditions, however, were not the only reason for the military victories of the first Sassanid kings, Ardashir I and Shapur I, but also coincided with the crisis of the third century in Rome, which led to the decline of the empire and until the rise of Diocletian (AD 284-305) and the creation of the system of Tetrarchy (two emperors and two Caesars) lasted.

Fourth Century AD: The First invasions of Nomads

Due to the weakening of the monsoons and the increase in arid conditions from the early fifth century to the late seventh century AD (Fleitmann and Matter, 2009), the influx of the Arab tribes of Abdul Qais, Bahrain, and Kazemah into Rēšahr and the shores of Ardashir-Khwarrah in the second decade of the fourth century may be related to climate change. Tabari points out that the group invaded the area to obtain "livestock, grain and necessities". Shapur II (AD 309-379), after reaching the age of sixteen, expelled them from the Ērānšahr (traditional borders of Sassanid territory) (Fig. 4), but the last years of his reign coincided with the invasion of the east tribes that were a great danger to the country. These tribes have long lived in the plains of the east Eurasia and the north China. The severe and prolonged drought that occurred

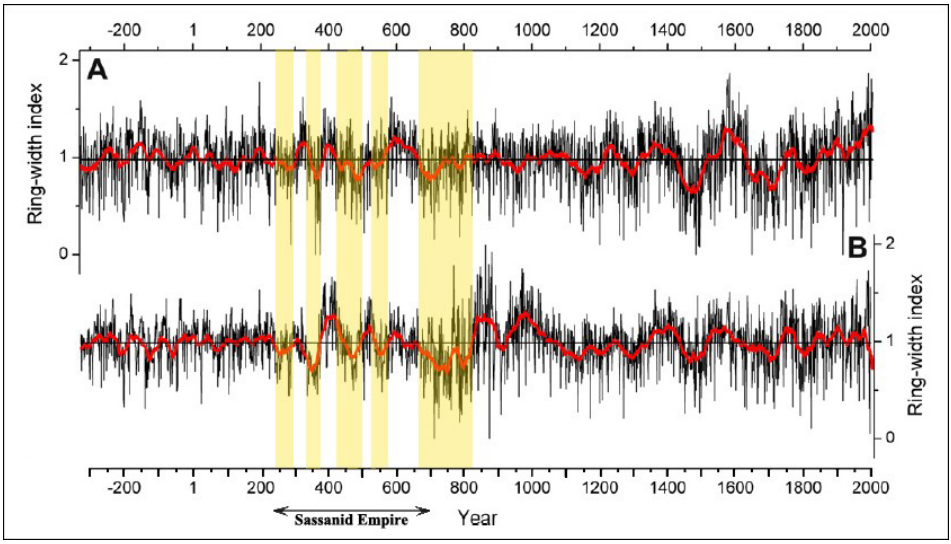

Fig. 3. Diagrams of Humidity Changes from Tree Ring Studies in the North-East Tibet, Central Asia (Shao et al., 2010)

in the pastures of Eurasia, especially in the east parts of the region, led to the migration of pastoral-nomad tribes to find favorable environments (McMichael et al., 2017: 149). The dendroclimatology in the north-east Tibet confirmed the occurrence of this severe and prolonged drought from AD c. 340 to 380 (Shao et al., 2010). This dry period played a key role in driving the mobile pastoral federation known by the name of Huns. They reached the Don River by the 370s and crossed it AD c. 375. Their attacks in the north Black Sea drove the Goths to flee into the Roman Empire and ultimately to attack it. This attack resulted in one of the greatest military defeats in Roman history in AD 378 at Adrianople (Edirne, Turkey) (McCormick et al, 2012: 190).

The south branch of the Huns, known as the Iranian Huns, probably entered Sogdia from the east plains of Eurasia and after crossing the Amu Darya (Oxus River) entered the Kushan-Sassanid territory. Shapur II tried to block their infiltration. Ammianus Marcellinus is the first Western historian to speak of these tribes and to report the winter residence of Shapur II in the lands of Hun (Chionitae) and Euseni (*Roman History*, XVI. 9. 4). In AD 357-358, Shapur made a peace treaty with the Hun and Gelani tribes (Ibid, XVII. 9. 3). Thus, in AD 359, he was able to attack the city of Amida at the head of the forces in which the kings of Hun and Albania were present (Ibid, XVIII. 6. 20). Ammianus reports on the influential role of the Huns, and the death of their king's son, during the conquest of this city (Ibid, XIX. 1. 7). The peace treaty with the Huns does not seem to have been sustained because the fifth-century Armenian historian P'awstos Buzand speaks of a renewed battle in the east during which the Huns crushed Shapur's army, leaving only two Armenian brothers, Manuel and Koms survived (*History of the Armenians*, V. 37). The result of this battle was the domination of the Huns, probably the Kidarians, over the north Hindu Kush. Numismatic evidence also confirms the Kidarian conquest of Tokharistan (Greek Bacteria) during the fifth century.

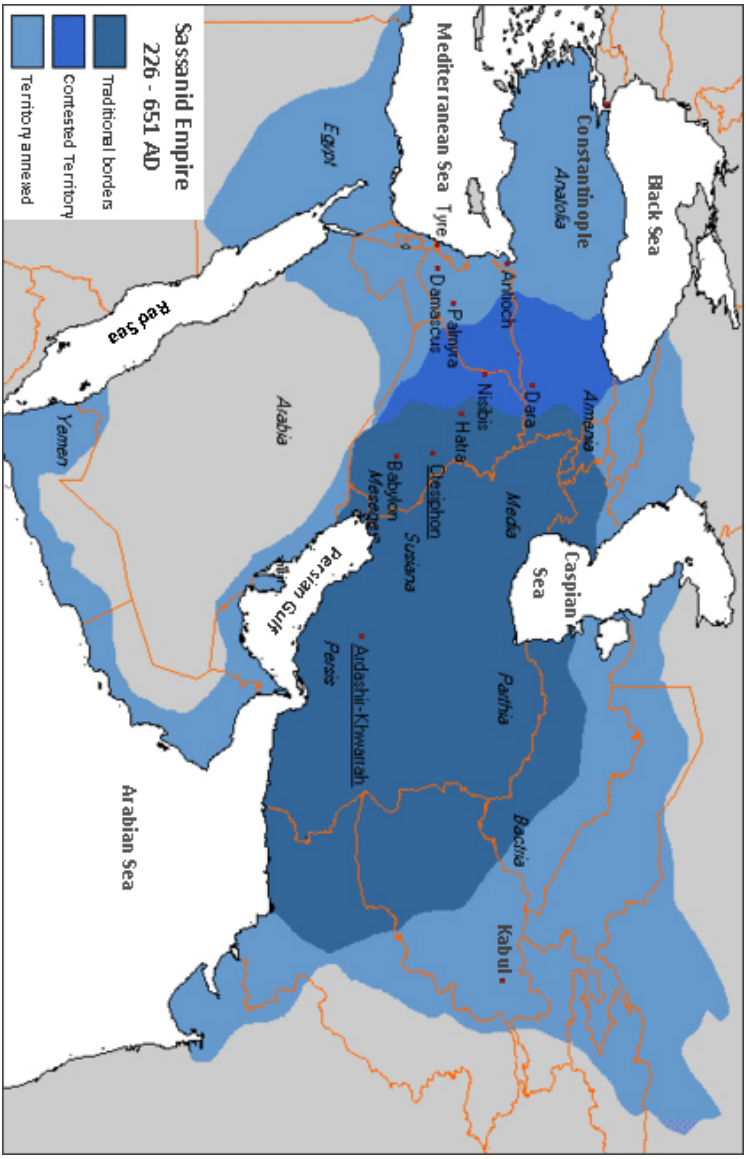

Fig. 4. The Territorial Expansion of the Sasanian Empire from 226 to 651 AD (Cervantes, 2013)

It seems that during this period, the Kushan-Sassanid state was under the patronage of the Sassanids, Shapur II and III, and their territory was limited to the Kabul Valley (Mitchiner, 1975: 157, 160). The Kushan-Sassanid state was likely overthrown during this period, and the Sassanids came to power directly in parts of the south Hindu Kush. Schindel suggests that there were Sassanid mints belonging to Bahram IV in or near Taxila, which led to the spread of his coins in Taxila, Swat, and Jalalabad (Schindel, 2004, 1: 300-301).

Fifth Century AD: Drought, Economic Crisis and the Struggle against Nomads

"The east politics" was the basic approach

of the Sassanid state throughout the fifth century AD. In AD 408, the support of Yazdgerd I (AD 420-339) for Theodosius II (AD 401-450) (History of Wars, I. ii. 7-10; Hamza Isfahani, 1961: 17) established a policy of de-escalation with the Romans and made it possible to pay attention to the east borders. Yazdgerd used this policy to reduce the pressure of the Huns on the east borders. He probably lived in the east of the country for a long time and the oldest evidence found in the historical area of Neishabour belongs to his time. Yazdgerd's residence in Gorgan, near the east border, provided an opportunity for his assassination by the aristocracy (Shahbazi, 2003). The first indirect historical reference to climate change can be found in the narrations related to the battle of Bahram V (AD 438-420) with the Kidarians, who are introduced as Turks in Islamic texts and Iranian national history (Dinawari, 2011: 84-85). The reign of Yazdgerd II (AD 437-457) coincides with the onset of severe droughts in Central Asia. Examination of tree rings in the north-east Tibet shows that after the wet period of AD 340-440, a period of severe drought occurred that lasted until about AD 500 and caused another wave of invasions to the east borders of the Sassanid empire. New waves of immigrants probably joined the previous waves, which increased the power of the newly established Iranian Huns. For this reason, this period of drought coincides with the decline of Sassanid power in east Iran. Yazdgerd II spent seven years of his rule on the east frontiers to repel the invasion of a group of Huns, possibly the Kidarians, who threatened much of the civilized world. In this respect, he is very similar to Marcus Aurelius, the Roman emperor who spent most of his reign fighting in the north borders of the empire. Yazdgerd made Neyshabur its operational base and fortified Kumesh (Qomes) against the Tšōl (Čōl) tribes (Daryaee, 2012).

Historical texts report widespread droughts and famines in the second half of the fifth century AD, indicating climate change. Tabari refers to a severe seven-year famine during the Pērōz era (AD 459-484) during which rivers, Qanats, and springs dried up and the water of the Tigris decreased (Tabari, 1387 AH: 83). The existence of a part of the Gorgan wall, between Jorjan and Sool gate, which is underwater today, shows that at the time of construction of this wall, by the order of Pērōz, the water level of the Caspian Sea was at least 2.5 meters lower than today (Altheim, 1969: 114). During this drought and famine, the Sassanid King forgave land and per capita taxes. In the last years of the fifth century, at the same time as the reign of Kavad I (AD 537-487), the Sassanid territory witnessed extensive droughts mentioned in the Shāhnāmeh, during which Mazdak, a Zoroastrian priest, with the permission of the Shah, provided royal and private warehouses to the people. (Ferdowsi, 2009, vol. 7: 72). Most likely, the driving force behind the Mazdaki movement was the repeated fifth-century droughts and the inability of the Sassanid state to improve the living conditions of the villagers. (Crone, 1991: 33) considers this Shahnameh narration about the drought in the Kavad I period to be fictional and believes only in the occurrence of long-term drought in the Pērōz Period. However, as mentioned, climate proxies show that during this period, South-west Asia experienced many droughts and famines.

Climate change was not only damaging crops but was also likely causing tribes living in mountainous and cold regions within Ērānšahr to

migrate to warmer areas and cities. These demographic changes both put pressure on the limited food resources of these areas and weakened the country's defense structure. The available sources are often silent about the reason for the rapid advance of The Hephthalites or the Western Turks on the east borders of Iran or the repeated Khazars infiltrations into Arān and sometimes as far as Mesopotamia. The migration of tribes living in these areas may have reduced the indigenous population of these areas and opened the way for the influx of nomads. The construction of the Gorgan Wall and the Derbent gateway, and the establishment of strong military bases in these areas could indicate a decrease in population and an effective defense force in these areas. The participation of the Byzantine Empire in the cost of building the Derbent shows that this problem existed in both lands.

Giving food from royal and private warehouses by Mazdak during the famine of the Kavad I period (Ferdowsi, 2009, vol. 7: 70-74) was not a strange and innovative activity, but a sign of following Pērōz who temporarily used the nationalization of food resources to manage the drought crisis. The narration of Birouni on giving the property of fire temples to the poor affected by the drought (Biruni, 1984: 353) shows that Pērōz used the critical conditions resulting from the drought to limit the power and wealth of the powerful Zoroastrian clergy. In this sense, he was the pioneer of the actions that were later carried out by his son, Kavad I. Perhaps many of Mazdak-related economic practices were solutions devised by the Sassanid bureaucracy to prevent the effects of the long droughts of the fifth century AD on the livelihoods of the majority of society. The correctness of this assumption shows that during the second half of the fifth century AD, drought and famine had become a common phenomenon, and premeditated solutions had been developed to deal with it. Obviously, the purpose of such measures was not specifically to improve the living conditions of the people, but the king sought to maintain his political interests, and especially his legitimacy, by reducing the damage caused by the drought.

Sixth and Seventh Centuries AD: Cooling and Plague

The suppression of the Mazdaki movement allowed Khosrow I (Anōšag-ruwān) (AD 531-579) to carry out the economic, social, and military reforms he intended. Unfavorable climatic conditions during the reign of Khosrow I can be deduced from some historical narrations (Tabari, 1387 AH: 150; Miskawayh, 1424 AH: 130). According to them, one of the secretaries objected to the imposition of taxes on unstable springs and qanats, which is a sign of the possible continuation of unfavorable weather conditions in the first half of the sixth century AD. However, the military growth of the Sassanid Empire can be a witness to their stable economic situation during this period, which in turn is proof of the favorable climatic conditions. Similarly, in the first half of the sixth century AD, economic development in Byzantium is visible clearly, which led to the extensive conquests of the period of Justinian I (AD 527-565) in Europe and Africa. This flourishing period ended with the beginning of a series of crises in the summer of AD 536.

The study of solar activity indicates a cooling period in the middle of the fifth century AD. Examination of the Greenland Ice Core (GISP2) also reveals a cold period in the fifth century that

peaked AD c. 540 (Alley, 2004). Besides, some paleoclimate studies determine the cold years at AD 526, 535 and 585 (McCormick et al., 2012: 191). Some researchers have called this period the late antiquity Little Ice Age (Büntgen et al., 2016: 3). Procopius is the first historian to mention this event. In the fourth book of *the Wars* and the report of Battle with the Vandals, he mentions the summer of AD 536 when the sunlight was dim: "For the sun gave Forth its light without brightness, like the moon, during this whole year, and it seemed exceedingly like the sun in eclipse. ... And it was the time when Justinian was in the tenth year of his reign" (*History of the Wars*, IV. 14. 5). John of Ephesus also reports that for 18 months from AD 536-537, the days were darkened and during this time the grains were rotten and the wine was spoiled and heavy and unusual snow fell in Mesopotamia (McMichael et al., 2017: 157).

Bar Hebraeus is another historian who has referred to this unusual phenomenon. "In the ninth year of the reign of Justinian I, an eclipse occurred," he said. The eclipse lasted for a year and two months and did not appear in the sunlight except a little. People said that the sun had a disease from which it could no longer be cured. In the same year, there were many locusts all over the land, and the winter was very cold and it snowed a lot, as many people died. The following year, strange signs appeared in the sky. The heat of the sun was reduced that year so that no fruit was ripe" (Bar Hebraeus, 2007: 87). He also reports the occurrence of severe frosts during the reign of Justinus I (AD 518-527): "In the seventh year of the reign of Justinus, it snowed heavily and became frost, and all the trees and vineyards were destroyed. After a year, the rain stopped and the grains became less and the water of the springs decreased and after that, the air became very hot and the diseases intensified and this lasted for six years" (Ibid: 86). Recent studies show that this cooling age coincided with three major volcanic activities that occurred in AD 536, 540, and 547 (Büntgen et al., 2016: 2). Some researchers have blamed the Rabaul volcanic eruption in Papua New Guinea for the incident (Arjava, 2005: 93; McMichael *et al.*, 2017: 157).

The possible occurrence of intense volcanic activity has been recorded in later years as well. In the second year of the reign of Justinus II (AD 565-578), a fire appeared in the sky. The fire was in the Arctic and lasted for a whole year. Nine hours after the beginning of the day, darkness covered the whole world until night, as nothing could be seen and something like dry particles of dust and ash rained down from the sky (Bar Hebraeus, 2007: 88). This is the most characteristic sign of volcanic activity. The closest volcanoes to Byzantine territory are in Sicily, but there have been no reports of intense volcanic activity in the area during this century. Thus, according to Bar Hebraeus, the probability of a volcanic eruption in the north latitudes was very high. The last report of a solar eclipse due to possible volcanic activity in Bar Hebraeus's book relates to the reign of Heraclius: "In the seventeenth year of the reign of Heraclius (AD 610-641), half of the sun was eclipsed, and this eclipse remained from Tešrīn Qdīm (October) to Hzīrān (June), and its light was only slightly visible" (Ibid, 92). This means that volcanic activity was not limited to AD 536-547, but probably lasted a little over ninety years, up to AD 627.

Climate change and the occurrence of the cooling period (apparently on a

global scale) in the sixth century AD led to the emergence and spread of the plague epidemic, known in history as the plague of Justinian. This is the first historical record of a widespread plague. Although the demographic patterns of this period are unclear, there is little doubt that by the second half of the sixth century and during the seventh century AD, the population of the east Mediterranean had reached its lowest point since the rise of the Roman Empire that the role of the plague of Justinian as one of the important factors in population decline should be considered. This plague was one of the factors that halted Justinianus' plan to rebuild the Roman Empire and transferred power to the north Europe that were safe from the effects of the disease (Dols, 1974: 371-2). According to Procopius, the plague of Justinian began in AD 541 in the Egyptian port of Pelusium. It then spread to Alexandria and throughout Egypt, as well as to Palestine (*History of the Wars*, II. 22. 6). The temperature of the ships sailing on the Nile River and the Red Sea was between 33° and 40°C. This temperature was too high for fleas and possibly mice to grow and reproduce. The ideal temperature for fleas is between 20° and 30°C. Since the plague often occurs in areas where the ambient temperature is between 24° and 27°C, therefore, a decrease in temperature along with an increase in humidity caused the infection cycle between fleas and mice to be completed and the disease to spread from Egypt to the north (McMichael et al., 2017: 157-158).

The plague reached Constantinople in the fall of AD 541 or the spring of 542 AD. This disease covered most of the known lands and peoples of the world and was probably the cause of Khosrow Anoshirvan's rapid retreat from Byzantine territory in AD 542 (*History of the Wars*, II. 21. 21). The Byzantine Empire and the rest of Europe, Iran, and the plains of Eurasia became infected. According to Western sources, the plague of Justinian dates back to the 9 to 12 years, and the plague spread several times in Egypt and Asia Minor (Dols, 1974: 373). The plague spread to Asia Minor and the south Caucasus in the second half of the sixth century AD, destroying a quarter of its population and spreading to Iran for decades. In the early seventh century, the Byzantine population declined due to the plague (McMichael et al., 2017: 158). Procopius's report of Khosrow I's fear of a plague in Azerbaijan and the transfer of troops from that region to Assyria (*History of the Wars*, II. 24. 12) confirms the outbreak of the plague in the south Caucasus.

We know about two plague epidemics during the reign of Khosrow II (Parviz) (AD 591-628). The first of these is the plague of Shirouyeh/Kavad II (AD 628). The plague broke out in Ctesiphon in AD 627-628, and Shirouyeh probably died of the disease in AD 629. Al-Suyuti also reports the outbreak of the Yazdgerd plague, which occurred during the reign of the last Sassanid emperor, Yazdgerd III (AD 632-651), between AD 634 and 642.

The frequent outbreak of the plague in Anatolia and the Levant and the decline of the Byzantine population at the beginning of the seventh century could be one of the reasons for the rapid advance of the Iranian army in these areas. Furthermore, Khosrow II "contracted to dysentery" while escaping from Dastagerd to Ctesiphon (Theophanes, 1982: 28), the death of Shirouyeh of plague, and severe diarrhea of Shahrvaraz, a commander who had lived in Byzantine territory for a long time (Tabari, 2008: 231) reflect the fact

that both Rome and Iran were suffering from epidemics. This deadly epidemic was transported to China by commercial caravans via the Silk Road (McMichael et al., 2017: 158).

Examining the historical events, it can be said that the plague epidemic was beneficial for the nomadic and semi-nomadic tribes that lived in the vicinity of the empires. "Their lesser losses in time of plague made the Arabs, the Berbers, and other tribesmen potentially dangerous to the Empire even before their unification in Islam. The appearance of Mohammed and the development of the Caliphate may possibly be classed as an accident, but conditions were ideal for them" (Rusell, 1968: 182). The invaders were always in a superior position to the defenders because they could escape the epidemics but the evacuation of cities by the defenders led to weakening the defense power and the rapid advance of the invaders. Thus, just as in the sixth and the early seventh centuries AD, the Sassanid army easily conquered the weakened regions of Syria and Anatolia, in the seventh century AD, the Arab army was able to conquer Syria, Egypt, and Iran.

Conclusion

The Sassanid state came to power in suitable climatic conditions, but climate change, which began in the fourth century AD, put pressure on the nomadic tribes on their east borders. This pressure caused in the fifth century AD, policies, an important part of the Sassanid manpower and financial resources to be concentrated in the east regions of the country. However, the economic consequences of climate change caused the Sassanid state to become extremely weak in the last decades of the fifth century. The restructuring of the Sassanid state in the first half of the sixth century by Khosrow I (anōšag-ruwān) revived this government. Despite references in historical texts to the damage caused by repeated droughts and plague epidemics, it seems that the Sassanids kingdom did not suffer more from these events than their western rival. There is evidence of the role of climate change and the spread of epidemics in weakening the defenders of the cities of Anatolia, the Levant, and Egypt, which led to the victorious advance of Khosrow Parviz's army into Byzantine territory. In addition, the return wave of the plague epidemic might be one of the main factors in the final collapse of the Sassanid state. Therefore, it can be assumed that climate change with consequences such as cold spells, drought, famine, and plague outbreak, is an important factor in reducing the power of the Sassanid state and has played a significant role in the fall of the last ancient Iranian dynasty.

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