

## **Potential influence of Okmok volcano on migration in Ptolemaic Egypt**

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### **Abstract:**

The "*ἀναχώρησις*" or migration to another place was wide spread during reign of Queen Cleopatra VII, especially from 43 to 42 B.C., because of the failure of the Nile River inundations and climate change, which resulted famine, starvation, food shortages, crop failure, prevalence of disease and epidemics, imposing heavy taxes despite the lack of Nile flooding, and entire unrest and struggle in Egypt.

So this research sheds light on the influence of the natural disasters such as Okmok volcano, which occurred during the Ptolemaic era and affected on the climate which resulted a lot of troubles in Ptolemaic Egypt during reign of Queen Cleopatra. The study depends on archaeological evidence, inscriptions and literary texts.

**Key words:** Okmok Volcano. ἀναχώρησις . anachoresis. Migration

### **Introduction:**

It is difficult for people to leave their home and migrate to another place to live, but there are many motives that force those people to migrate and stay in another land.

Migration is defined as "A person who moves away from his usual residence place to another place temporarily or permanently for variety reasons"<sup>1</sup>. Thus is related to change negative social conditions such as conflicts, economic developments, wars<sup>2</sup>, poverty, economic negativities, famine and social inequalities<sup>3</sup>.

Furthermore the environmental factors; such as the natural disaster, volcano, floods, climate change<sup>4</sup> and crops draught. Moreover the economical factor that is occurred to

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<sup>1</sup>Mustafa YAVUZKİNCİ, Figen GÜR SOY, Concepts of Migration and Temporary Protection, Recent Research Studies In Health Sciences, St. Kliment Ohridski University Press, Sofia, 2022, 3.

<sup>2</sup>Khalid Koser, Migration and security: exploding the myths and understanding the realities. In: Demography of refugee and forced migration, Springer, 2018, 235 – 249.

<sup>3</sup>Stephen Castles, "*International migration at the beginning of the twenty-first century: Global trends and issues*", International Social Science Journal, Vol 52, 2002, 269–28.

<sup>4</sup>Stephen Castles, "*Towards a Sociology of Forced Migration and Social Transformation*", Sociology, Vol. 37, No. 1, FEBRUARY 2003, 13- 14.

find a work or to get a high wages to improve their living standard<sup>5</sup>, or to escape from hometown to avoid paying the high taxes which called in Graeco-Roman era the "anachoresis".

The terminology of "ἀναχώρησις" or "anachoresis" is derived from verb "anachoreo" which used in the classical language during the Ptolemaic and Roman era which means of withdrawal and return<sup>6</sup>, taking refuge in mountains, hiding in forests, withdraw and temporary migrate or migration.<sup>7</sup>

Another types of migration occurred because political factors, religious intolerance and finally because of the social motivations; such as migrate for education, healing or marriage. There are a lot of types of migrations are hard to quantify.<sup>8</sup>

### **Alaska's Okmok Volcano:**

This eruption considered one of the biggest volcanic eruptions of the past 2500 years occurred in early 43B.C, with special geochemistry of tephra deposited during that phenomenon<sup>9</sup>.

Alaska is one of the United States of America. It is located at the far northwest of the North American continent, and the Alaska Peninsula is the biggest peninsula in the Western Hemisphere. Because the 180<sup>th</sup> meridian passes through the state's Aleutian Islands, Alaska's westernmost part is in the Eastern Hemisphere. Therefore Alaska is in both hemispheres.

It is bounded by the Arctic Ocean and the Beaufort Sea to the north, the Gulf of Alaska and the Pacific Ocean to the south, Canada's Yukon territory and British Columbia province to the east, the Bering Sea and the Bering Strait to the west, and the Chukchi Sea to the northwest<sup>10</sup>.

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<sup>5</sup>Mustafa YAVUZKİNCİ, Concepts of Migration, 4.

<sup>6</sup>Guido Migliora, "Semantic of Anachoresis: "Withdrawal and Return" Pattern", Cultural and Religious Studies, January 2021, Vol. 9, No. 1, 13 – 18.

<sup>7</sup>H.Henne, Documents et travaux sur l'anachoresis, Akten des 8. Internationalen Kongresses für Papyrologieien, 1956, 59 - 66. ;

أبو اليسر فرح، الدولة والفرد في مصر ظاهرة الهروب من الموطن في عصر الرومان، عين للدراسات والبحوث الإنسانية والاجتماعية، 33 -31، 2009

<sup>8</sup>Stephen Castles, "Towards a Sociology of Forced Migration", 15.

<sup>9</sup>Joseph R. McConnell, Michael Sigl, Gill Plunkett, Andrea Burke, Woon Mi Kim, Christoph C. Raible, Andrew I. Wilson, Joseph G. Manning, Francis Ludlow, Nathan J. Chellman, Helen M. Innes, Zhen Yang, Jessica F. Larsen, Janet R. Schaefer, Sepp Kipfstuhl, Seyedhamidreza Mojtabavi, Frank Wilhelms, Thomas Opel, Hanno Meyer, Jørgen Peder Steffensen, "Extreme climate after massive eruption of Alaska's Okmok volcano in 43 BCE and effects on the late Roman Republic and Ptolemaic Kingdom", Proceedings of the National Academy of Sciences of the United States of America, Vol. 117, No. 27 (July 7, 2020), 15443.

<sup>10</sup><https://www.britannica.com/place/Alaska>, last visited on May 23, 2024.

The North Greenland Ice Core Project 2 (NGRIP2) records two featured eruptions, the first eruption beginning in early 45 B.C.; it was no large scale climate effects because its short-term event, thus it is far-fetched this eruption had a significant effecting on the closer countries. The second eruption occurred in the early of 43 B.C. It was a massive eruption, with enormous volcanic fallout lasting over two years. It was started in the beginning of winter season and reached its peak in spring and overall maximum in the end of autumn of 43 B.C and lasted until the spring of 41 B.C<sup>11</sup>.

The volcanic eruption has long reach impacts on the ancient Mediterranean world that employs roughly dated ice core evidence and historical records for volcanic events<sup>12</sup>. Due to current analysis, this study suggests the susceptibility of Ptolemaic Egypt to the influences of volcanically forced changes in seasonal precipitation on agricultural production of the Nile delta. Dating opposition between the various human and natural archives would have challenged any association between monsoon dynamics, volcanic eruptions, flood suppressions, and the societal rebellions<sup>13</sup>.

The Okmok II eruption effects on that the second year cooling was among the most significant recorded in Northern Hemisphere summer temperature for the past 2500 years. The 43 and 42 B.C. ranked as the 2<sup>nd</sup> and 8<sup>th</sup> coldest years in a recent tree ring assessment<sup>14</sup>. While 43 to 34 B.C were the 4<sup>th</sup> coldest years<sup>15</sup>.

The Community Earth System Model<sup>16</sup> simulations refer to the Okmok II eruption in early 43 B.C resulted in 0.7 to 7.4 degree seasonal cooling in specific regions of Southern Europe and Northern Africa, with cooling during autumn and summer<sup>17</sup>. Moreover the CESM simulation suggests that the same volcanic eruption caused a dry autumn, wet winter conditions in lower reaches of the Nile River and spring conditions in the upper reaches<sup>18</sup>.

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<sup>11</sup>Joseph R. McConnell, *"Alaska's Okmok volcano in 43 BCE and effects on the late Roman Republic and Ptolemaic Kingdom"*, 15444 – 15445.

<sup>12</sup>J.G. Manning et al, *"Volcanic suppression of Nile summer flooding triggers revolt and constrains interstate conflict in ancient Egypt"*, Nat. Commun.8, 2017, 900.

<sup>13</sup>Ulf Büntgen, Clive Oppenheimer, *"The importance of "year zero" in interdisciplinary studies of climate and history"*, Proceedings of the National Academy of Sciences of the United States of America, Vol. 117, No. 52 (December 29, 2020), 32847.

<sup>14</sup>M. Sigl et al., *"Timing and climate forcing of volcanic eruptions for the past 2,500 years"*, Nature, 2015, 543 – 549.

<sup>15</sup>Joseph R. McConnell, *"Alaska's Okmok volcano in 43 BCE and effects on the late Roman Republic and Ptolemaic Kingdom"*, 15445.

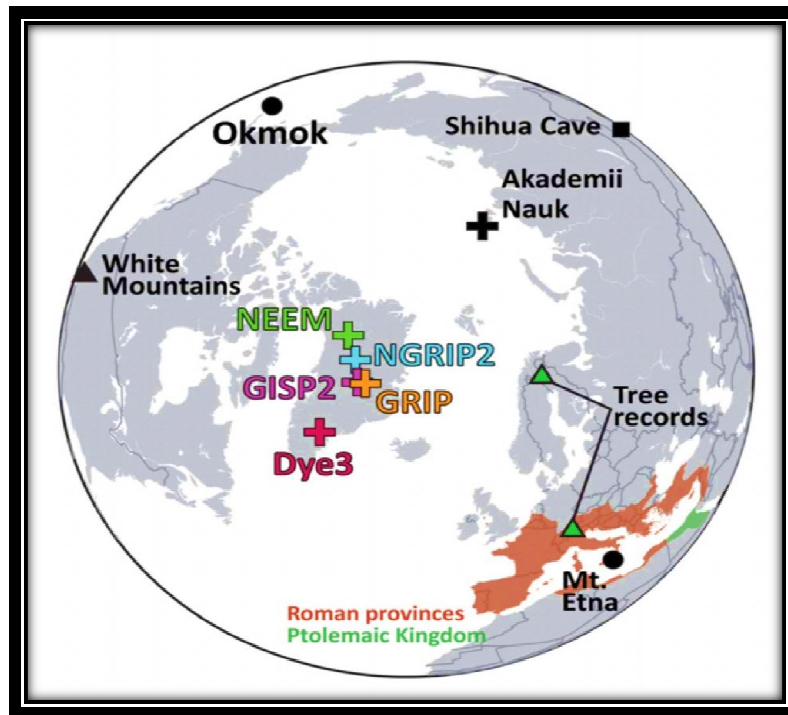
<sup>16</sup>The Community Earth System Model or CESM provides state-of-the-art computer simulations of Earth's past, present, and future climate states, <https://ncar.ucar.edu/what-we-offer/models/community-earth-system-model-cesm>

<sup>17</sup>Joseph R. McConnell, *"Alaska's Okmok volcano in 43 BCE and effects on the late Roman Republic and Ptolemaic Kingdom"*, 15447.

<sup>18</sup>A. M. Melesse, River Basin : Hydrology, Climate and Water Use, Springer, Berlin, 2011, 7 – 17.

## The influence of Okmok Volcano eruption on Ptolemaic Egypt:

The historical evidence presents a major social stress, unusual weather, famine, food shortages, civil unrest and disease in the Mediterranean region<sup>19</sup>. Queen Cleopatra was the ruler of Egypt - (Fig.1) - during the Okmok I & Okmok II volcano eruptions, qualitative approaches may introduce environmental shocks as a revelatory crisis<sup>20</sup>, which bad harvests might have contributed to her and a famine occurred during her reign that caused social events<sup>21</sup>. When Octavian and Antony tried to get grain from Egypt in October 42 B.C., Queen Cleopatra refused, because Egypt was already exhausted by famine<sup>22</sup>.



(Fig. 1): Location map shown the eruption site in Okmok and the extent of the Ptolemaic Kingdom in 44 B.C.<sup>23</sup>

<sup>19</sup>P. Garnsey, *Famine and food supply in the Greco-Roman World: Responses to Risk and Crisis*, Cambridge University Press, Cambridge, UK, November 2009, 3 – 7.

<sup>20</sup>J. S. Solway, *Drought as revelatory crisis: An exploration of shifting entitlements and hierarchies in the Kalahari, Botswana*. *Dev. Change* 25, 1994, 471–498.

<sup>21</sup>Sebastian Strunz, Oliver Braeckel, "Did volcano eruptions alter the trajectories of the Roman Republic and the Ptolemaic Kingdom? Moving beyond black-box determinism", *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 117, No. 51 (December 22, 2020), 32207.

<sup>22</sup>Appian, *Roman History: Volume V, Civil War, Book IV*, translated by B.C. McGing (ed.), Loeb Classical Libraries 543, Cambridge MA, 2020, 108.

<sup>23</sup>Joseph R. McConnell, "Alaska's Okmok volcano in 43 BCE and effects on the late Roman Republic and Ptolemaic Kingdom", 15444.

A text dates to 43 B.C. - the 10<sup>th</sup> year of Cleopatra's reign - referred to social disaster occurred in Egypt and lasted until 42 B.C., that many diseases and epidemics have been outbreak in Egypt. The Alexandrian doctor Discorides said describing one of the most widespread diseases during that time:

*"Suppuration of the lymph nodes has occurred with the appearance of black pimples on the skin, and malignant tumors have spread in Alexandria and the rest of the cities"*<sup>24</sup>.

Also during the first decade (50 B.C) of reign of Queen Cleopatra VII and Ptolemy XIII, Egypt was affected by many Nile failures, resulting in failed harvest, draught, starvation and famine. The farmers living in the nome of Heracleopolis complains and asking for a reduction of taxes because of the insufficient Nile flood of that year. They added that all the strangers who normally lived in their village had to migrate and returned to their own villages, leaving the village because they were unable to pay the high taxes<sup>25</sup>.

This is therefore a clear evidence of the *ἀναχώρησις* or "anachoresis" of entire villages of Herakleopolite nome. Furthermore the priests of these villages complained of a theft in their temple because the entire population had fled the villages and migrated. As a response to the low Nile flood inundation of that year and the famine, Cleopatra VII and Ptolemy XIII issued a decree that prohibited anyone beyond the province of Memphis to move or trade grain towards any other parts of Egypt that were not Alexandria<sup>26</sup>.

The historical evidence proved that the eruption of Okmok volcano affected in the rate of Nile River flood, because Seneca wrote about the failure of the Nile flood from 43 to 42 B.C<sup>27</sup>. Moreover Appian described the spread of plague, diseases, and occurrence of famine and starvation in Egypt during the second half of the 40 B.C<sup>28</sup>.

### **The papyrological and historical sources of "*ἀναχώρησις*" in Egypt during the reign of Cleopatra VII:**

It was recorded that ice core evidence, which identified great sulfur crumbling over much of the Arctic, was belonged to the eruption of Alaska's Okmok volcano, with climate model simulations shows two years of extreme temperatures and precipitation throughout the Northern Hemisphere beginning in early 43 B.C. This climate change occurred in the waning years of the Ptolemaic Kingdom during a period of well-known political,

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<sup>24</sup> مانفريد كلاوس، الاسكندرية أعظم عواصم العالم القديم، ترجمة. أشرف نادي، مراجعة. صلاح الخولي، الهيئة المصرية العامة للكتاب، 2009، 130.

<sup>25</sup>BGU, VIII, NO 1842. ; BGU, VIII, NO 1843. ; BGU VIII, 1836.

<sup>26</sup>F. Meijer and O. van Nijf, Trade, transport and society in the ancient world: A sourcebook, London, 1992, 64-65

<sup>27</sup>Seneca, Naturales Quaestiones, Vol. IV, translated by T.H. Corcoran, Loeb Classical Libraries, Cambridge MA, 1972, 61.

<sup>28</sup>Appian, Civil War, IV.61

economic and social stress including epidemic disease, famine, food shortages and unusually severe weather reported in ancient sources.<sup>29</sup>

A lot of historical evidence proved that the "*ἀναχώρησις*" as a result of climate change, lack of Nile flooding and the high taxes. The following text date back to 39 B.C., It is inscription honoring Kallimachos a *strategos* during the reign of Cleopatra VII, among of his honorary title "savior of the city"<sup>30</sup>, he saved Thebes during the famines which occurred because of the failure of the Nile flood and resulted *ἀναχώρησις* most probably as a resulted of Okmok eruption during 43 and 42 B.C.<sup>31</sup>:

*"1 In the reign of Cleopatra, the 'Father-Loving Goddess' and Ptolemy, also (named) Caesar, the 'Father-Loving and Mother-Loving God',*

*2 Year 13 (?), (in the month) Artemisios, (day) 18, (that means) Phamenoth, (day) 18. To the priests from Diospolis the Great (=Thebes), (priests) of the*

*3 greatest god Amonrasonther and the presbyteroi and all the others it seems right: ...*

*26 ..., that he (= Kallimachos II) shall be called soter, ('saviour') of the city, which is the residence (of the god ?) ...*

*27 ..., that one (=priests and people) shall set up for celebration of (his) birthday in crowded places of the sanctuary of the greatest god Amon-rasonther*

*28 three effigies of him (=Kallimachos), one of hard stone the priests, but two the city: one of bronze and the other likewise of hard stone,*

*29 to celebrate every year the day named after him and to sacrifice to the sovereign gods and to wear wreaths and to hold festive banquets,*

*30 as it customary, but to inscribe decree (psephisma) on a stela made of stone in Hellenic and native (=Demotic) letters,*

*31 and to set it up on the floor of this sanctuary, so that also publicly he has received the greatest god's*

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<sup>29</sup>Joseph R. McConnell, Michael Sigl, Gill Plunkett, Andrew I. Wilson, Joseph G. Manning, Francis Ludlow, Nathan J. Chellman, "*REPLY to STRUNZ and BRAECKEL: Agricultural failures logically link historical events to extreme climate following the 43 BCE Okmok eruption*", Proceedings of the National Academy of Sciences of the United States of America, Vol. 117, No. 51 (December 22, 2020), 32209.

<sup>30</sup>Rolf Strootman, Volcanic Eruptions, Resilience and Vulnerability: The Impact of Nile Flood Variability on Ptolemaic Egypt (261-30 BC), Thesis Bart Blokland Research master Ancient, Medieval and Renaissance studies, 2022, 77.

<sup>31</sup>OGIS 194. ; Translation. S.M. Burstein (ed.), The Hellenistic Age from the battle of Ipsos to the death of Kleopatra VII, Cambridge, 1985, 144-145

*32 Amonrasonther's grace, in order that for ever (his) benefactions will be remembered for him."*<sup>32</sup>

Another proof for the migrate during reign of Queen Cleopatra and her son Ptolemy XV, was a text, which dates back to the eleventh year of Cleopatra's reign, written in 13<sup>th</sup> of April, 41 B.C written by a mission sent from Alexandria to Queen Cleopatra to complain because the farmers of Alexandria were forced to pay taxes because they temporary migrate to work outside Alexandria, and forced into forced labor to clean the canals of the Nile that have not been cleaned of silt as a result of the low water level<sup>33</sup>:

*"Cleopatra and Ptolemy XV confirm the special benefits which given to the Alexandrian citizens who migrate to work in agriculture outside the city of Alexandria. These farmers were forced by the local authorities to pay taxes and they were originally Alexandrian citizens who were not permitted to pay that. Also they were forced into forced labor without paying their wages.*

*The citizens sent a mission from their own side, dated mid-March 41 B.C."*<sup>34</sup>

Later Queen Cleopatra reacted and issued a decree dating back to 12<sup>th</sup> of April 41 B.C. to rectify the situation:

*"Queen Cleopatra Thea Philopator, and King Ptolemy, who is also Caesar, Theos Philopator Philometor, to the strategos of the Herakleopolite nome, greeting. Let the subjoined decree, with the present royal letter, be transcribed in Greek and in native letters, and let it be put up publicly in the metropolis and in the principal places of the nome, and let all else be done according to our commands. Farewell. Year 11. Daisios 13, which is Pharmouthi 13 {12 April 41 B.C.}.*

*To Theon {the dioiketes?}. Whereas those from the City who do agricultural work in the Prosopite and Bubastite nomes have addressed a petition to us in audience on the 15th of Phamenoth {15 March} against the officials of the Ten Nomes, setting forth how these, contrary to our will and to the orders repeatedly sent out in accordance with our decision, by those over the administration {dioikountes}, to the effect that no one should demand of them anything above the essential royal dues, essay to act wrongfully and to include them amongst those of whom rural and provincial dues, which concern them not, are exacted, we, being exceedingly indignant and judging it well to issue a general and universal ordinance regarding the whole matter, have decreed that all those from the City, who carry on agricultural work in the country, shall not be subjected, as others are, to*

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<sup>32</sup>OGIS 194.; Andreas Blasius, *Army and Society in Ptolemaic Egypt - A Question of Loyalty*, 2001, 96, [academia.edu](http://academia.edu)

<sup>33</sup>مانفريد كلاوس، الاسكندرية، 130.

<sup>34</sup>G.Lefebvre, *Le dernier decret des Lagides*, Melanges Holleaux, Paris 1913, 103 – 108;

مانفريد كلاوس، الاسكندرية، 131.



*demands for stephanoi and epigraphai such as may be made from time to time, and on special occasions, in the nomes, nor shall their goods be distrained for such contributions, nor shall any new tax be required of them, but when they have once paid the essential dues, in kind or in money, for corn-land and for vine-land, which have regularly in the past been assigned to the royal treasury, they shall not be molested for anything further, on any pretext whatever. Let it be done accordingly, and let this be put up publicly, according to law.*"<sup>35</sup>

From the previous decree inference that the forced labor to migrate to clean the canals of the Nile was widespread, and the officials were harsh with the citizens to collect the heavy taxes, all of this forced prove the occurrence of troubles and unrest inside the country which resulted from the Okmok eruption and its influence on cold climate, Failure of Nile flood and crop failures.

### **Conclusion:**

The Alaska's Okmok volcano considered the largest volcanic eruption occurred in 43 B.C. The NGRIP2 records two separate eruptions, the first one starting in early 45 B.C, but it was short lived and no climate effects on Egypt. The second eruption which occurred in 43 B.C had a great influence in Egypt.

Queen Cleopatra VII was the ruler of Egypt during that time and the Okmok II volcano eruption fill her in troubles, because the eruption resulted a 0.7 to 7.4 degree seasonal cooling in Egypt. The climate change caused a widespread epidemic diseases, civil unrest, famine, draught, food shortage and Nile failure.

The Nile failure push the local authorities to fore the farmers of Alexandria to temporary migrate outside Alexandria to cleaning the canals of the Nile that have not cleaned of silt as a result of the low water level. Moreover the local authorities forced the farmers of Alexandria to forced labor without paying their wages.

Furthermore they forced the people to pay high taxes and this is caused *ἀναχώρησι*, all of that forced the people to migrate and fled instead of paying high taxes or working in forced labor outside their hometowns.

Finally; Queen Cleopatra reacted and issued a decree to stop demand anything from the people above the essential royal dues, moreover not act wrongfully with the people. Also the people from the city, who were forced to work in the countryside they aren't obliged to work outside their city, and not demand any new tax.

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<sup>35</sup>SB. 4. 7337. ; Translated by E.R.Bevan, Cited in [https://www.attalus.org/docs/other/inscr\\_5.html](https://www.attalus.org/docs/other/inscr_5.html)



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## احتمالية تأثير بركان أوكموك على الهجرة في مصر البطلمية

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### الملخص العربي:

من الصعب على الأشخاص ترك أوطانهم والانتقال إلى مكان آخر للعيش فيه، لكن لسبب ما أو لآخر هناك الكثير من العوامل التي دفعت هؤلاء الأشخاص للهجرة وترك أوطانهم، ومن أهمها العوامل البيئية مثل الزلازل والبراكين والتغير المناخي والجفاف الذي بدوره يؤثر على المحاصيل ويسبب تلفها. لقد انتشر في مصر في العصر البطلمي مصطلح "أناخورسيس"، وهو مشتق من فعل "أناخوريو" الذي استخدم في اللغة الكلاسيكية في العصرين البطلمي والروماني؛ ومعناه اللجوء إلى الجبال والاختباء في الغابات أو الانسحاب أو الهجرة أو الهروب.

إن أحد أكبر الانفجارات البركانية التي حدثت خلال الألفين وخمسائة عام الماضية قد حدثت في أوائل عام 43 ق.م، وحدث ذلك البركان في (أوكموك) في (الأسكا)، حيث تؤكد سجلات المناخ أن تغيرات مناخية كبيرة قد حدثت بين عامي 43 - 44 ق.م، وتشير السجلات أن هاتان السنتان كانتا من أبرد السنوات في آلاف السنوات الأخيرة في نصف الكرة الأرضية الشمالي، وذلك نتيجة التأثير الإشعاعي الناتج عن ثوران البركان، حيث انخفضت درجات الحرارة الموسمية في مصر بما يصل إلى 7 درجات مئوية تحت المعدل الطبيعي.

وتؤكد المصادر القديمة انخفاض منسوب فيضان النيل لعدة مرات خلال فترات بسيطة، ونستدل على ذلك بأن في عهد الملكة (كليوباترا السابعة) قد تفاقمت المشاكل في (مصر) بين عامي 43 - 44 ق.م، حيث حدث انخفاض في منسوب مياه النيل ونتج عنه قلة المحاصيل والذي بدوره تسبب في مجاعة في البلاد. وكذلك تفشت الأمراض والأوبئة، مما جعل الحكومة البطلمية تفرض على المواطنين المزيد من الضرائب والخدمات الإلزامية والعمل بنظام السخرة وإجبار الفلاحين السكندريين وفلاحين المدن على الهجرة من المدن إلى القرى للقيام بأعمال تنظيف الترع من الطمي وذلك دون مقابل مادي، بالإضافة لزيادة عدد الضرائب المطلوبة من المواطنين مما دفعهم إلى الهجرة والهروب وترك أوطانهم واللجوء إلى المعابد التي بها حق اللجوء، حيث كانت تلك المعابد تعج باللاجئين، بينما كانت البلاد في أمس الحاجة للأيدي العاملة.

الكلمات المفتاحية: بركان أوكموك . ἀναχώρησις . أناخورسيس. الهجرة.