

WEATHER ANOMALIES IN TRANSYLVANIA, THE BANAT AND PARTIUM FROM 1813 TO 1818, AS REFLECTED IN CONTEMPORARY SOURCES

VREMENSKE ANOMALIJE U TRANSILVANIJI, BANATU I PARTIUMU OD 1813. DO 1818. GODINE, KAKO SE ODRAŽAVAJU U SUVREMENIM IZVORIMA

Dorin-Ioan RUS

Gesellschaft zur Erforschung des 18. Jahrhunderts im südöstlichen Europa, c/o Institut für Geschichte, Universität Graz, Heinrichstraße 26, 8010 Graz, Austria
dorin-ioan.rus@gmx.at

Received/Primljeno: 12.12.2020.

Accepted/Prihvaćeno: 30.12.2020.

Original scientific paper/Izvorni znanstveni rad

UDK / UDC: 551.583.16(493.21)“181”(093.3)

551.583.2(493.21)“181”(093.3)

Summary

The article is based on documentary sources from the Romanian, Hungarian and German ethnic groups from Transylvania, Partium and the Banat. These include newspapers, chronicles, and notes in liturgical books. The article offers an overview of weather variability in 1812–1818, like changes in temperature, precipitation, and storms, which led to higher food prices, and to a food and livestock feed crisis.

The period under examination begins in the summer of 1812, when very low winter temperatures and a cool summer were recorded in these provinces. It includes the summer of 1815, when Europe witnessed the first effects of Tambora's eruption. It ends in 1818 when the administrative measures introduced to combat the food crisis and famine were not needed any more.

The natural events depicted and recorded in the above-mentioned sources were part of the worldwide weather extremes, which are presented here in their regional-European context.

Keywords: Tambora's eruption, historical climatology, Transylvania, chronicles, Orthodox liturgical books, rural population

Ključne riječi: Erupcija vulkana Tambora, historijska klimatologija, Transilvanija (Sedmogradska), kronike, pravoslavne liturgijske knjige, ruralno stanovništvo

INTRODUCTION

This study focuses on the weather anomalies from 1813 to 1818 in the Habsburg provinces of Transylvania, the Banat and Partium, as reflected in contemporary documents. This environmental history topic has not yet been approached with regard to these geographical areas either in the European historiography or in that of Romania. The central theme of the paper is how contemporary sources reflect weather variability.

The **period** under examination begins in the summer of 1813, when sudden weather changes were recorded in these provinces. It includes the summer of 1815, when these parts of Europe were witnessing extensive weather anomalies, and ends in 1818 when the administrative measures introduced to combat the food crisis were not needed any more.

Tambora's eruption on 10 April 1815 triggered a sudden and serious change in the weather. The ensuing drop in temperature caused a massive decrease in agricultural production which, in turn, led

to a food crisis in the following years. Thus far, the consequences of this natural disaster in this part of Europe have not been thoroughly researched. Many chronicles, travel books, and official documents in Central and Western Europe mention low temperatures, price hikes, poverty, and food crises. The year 1815 was characterized by massive rainfall that caused many floods in several parts of Europe, and the winter of 1815/16 was abnormally harsh. 1816 is known as ‘the year without a summer’ in Europe and America, while 1817 became known as ‘the year of famine’ in many areas. In the following years, the terrible effects of famine and improper hygiene – such as epidemics, mass migration, and social tensions – were acutely felt all over the world. Luterbacher & Pfister¹, Brönnimann & Krämer², and Pfister & White³ demonstrated that the impacts of the Tambora eruption were not uniform.

Mount Tambora’s eruption had a profound impact on many societies, which were suddenly faced with severe weather anomalies, like extreme drought, blizzards and prolonged rain- and snowfall, which posed serious challenges in securing adequate food supplies. In April 2015, the University of Bern marked the 200th anniversary of Tambora’s eruption with the conference, ‘Volcanoes, Climate, and Society’. Participants discussed the manifold impacts of this eruption, but no mention of the aforementioned provinces was made. Other important contributions to the literature about the eruption of Tambora and its impacts on weather include those of Oppenheimer⁴, Klingaman⁵, D’Arcy Wood⁶, Behringer⁷, and Krämer⁸, Herkle / Holtz & Kollmer-von Oheimb-Loup⁹, Trommelt & Hitz¹⁰, and Luterbacher & Pfister¹¹, Brönnimann & Krämer¹² and Pfister & White¹³.

There are a number of works devoted to the history of natural hazards which are relevant to this study. As regards the aforementioned provinces in the period under examination, one must first consider the findings of contemporary historiography. Works of interest in the current literature distinguish themselves by their focus on understanding and correlating environmental variations at a local, regional, and global level, by the sound analysis applied to the interaction between man and the environment, and by

¹ Jürg Luterbacher & Christian Pfister: “The year without a summer”. *Nature Geoscience* 8, April 2015, 246–48. The authors show, based on interdisciplinary research, that the consequences of this eruption were not uniform in Europe. The main areas analysed were in Western Europe, where the impacts on agriculture and demography were large. Smaller effects were confirmed in the Baltic region and Scandinavia.

² Stefan Brönnimann & Daniel Krämer, *Tambora and the “Year Without a Summer” of 1816. A Perspective on Earth and Human Systems Science*, Bern, 2016.

³ Christian Pfister & Sam White: “A year without a summer, 1816”. In: *The Palgrave Handbook of Climate History*. London, Palgrave Macmillan, 2018, 551-561.

⁴ Clive Oppenheimer, *Eruptions that Shook the World* (Cambridge: University Press, 2011). The volcanologist Clive Oppenheimer’s book deals with the relationship between the cause and effect of volcanic eruptions. He also argues that even events which occurred at the beginnings of human existence on Earth can prove helpful to future disaster risk management.

⁵ Nicholas Klingaman and William Klingaman, *The Year Without Summer: 1816 and the Volcano That Darkened the World and Changed History* (New York: 2013). William K. and Nicholas P. Klingaman’s book examines – by using rich source material – not only the climate change caused by Mount Tambora’s eruption in 1815, but also its political, economic, social and cultural impact.

⁶ Gillen D’Arcy Wood, *Tambora: The eruption that changed the world* (Oxford: Princeton University Press, 2014). Gillen D’Arcy Wood’s book deals with man’s strong dependence on the climate. The author investigates some of the major consequences of Tambora’s eruption around the world, such as the first worldwide cholera pandemic, the expansion of the opium market in China, and the first economic depression that affected the United States of America.

⁷ Wolfgang Behringer’s book, *Tambora und das Jahr ohne Sommer: Wie ein Vulkan die Welt in die Krise stürzte* (München: Beck, 2015), was published on the 200th anniversary of this catastrophic event, and is addressed to the general public. It is based on many regional studies as well as specialized works from the field of natural sciences. The book attempts to find out how past societies reacted to environmental challenges, and provides specialists with an excellent monograph on this topic. It also includes many connections between this event and subsequent historical-political developments.

⁸ Daniel Krämer, *Menschen grasten nun mit dem Vieh: Die grosse letzte Hungerkrise der Schweiz 1816/17*, Basel Schwabe Verlag, 2015.

⁹ Senta Herkle / Sabine Holtz / Gert Kollmer-von Oheimb-Loup (Ed): *1816 - Das Jahr ohne Sommer. Krisenwahrnehmung und Krisenbewältigung im deutschen Südwesten* (Veröffentlichungen der Kommission für geschichtliche Landeskunde in Baden-Württemberg, Reihe B: Forschungen), Stuttgart, 2019.

¹⁰ Fabian Trommelt and Florian Hitz: *Das Jahr ohne Sommer: Die Hungerkrise 1816/17 im mittleren Alpenraum*, Innsbruck, Wagner Verlag, 2017.

¹¹ Jürg Luterbacher, Christian Pfister “The year without a summer”. *Nature Geoscience* 8, April 2015, 246–48.

¹² Stefan Brönnimann & Daniel Krämer, *Tambora and the “Year Without a Summer” of 1816. A Perspective on Earth and Human Systems Science*, Bern, 2016.

¹³ Christian Pfister & Sam White: “A year without a summer, 1816”. In: *The Palgrave Handbook of Climate History*. London, Palgrave Macmillan, 2018, 551-561.

the development of a historical perspective, as well as by their efforts to raise awareness of the social and political causes of environmental changes.

This study pursues current trends and issues in European historiography – more precisely in environmental history. The interdependence between society, (resource) economy, the environment, religion, disaster management, and culture has recently been approached within European interdisciplinary research by Rohr¹⁴, Schenk¹⁵, Krämer¹⁶ Juneja/Mauelshagen¹⁷.

Regarding the history of natural disasters in Romania, the only existing work is Cernovodeanu and Binder's *Cavalerii Apocalipsului* [Knights of the Apocalypse], published in 1990. At the time of its publication, this book was considered a trailblazing work. It is based on newspaper articles as well as on medieval and modern chronicles from Transylvania and the Romanian Principalities, which is why my paper is based on archival records and further newspapers that had previously not been analysed from a historical climatology perspective.

The first Romanian historian who presented the issue of weather variability and its consequences on food was George Barițiu; in his work on the history of Transylvania he briefly presented the situation of the Wallachian military border guards in the period 1816–1817, their mode of feeding, and their emigration tendencies. He pointed out that the lack of roads, or the poor administration of the existing ones, prevented the distribution of cereals offered by the government to the military border families¹⁸.

A number of articles have examined the emigration from these provinces to Wallachia¹⁹ or Bukovina²⁰ – provinces that were apparently less affected by these crises – or the technical modernization in agriculture²¹. However, they were published before 1989, in times of Marxist historiography, and these works did not analyse the historical climatology context, but rather the social context.

There are works from outside Romania that can compensate for the theoretical shortcomings of Romanian historiography. Relevant studies on floods and weather in Transylvania's neighbouring regions were published by Andrea Kiss²² and Lajos Rác²³.

Geographically, Transylvania proper covers the central part of Romania – namely the Transylvanian Plateau and the inner slopes of the surrounding Eastern, Western and Southern Carpathians – with a total area of about 57,000 km². Politically, the early modern Principality of Transylvania and later the Grand Principality of Transylvania also included the so-called *Partium* (Crișana), namely the northern and western territories which were detached from the Kingdom of Hungary in the sixteenth century. In

¹⁴ Christian Rohr, *Extreme Naturereignisse im Ostalpenraum. Naturerfahrung im Spätmittelalter und am Beginn der Neuzeit*, Köln, Weimar, Wien, 2007.

¹⁵ Gerrit Jasper Schenk and Jens-Ivo Engels (eds.): "Historische Katastrophenforschung. Begriffe, Konzepte und Fallbeispiele". *Historical disaster research. Concepts, methods and case studies. Historical Social Research* 32, 3, Special Issue, Köln, 2007.

¹⁶ Daniel Krämer, *Menschen grasten nun mit dem Vieh: Die grosse letzte Hungerkrise der Schweiz 1816/17*, Basel Schwabe Verlag, 2015.

¹⁷ Monica Juneja and Franz Mauelshagen, "Disasters and Pre-Industrial Societies: Historiographic Trends and Comparative Perspectives". *The Medieval History Journal*, 10, No. 1&2 (2007) 1–31.

¹⁸ George Barițiu, *Părți alese din istoria Transilvaniei* (Brașov: Inspectoratul pentru cultură, 1993), I., 525.

¹⁹ Liviu Moldovan and Viorel Grama, "Situația oierilor români transilvăneni în Țara Românească pe timpul domniei lui Ioan Caragea (1812–1818)". *Marisia*, No. IX (1979), 237–45.

²⁰ Ecaterina Negruți, "Informații noi privind imigrările din Bucovina în prima jumătate a secolului al XIX-lea", *Anuarul muzeului județean Suceava*, No. VIII (1981), 257–63.

²¹ Barbu Ștefănescu, "Începuturile introducerii tehnicii moderne în agricultura Bihorului". *Biharea*, Nr. 1 (1981): 7–38; Liviu Botezan, "Tendințe ale gospodăriilor nobiliare din Transilvania de a introduce plante tehnice și de a ameliora soiurile de pomi fructiferi și de viță de vie în perioada 1785–1820". In *Ștefan Meteș la 85 de ani*, ed. Constantin Daicoviciu (Cluj-Napoca: s.n.1977), 311–14.

²² Kiss, Andrea: *Floods and Long-Term Water-Level Changes in Medieval Hungary*, doctoral dissertation, Budapest, 2011; Kiss – Csernus-Molnár: "Időjárás viszonyokhoz kapcsolható szélsőségek területi vonatkozásai a Temesi Bányában: 1780–1800" [Areal consequences of weather-related extremes in the Temesi Bány/Banat area: 1780–1800], 2008, 101–106; Csernus-Molnár – Kiss – Pócsik: "18th-century daily measurements and weather observations in the SE-Carpathian Basin: A preliminary analysis of the Timișoara series (1780–1803)". *Journal of Environmental Geography* 7/1-2, 2014, 1–9; "An experimental 392-year documentary-based multi-proxy (vine and grain) reconstruction of May–July temperatures for Közseg, West-Hungary". *International Journal of Biometeorology* 55 (2011): 595–611; "Before and after Tambora: Extreme floods in the mid-1810s in Hungary". *Geophysical Research Abstracts*, Vol. 17, EGU2015-13869, 2015 EGU General Assembly 2015.

²³ Rác Lajos: *Climate History of Hungary Since 16th Century: Past Present and Future*. Pécs: Centre for Regional Studies of the Hungarian Academy of Sciences, 1999.

this study, I will use the name ‘Partium’ for the area covered by the counties of Maramures, Satu Mare, Sălaj, Bihor, and Arad in present-day Romania (see map).

From a hydrographic perspective, apart from major rivers such as the Danube (Dunărea/Duna/Donau), the Mureş (Maros/Mieresch), the Olt (Olt/Alt), and the Someş (Szamos/Samosch), the provinces of the Banat and Transylvania were crossed by many other rivers, which were economically relevant. However, these rivers also caused extensive material damage on an almost yearly basis. The most important rivers in the Banat are the Timiş (Temes/Temesch/Тамиш), the Vega, and the Cerna (Cserna), and in Partium, from north to south, the Tisa (Tisza/Theiß), the Criş (Körös/Kreisch), and the Mureş. Within the territory of the Hapsburg Empire, for instance, in the period between 1770 and 1790 several rivers were regulated and cleaned each year for better flood prevention. However, these provinces witnessed floods in 1771–72, 1774, 1778, 1813, 1814, 1815, and 1816²⁴.

Transylvania, the Banat and Partium belong to a transitional climate zone. The region contains elements of the oceanic temperate climate (with abundant rainfall, milder winters and moderate and rainy summers), those of the continental temperate climate (frosty winters, hot summers, and little precipitation), and also a large number of topoclimates or microclimates, in depressions, or mountains, for instance. All of this variation amounts to a region containing multiple areas in terms of average and extreme temperatures, as well as rainfall²⁵.

In the first half of the nineteenth century the northern and eastern parts of Transylvania, i.e. the coldest parts of the province, belonged to the coldest parts of the Hapsburg Empire. Therefore, the land was less suitable for agriculture. Summers were very hot indeed, winters unbearably cold²⁶, and sudden weather changes, as well as hot days and cold nights, were not a rarity. But despite this, wheat was grown between the spruce and fir trees even in the harshest regions of Ciuc and Gheorgheni (Gyergyószentmiklós / Niklasmarkt). The other parts of Transylvania, the Banat and Partium, belonged to temperate climate zones. However, temperature changes were very frequent in the Banat – an area that was more exposed to the winds than the other provinces – so in this area the winters were even longer during the studied period, with unseasonably low temperatures beginning in the autumn and lasting until the spring²⁷.

After the Sremski Karlovci/Karlowitz (1699) and Požarevac/Passarowitz (1718) Peace Treaties, Transylvania, including Partium and the Banat, respectively, came under Austrian rule. This also breathed new life into the economic, social and political life of these provinces.

The areas under examination were located at the periphery of the Hapsburg Empire, where major communication routes towards the south-east intersected. In these provinces – which were rich in raw materials, energy and human resources – various traditions, economic systems²⁸, mentalities and cultural models met and coexisted, which explains the particularities of their societies and customs.

²⁴ Eduard Albert Bielz, “Beitrag zur Geschichte merkwürdiger Naturbegebenheiten in Siebenbürgen”. *Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenschaften*, No. 4 (1862), 73.

²⁵ Lucian Badea (Ed): *Geografia României. III. Carpații românești și depresiunea Transilvaniei*, București, 1987, 28.

²⁶ This statement, according to which the weather was “unbearably cold” in winter, seems to come from a local reporter, such as Demian, whom Hietzinger (see the next footnote) cited. The lowest temperatures in winter are not in the area of the 1st Szekler Regiment, but in the southeast of Transylvania, on the former territories of the 2nd Szekler Regiment (see Figure 1), namely in the village of Întorsătura Buzăului, where, for example, a temperature of -34.5° C was registered in 1998. <https://realitateadebrasov.net/cea-mai-scazuta-temperatura-din-istoria-romaniei-in-judetul-brasov/>The systematic meteorological measurements began in Transylvania after 1860 (Gheorghe Băzâc, *Din istoria meteorologiei*, (București, Ed.Științifică și Enciclopedică, 1985), 67).

²⁷ Hietzinger, *Statistik*, I, 117, quoted “Vaterländische Blätter”, 1812, 42, 72, and Demian, *Statistische Beschreibung der Militärgränze*, (Wien, 1806–1807), II, 301, 302.

²⁸ Besides agriculture and animal husbandry, which were practiced in all three provinces, Transylvania and the Banat had some industrial branches, such as textile industry and woodworking. The last two provinces were considered to be resource supply bases for the Hapsburg economic industry, which made mining a very important industry.

Sources. The Romanian sources consist of hand-written notes made in Orthodox liturgical books²⁹, such as Horologions³⁰, Pentecostarions³¹, Triodions³², Anastasimatarions³³, Euchologions³⁴, books of Akathists³⁵, Antologhions³⁶, Chiriadromions³⁷, Menaions³⁸, Octoechos³⁹, and miscellaneous others⁴⁰. Historian Florian Dudaş published a series of inscriptions by Romanian priests in liturgical books which refer to the weather events, the epidemics, and the famine generated by them, without interpreting them or putting them in context.⁴¹ The dating of the Romanian information is according to the Julian calendar of the old Orthodox rite which was then in use, but these sources must be correlated with the official data or data from other types of sources, in order to have a clear image of their dating.

There are both advantages and disadvantages to using this type of source. First of all, they are first-hand sources, and they sometimes provide more information than the official reports. They mainly include information from the local village or surrounding villages, but they do not accurately refer to more distant areas; words like “land” are used in a very general way in this case, and mostly concern small regions. A second drawback is the dates to which they refer. Apart from the calendar, following the old style in these sources, we are dealing here with inaccurate data. Normally the priests did not describe these natural events on the same day, but days or weeks later; in these cases, it is understandable that there may be gaps in an author’s memory, resulting in inaccurate reports regarding the amount of damage, for example. It is also possible that some of these reports are exaggerated. Some priests at the time described some extraordinary natural events from the distant areas only from secondhand reports from other people, such as merchants, travellers, etc., so this kind of media is not entirely reliable. Another disadvantage of notes in the liturgical books is the language used: the parish priests used regionalisms, in addition to many general, incomprehensible expressions that are hard to understand today. Another problem is that the terminology of the sources was not comparably accurate; e.g., very many adjectives and adverbs appear in different forms (rainy, very rainy, extremely rainy), which do not necessarily reflect a regional difference, but rather the observer’s perception.

There are no known diaries and memoirs from the study area in this period.

For the Saxon historiography of Transylvania, various editions of documents referring to the history of natural disasters and epidemics of Transylvania are important in this regard. These include those

²⁹ The English titles of these religious books come from the Greek, which is why I have indicated these in parentheses along with their original titles. Because the liturgical language of the territories was, at that time, Slavic, I have also indicated their titles in this language. To explain the titles of these books, I used the English version of Wikipedia.

³⁰ Ceaslov [English: Horologion; Greek: Ὡρολόγιον; Slavonic: Часословъ] or the Book of Hours provides the fixed portions of the liturgy or the daily cycle of services. Into this fixed service framework, numerous parts are inserted, which change daily.

³¹ Pentecostar [English: Pentecostarion] (also known as the *Flowery Triodion* or *Festal Triodion*) is the service book of the Orthodox Church that provides the texts for the moveable portions of the divine services from Pascha through the fast of All Saints (the Sunday following Pentecost).

³² Triod [English: Triodion; Greek: Τριῳδιον; Slavonic: Постная] comes from the Greek “triadion”, consisting of the words “trio” (three) and “odi” (ode), and means singing, or hymn, in three verses. It is also called the Lenten Triodion, and is the liturgical book used by the Eastern Orthodox Church. It contains the proper for the fasting period preceding Easter and for the weeks leading up to the fast.

³³ Catavasier [English: Anastasimatarion] is a service book of the Orthodox Church that contains the Anastasima (Resurrectional) hymns of vespers, Sunday matins, and certain other hymns, which are divided according to the eight tones of the eight-week cycle. It is a book for chanting that encompasses all the chants of the vespers and matins of Saturday and Sunday addressing the resurrection of Christ.

³⁴ Molitfelnic, or Molitvelnic, or *Euhologiu* [English: Euchologion; Greek: εὐχολόγιον; Slavonic: Молитвословъ] is one of the chief liturgical books of the Eastern Orthodox churches, containing the portions of the services which are said by the bishop, priest, or deacon. There are several different volumes of the book in use.

³⁵ Acatistier [English: Book of Akathists]. An Akathist hymn (Greek: Ἀκάθιστος Ὕμνος, “unseated hymn”), is a type of hymn usually recited by Orthodox Christians, dedicated to a saint, holy event, or one of the persons of the Holy Trinity.

³⁶ Antologhion [English: Antologion; Greek: ἀνθολόγιον]. A religious book of the Orthodox Church, containing the services of the feasts and saints of the year.

³⁷ Chiriadromion [Greek: χηριαδορομιον] A book of the Orthodox Church containing the Sunday Gospels.

³⁸ Minei [English: Menaion; Greek: Μηναῖον; Slavonic: Минея]. A liturgical book containing the proper for fixed dates of the calendar year, and prayers, hymns and readings for each month).

³⁹ Octoih [English: Octoechos; Greek: Ὀκτώηχος; Slavonic: Осмигласникъ] is a liturgical book containing hymns for each day of the week.

⁴⁰ Miscelaneu [English: miscellaneous, from Latin: miscellanea, French: miscellanées], a publication with varied content, written by several authors.

⁴¹ Florian Dudaş, *Catastrofe naturale în Transilvania în lumina însemnărilor scrise pe cărți românești vechi, între anii 1500 și 1900* (Oradea: Lumina, 1999).

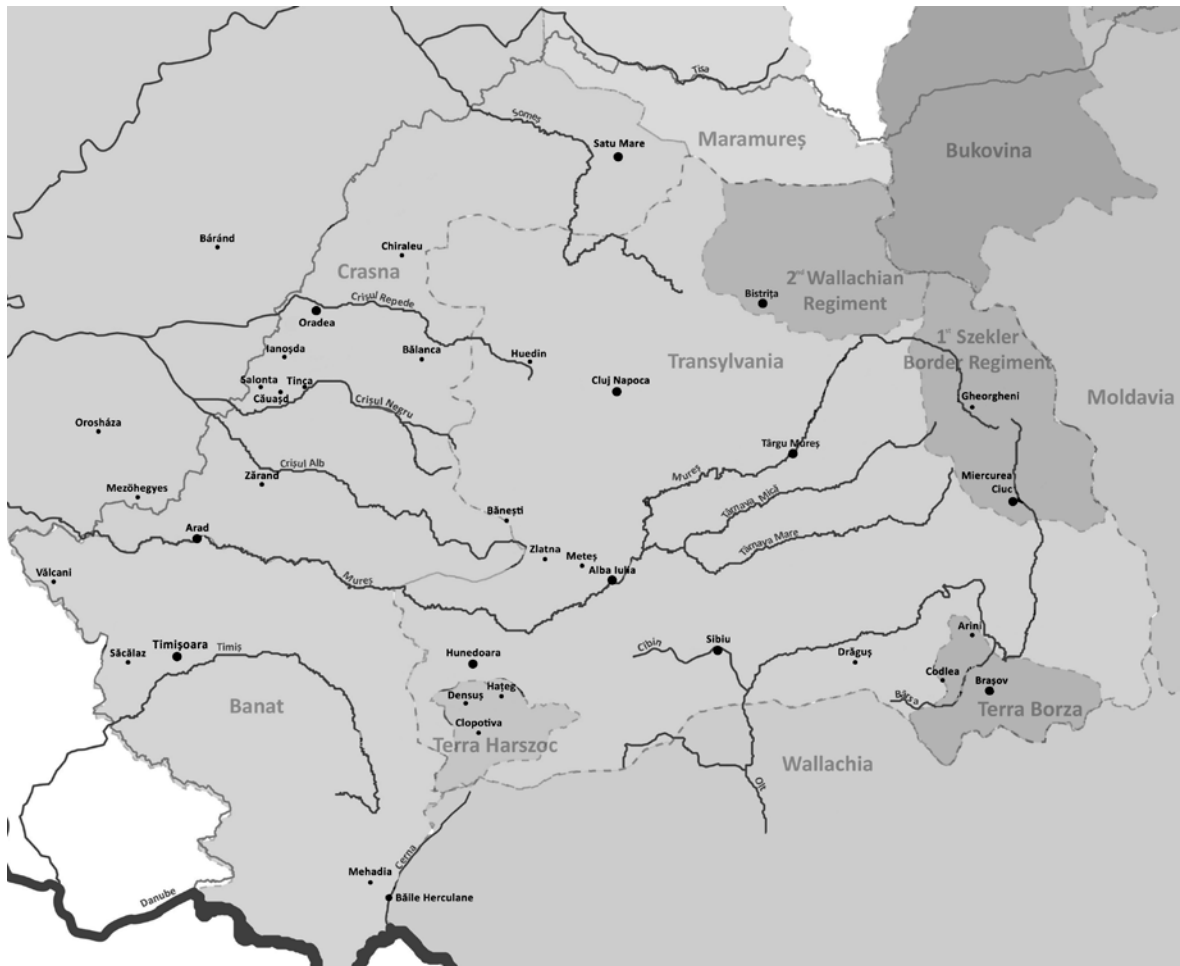


Figure 1: Map of all locations mentioned in the paper.

published by Hain in 1854⁴² and Bielz in 1862⁴³, and the chronicles from Burzenland (Terra Borza in Figure 1), edited by Julius Gross⁴⁴, which include urban or family chronicles from different localities. These contain contemporary reports on these weather variability, but they have never been placed in this context.

A chronicle of weather-related natural hazards and epidemics in these territories was published by Anton Cservény⁴⁵ in 1934; it contains a listing of Hungarian sources on major climatic events up to 1872.

Another important source for this study is contemporary newspapers. Their advantage is that they were edited by intellectuals, with some of the reports coming from scientists or professors who made direct observations. Some pieces of information provided by eyewitness reporters was verified by newspaper editors and journalists. The disadvantage of newspapers is that probably some reports are exaggerated. I have chosen three Baltic publications (*Dörptsche Zeitung*, *Rigaische Zeitung*, and *Zuschauer*). They appeared once or twice a week, so that the information provided was published very shortly after

⁴² Dietmar Hain, "Beiträge zur Witterungskunde Siebenbürgens", in *Programm des evangelischen Gymnasiums in Schässburg und der damit verbundenen Lehranstalten zum Schluss des Schuljahres 1853/4*, ed. Gymnasialdirektion Kronstadt, (Kronstadt: 1854) 1–35.

⁴³ Eduard Albert Bielz, "Beitrag zur Geschichte merkwürdiger Naturbegebenheiten in Siebenbürgen". *Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenschaften*, No. 4 (1862), 1–74.

⁴⁴ Julius Gross (ed.): *Quellen zur Geschichte der Stadt Brassó*, Vol. IV/1 (Brassó, 1904); IV/2 (Brassó, 1909).

⁴⁵ Anton Cservény, *Cronica calamităților și epidemiilor din Ardeal, Banat și teritoriile mărginașe de la 1007–1872 (Din izvoare ungurești)*, (Cluj: Gloria, 1934).

the natural events. They simply copied the articles published in the Western or Russian media. They covered the entire European and Russian territories, i.e. the neighbouring areas of the region under analysis.

HISTORY OF WEATHER ANOMALIES IN THE STUDY AREA

During the period 1750–1820, which formed a part of the Little Ice Age, a total of 17 severe winters occurred, the most important being in 1784/85 (probably as an effect of climate change caused by the eruptions of the Icelandic volcano Laki), 1795, 1808, and then those of 1813–1817, which were extremely long, with early snow and late snowmelt.

From 1812 onwards, the cold and snow often lasted until the summer⁴⁶. A note from Căușad [Kávásd] (Bihar County) says that on June 24, 1812, hailstones as big as walnuts fell in many places in the area (Partium), destroying “the fruits of the earth”⁴⁷.

In 1813, in Hațeg Country, the snow melted in April, and in Zarand it snowed on May 1. In the south of Transylvania, in the Sibiu area [Nagyszeben / Hermannstadt] there were severe floods, with the Cibin river flowing to the houses and gardens⁴⁸. In relatively nearby territories in Europe, major flooding occurred in Hungary, Austria, Poland, and Silesia. Poland was facing a drastic food shortage⁴⁹.

A note on the *Viețile Sfinților* (Lives of the Saints) informs us that in 1813 in Drăguș [Dragus/ Drachendorf] it snowed on Easter Sunday and the snow stayed until St. Peter’s Day (June 29)⁵⁰. The spring of 1813 was dry in the western plain (Partium), followed by heavy rains. Vasile Popovici from Bănești [Zarándbánya] (near Arad) noted that in 1813 in the spring there was a “great drought”⁵¹. In Densuș [Demsus/Demsdorf] (Hunedoara county) the summer of 1813 was very rainy, according to the local priest. The Romanian expression “foarte ploioasă” (Engl. “very rainy”) here does not mean the intensity but the frequency and duration of the rain. Due to the grain harvest failure, many people were forced to flee to the Banat⁵².

Between June 21 and October 12, the weather was so changeable in the south of Transylvania that the farmers were unable to sow stubble crops for periods of 3–4 days in a row⁵³. Summer rains, however, were a sign of fruitfulness for the rural population⁵⁴. The fact that many impoverished farmers from Transylvania fled to the Banat is proof that the effects of the weather were different in these provinces. From this we can deduce, the impact on agriculture was not as strong in the Banat as in Transylvania.

Due to the rains of the autumn of 1813, the soil was so soaked that it could no longer be sown in the spring of 1814⁵⁵. The same happened the following year. In Austria, the river Mur flooded on September 10, 1814⁵⁶.

After this rainy period, a warm winter followed: it was noted that in December 1813 in the south of Transylvania (Sibiu Region) the violets in the cemetery flourished⁵⁷.

The later part of the winter of 1813/14 was very harsh, especially in the south of Transylvania. In 1814 there was severe frost and abundant snow between May 11 and 19, which was reported in the Bârsa Country [Barcaság / Burzenland; Terra Borza on the map] as “big snow” (“neauă mare”). In the Alba Country, between April 18 and 20, 1814, the snow was knee-deep, and a particularly harsh freeze

⁴⁶ Ciorba: *Marea Foamete*, 104.

⁴⁷ Florian Dudaș, *Memoria vechilor cărți românești. Însemnări de demult*, Oradea, Editura Episcopiei Române a Oradei, Oradea, 1990, 288.

⁴⁸ Bielz, “Beitrag”, 68.

⁴⁹ Josef Nussbaumer: *Gewalt der Natur. Eine Chronik der Naturkatastrophen von 1500 bis heute*, (Basel, 1996: Sandkorn), 131.

⁵⁰ Doina Braicu, Victor Bunea, *Cartea veche românească din secolele XVI-XVII în colecțiile arhiepiscopiei Sibiului*, Sibiu, Centrul mitropolitan, 1980, 40, 90.

⁵¹ Titus Roșu, *Însemnări și inscripții bihorene* (Beiuș: 1941: Universitatea Stahl), 143.

⁵² Dudaș, *Memoria*, 288.

⁵³ Bielz, “Beitrag”, 68.

⁵⁴ Traian Gherman, *Meteorologia populară. Observări, credințe, obiceiuri* (București: Paideia, 2002): 67.

⁵⁵ Ciorba: *Marea Foamete*, 109–11.

⁵⁶ Nussbaumer: *Gewalt der Natur*, 131.

⁵⁷ Bielz, “Beitrag”, 68.

caused defoliation of deciduous trees, of fruit trees, and vines. In a *Pravilă* from an unknown locality in Transylvania, a note records that it snowed abundantly on April 17, with plum trees breaking under the weight of the snow, and that snow that fell on Saturday, April 20, 1814, remained until Wednesday, April 24. Similarly, in the Hunedoara region and in the Mureş Valley it snowed between April 27 and 30, 1814, and the month of May was frigid, with the fog destroying the fruit of trees and vine shoots.⁵⁸ We also find out about the snows of April 1814 from a note written in a *Bible* in the village of Meteş [Metesd/Metesdchorf] (Alba County). According to the priest, Gheorghe, the snow that fell uninterrupted on April 18, 19, and 20 was “up to the knees”, and on April 21 and 22 it was freezing, so the snow broke the trees with its weight. Moreover, on April 29 and 30, 1814, it snowed again, this time with a strong storm, “which uprooted the trees”. Consequently, in the autumn of the same year, food prices rose⁵⁹. In south-eastern Transylvania, in the Bârsa Country, the snow that fell during the night and day of April 18, 1814, remained for six days and destroyed the buds of plants and vines⁶⁰; a new snow followed on April 25, followed by a blizzard, which lasted for five days⁶¹. A priest from Densuş says that in 1814 it snowed from April 27 to 29, but the snow that fell overnight melted during the day, the damage to the fruit being insignificant. May was very changeable in Densuş. He also mentions, as anomalies, a frost on August 14, 1814, as well as an early snowfall on September 28, 1814, which did not melt, despite the heat⁶².

In Arini [Lüget] (Braşov County), the church singer Jacob Popovici recorded a “big snow” between May 11 and 19, 1814⁶³, with similar conditions reported in Sibiu on May 10⁶⁴ and Satu Mare [Szatmár/Sathmar] on May 14⁶⁵. In the village of Clopotiva [Klopotiva] (in the Banat) it snowed on June 2. All this made the wheat harvest very poor. On August 14, 1814, corn was destroyed by fog in many places. In the years that followed, climate anomalies continued⁶⁶.

A note from the Banat says that “in 1814 there was a drought all over the country (the Banat) and the wheat did not grow”⁶⁷.

1814 was a fruitful year in Wallachia, but there was still a shortage of food until the new harvest; in Oltenia (an area south of the Carpathians, now in Romania) there were floods⁶⁸. There were also some notable natural events in nearby Europe at this time: on August 29, 1814, the River Mur flooded in Styria⁶⁹.

For the villages in the Banat plain, just as for the mountains, the situation was catastrophic between 1814 and 1817. The floods of this period affected all areas of the Banat; in October 1815, great floods affected the south of the country, “which drowned many houses, people, animals, hay and food”⁷⁰. A detailed description of the floods from the Băile Herculane [Herkulesfürdő / Herkulesbad] and Mehadia [Mehádia / Mehadia] was written by the chronicler Nicolae Stoica, who noted that the floods of the Cerna river destroyed agricultural crops⁷¹. The establishments of the health resort in Băile Herculane were filled with different species of fish brought by the waters of the Cerna, which became a food supply for many inhabitants of the area until Christmas⁷².

⁵⁸ Dudaş, *Memoria*, 290.

⁵⁹ Dudaş, *Memoria*, 289.

⁶⁰ Ion Muşlea, “Însemnările’ popii Nicolae Grid despre Şcheii de altădată şi biserica lor”. *Ţara Bârsei*, No. 4 (1931): 351–352.

⁶¹ Muşlea, “Însemnările”, 351–352.

⁶² Dudaş, *Memoria*, 289.

⁶³ Corfus, *Însemnări*, 131.

⁶⁴ Sigerus, *Die Chronik der Stadt Hermannstadt*, 44.

⁶⁵ Ciorba: *Marea Foamete*, 106.

⁶⁶ Neamţu, *Date noi*, 315–42.

⁶⁷ Valeriu Leu, *Banatul între arhaic şi modern. Mentalităţi în Veacul Luminilor*, Reşiţa, 1993, p.75.

⁶⁸ Ioana Constantinescu, “Climă, agricultură şi societate în Ţara Românească şi Moldova sub fanarioţi”, *Revista de istorie*, Tom 42, No. 3 [1989]: 269.

⁶⁹ Nussbaumer: *Gewalt der Natur*, 132.

⁷⁰ Bocşan, Duma, and Bona, *Franţa şi Banatul*, 96.

⁷¹ Nicolae Stoica de Haţeg, *Cronica Banatului* (Timişoara: Facla, 1981): 301.

⁷² Stoica de Haţeg, *Cronica Banatului*, 301.

The heavy rains that fell in Transylvania between 1815 and 1817, as well as the icy cold summers, delayed or interrupted the growth of cereals and consequently led to a decrease in agricultural production.

Ioan Ungur, a priest from near Huedin [Bánffyhunyard / Heynod] (Cluj County), wrote that a drastic food shortage began due to the rainy weather: “since 1815 a great hunger began, it rained during the day, the night did not stop, the soil was very full of water”⁷³. The author also says that due to the abundant water there were landslides and changes of terrain, crops were completely destroyed, and animals fell ill due to the poor quality of the feed, with most of them dying, including all of the sheep⁷⁴.

Similar anomalies were occurring in other parts of Europe. In Njeshin, in the Russian governed area of Tschernigow, a great storm was registered on June 12 and 13, 1815, which caused significant material damage in the surrounding villages, with 200 sheep being killed on this occasion in a single village⁷⁵.

A strong hail fell on the villages of Bârsa Country on June 23 and 24, 1815, causing the Orthodox bishop Vasile Moga to ask the archpriest of Braşov to organize a charter to help the victims⁷⁶. The same storm, which struck Mezö Keresztur in Partium a few days later, killed 28 pigs and destroyed grain and roads⁷⁷.

At the same time, there was a drought in Russia⁷⁸.

In mid-September, 1815, fog and snow fell around Zlatna (Apuseni Mountains), followed by a week of uninterrupted rains, snow and violent winds, which destroyed the crops. After the rain, there was a cooling of the weather, and snow that was “big like a hand”, which permanently compromised the crops⁷⁹.

Some signs were said to predict pleasant, fruitful weather. In the city of Feodosia on the Crimean Peninsula, in December 1815, spring days were registered, with the trees blooming and sprouting.⁸⁰ In the Crimean Peninsula, the year 1816 began with spring weather, after uninterrupted rains in December 1815. Flowering of the trees is recorded, and on January 6 it was very warm⁸¹.

1815 brought a droughty summer in Wallachia, and poor maize fruit and lack of hay in Moldova. Moreover, large quantities of grain were delivered from these entities to the Ottoman Sublime Porte. In Wallachia, 1815/16 brought a heavy winter which was prolonged until April, and caused poverty and hunger. The lack of fodder caused livestock and cattle numbers to fall; there were also increased tax burdens⁸².

In the year 1816 there was a sudden change in the weather throughout Europe. On January 8, 1816, a blowing snow was recorded in Vienna, accompanied by thunder and lightning⁸³. Another phenomenon was the sudden change in temperature that caused warming in some parts of Russia⁸⁴.

A storm on January 29/30, 1816 brought a large amount of snow to Hungary, which killed cattle and sheep sent to the grazing in pastures⁸⁵. On the same two days, a snowstorm in the Hungarian town

⁷³ Nicolae Edroiu: “Despre situația din Munții Apuseni în prima jumătate a secolului al XIX-lea. Protocolul parohiei din Mărgău (Huedin), AIIA, XXIV, 1981, 358.

⁷⁴ Edroiu: “Despre situația”, 358.

⁷⁵ “Neshin, den 14. Juni”. *Rigasche Zeitung*, 57 from 17 July 1815.

⁷⁶ Ciorba: *Marea Foamete*: 113–114.

⁷⁷ Ciorba: *Marea Foamete*: 114.

⁷⁸ In the south-western part of Russia, drought caused fires, with one such case in Kasan, where on September 3, 1815 a fire caused immense material damage throughout the city (“Kasan, den 5. September”. *Rigasche Zeitung*, 80, from 6 October 1815).

⁷⁹ Neamțu, *Date noi*: 318–319.

⁸⁰ “Feodosia, vom 15. Februar”. *Dörptsche Zeitung*, 24, Wednesday, 22 March 1816: 2.

⁸¹ “Simferopol, vom 20. Februar”. *Dörptsche Zeitung*, 28, Wednesday, 5 April 1816: 1.

⁸² Constantinescu, “Climă, agricultură și societate”: 269.

⁸³ “Vermischte Nachrichten”. *Dörptsche Zeitung*, 7, from Sunday, 23 January 1816: 4.

⁸⁴ On the morning of January 27, 1816, a storm descended on the Russian city of Kursk, lowering the temperature to -20 / -23° Ré (-25 -28.75° C); in the afternoon, it became +2° Ré (2.50° C) (“Kursk, vom 29. Januar”. *Dörptsche Zeitung*, 18, Wednesday from 1. March 1816, 2; “Vermischte Nachrichten”. *Zuschauer*, 1229 from 22 February 1816). In Kameniec-Podolsky (now Ukraine) a snowstorm that took place on January 17 and 18, 1816, after a few warm days, and caused the death of some people and horses, which were found frozen on the streets (“Kameniec-Podolsk, vom 26. Januar”. *Dörptsche Zeitung*, 18, Wednesday, 1. March 1816: 2)

⁸⁵ “Vermischte Nachrichten”. *Dörptsche Zeitung*, 19, Sunday, 5. March 1816, 6.

of Orosháza harmed the cattle. Many peasants partially or completely lost their flocks of sheep: one shepherd was left with 24 sheep out of 540, another one with 12 out of 600, and another lost all 400. A tenant lost 400 oxen out of 900. In the same locality three shepherds froze to death in the fields. In Arad County, 25 shepherds and 50 horses perished during the storm⁸⁶. The Viennese authorities estimated the number of frozen livestock (especially sheep) to be in the thousands, and the number of people in the hundreds in Transylvania⁸⁷.

The year 1816 began with a sudden change in weather in Partium: on January 10 “*the rainbow appeared and it was warm weather, so that people walked barefoot*”⁸⁸. The presence of the rainbow was considered a good sign by Romanian peasants⁸⁹. However, the appearance of a rainbow in Bihor (in western Transylvania) on January 22, 1816, contradicted this superstition, because, after six days, on the night of January 28/29 (Gregorian calendar), “*there were great storms, so that cows, sheep, and pigs which were outside were all killed by the wind and snow and people still died of cold*”⁹⁰.

At the same time, a storm broke out over the Banat, where a snowstorm that lasted two days and two nights caused the death of many cattle and sheep. Many sheep were found frozen in the snow, and some were taken by the strong winds to the running waters, where they died. Due to the floods, many peasant buildings and constructions collapsed, and their tenants were forced to shelter in unstable houses, which in turn collapsed on them. Because of the harsh weather, the cold, and other natural phenomena, the people and cattle that were living outside in provisional shelters perished. The floods caused the separation of many communities, creating a few islets where people and livestock were isolated⁹¹. In the village of Vălcani [Valkany / Walkan] in Timiș county, for instance, the storm began on January 28, 1816, at 3 o'clock at night, and did not abate until January 18 at around 1 o'clock in the afternoon: “*Many sheep have died*”⁹². In the village of Săcălaz [Szakálház / Sackelhausen] in the Banat, the storm began on Sunday evening, from midnight, “*with cold, and snow, and held all night until Monday morning at 9 o'clock. The rain, snow, wind and frost continued until Tuesday morning, so you could not leave the house and go outside. After this, many dead cattle could be found, sitting upright in the ice, and many shepherds killed by the cold*”⁹³.

A snowstorm that arrived from the north-west in the Banat on January 28/29, 1816 was of such intensity “*as neither the elders remember*”⁹⁴. The damages brought by it amounted to 45 dead, numerous frozen cattle, and 38,238 frozen sheep, which amounted to a total of 464,670 Florins⁹⁵. In Banat, the snowstorm lasted for two days and two nights, killing cattle in stables, and shepherds caught in the field died frozen or were taken by the swirling waters. Many people lost their homes, which were knocked down by the storm⁹⁶, and there were many deaths of both people and livestock⁹⁷. The low temperatures from the beginning of 1816 in the Banat led to the freezing of the Danube and as such to the prevention of international transport from the Banat to the Ottoman Empire⁹⁸.

On January 29 and 30, 1816, Partium also was affected by the same meteorological phenomenon. At Báránd (today in Hungary) the snowstorm killed three people, 1,430 sheep, nine cattle, and two horses⁹⁹.

⁸⁶ “Wien, am 20. Februar”. *Dörptsche Zeitung*, 21, Sunday, 12 March 1816: 1–2.

⁸⁷ “Wien, vom 24. Februar”. *Dörptsche Zeitung*, 20, Wednesday, 8 March 1816: 2.

⁸⁸ Dudaș, *Memoria*: 292.

⁸⁹ Gherman, *Meteorologia populară*: 34.

⁹⁰ Roșu *Însemnări*: 49.

⁹¹ *Noul Testament* [New Testament], București, 1703, apud Dudaș, *Catastrofe*: 44.

⁹² *Ceaslov* [Horologion] from the eighteenth century, copy from Năráu (Timiș Country), published by Gh. Cotoșman, *Din trecutul Banatului*, vol. V (Timișoara: s.n. 1935): 552.

⁹³ *Miscelaneu* [Miscellaneous], Romanian manuscript, copied in June 1705 by Vasile Sturze Moldoveanul in Banat. Apud Dudaș, *Catastrofe*: 45.

⁹⁴ Hietzinger, *Statistik*, II: 118.

⁹⁵ Hietzinger, *Statistik*, II: 118.

⁹⁶ Dudaș, *Memoria*: 292–293.

⁹⁷ Cserveny, *Cronica calamităților*: 34. This source seems to be exaggerated, as the number of frozen sheep given here is 400,000, which is substantially greater than the 38,238 reported in the source quoted in the footnote 95.

⁹⁸ Valeriu Leu, *Banatul*: 76.

⁹⁹ Ciorba: *Marea Foamete*: 106.

In February 1816, numerous snowstorms were recorded again in Europe (Italy¹⁰⁰, Austria¹⁰¹, Belgium¹⁰² and German Confederation¹⁰³) and Russia (Tambow¹⁰⁴ and Kasan¹⁰⁵).

The storm of 1816, which caused damage to many settlements in Partium¹⁰⁶, as well as floods to arise from most large rivers, caused not only stagnation, but also decline of agricultural production. Food shortages and high prices appeared and spread to all areas of the country. The calamity thus encompassed the whole of Transylvania, and in a short time the population was falling into frightening poverty. Thousands of people were starving, while thousands more sold their wealth and emigrated in order to save their lives, even though emigration was restricted¹⁰⁷. In other parts of Europe too, such as England, and Ireland, some people emigrated aiming to escape poverty¹⁰⁸. Most of the cattle, which largely provided food for the pastoral settlements, were abandoned due to the lack of feed. The reason for leaving the cattle and not slaughtering them for consumption is that they were sick. Although the sources do not mention it directly, it cannot be ruled out that a cattle epidemic was raging. It is known that in 1816 such a cattle plague struck Central Europe. The church records in the study area reflected the spectre of these misfortunes, highlighting the shortages and rising prices of cereals, the general panic, and the deaths of starving people¹⁰⁹.

March 1816 was characterized too by storms and snowfalls in German Confederation (Hanover¹¹⁰, Danzig and Eldingen¹¹¹), Italy¹¹², and Russia¹¹³.

Storms were also reported in April 1816 in Austria¹¹⁴ as well as floods in Lithuania¹¹⁵.

¹⁰⁰ A storm on February 13, 1816 hit four Algerian warships on the shores of the Italian island of Favignana ("Aus Italien, vom 14. Februar". *Rigasche Zeitung*, 18 from 1 February 1816).

¹⁰¹ In the middle of February 1816, the second great storm of the year was registered in Austria ("Wien, vom 21. Februar". *Dörptsche Zeitung*, 22, Wednesday, 15 March 1816: 1).

¹⁰² February 15, 1816 saw a strong storm in Löwen (today in Belgium) ("Brüssel, vom 22. Februar". *Dörptsche Zeitung*, 20, Wednesday, 8 March 1816: 3).

¹⁰³ A snowstorm accompanied by thunder and lightning was recorded in Lüneburg on February 26, 1816, the phenomenon lasting 10 minutes, after which the weather became clear again. ("Lüneburg, vom 26. Februar". *Dörptsche Zeitung*, 22, Wednesday, 15. March 1816: 2).

¹⁰⁴ The blowing snow recorded on February 7, 1816 in the Russian city of Tambow caused significant material damage ("Tambow, vom 8. Februar". *Dörptsche Zeitung*, 20, Wednesday, 8. March 1816: 1–2).

¹⁰⁵ An unusually strong storm caused material damage on February 7, 1816 in the Russian city of Kasan ("Kasan, vom 14. Februar". *Dörptsche Zeitung*, 23, Sunday, 19 March 1816: 1).

¹⁰⁶ *Noul Testament*, București, 1703, copy from Banat, published by Roșu, *Însemnări*, 49; *Ceaslov*, eighteenth-century copy from Nerău (Timiș Country), published by Cotoșman, *Din trecutul*: 552.

¹⁰⁷ Ioan Bolovan, "Realități demografice în Regimentul II românesc de graniță (secolul al XIX-lea)", in *D. Prodan. Puterea modelului*, ed. Nicolae Bocșan, Nicolae Edroiu, Liviu Maior, Aurel Răduțiu, Pompiliu Teodor (Cluj-Napoca: Centrul de Studii Transilvane, 1995): 144; Cservény, *Cronica*: 21.

¹⁰⁸ Luterbacher & Pfister "The year without a summer", 247.

¹⁰⁹ Ciorba: *Marea Foamete*, 164-165.

¹¹⁰ On March 14, 1816, heavy snowfalls occurred in Hanover ("Hannover, vom 22. März". *Dörptsche Zeitung*, 30, Wednesday, 12 April 1816: 2).

¹¹¹ On the night of March 19/20, 1816, the Vistula River [Weichsel] flooded 17 square miles of land between Eldingen and Danzig. On April 6, 95 villages were flooded, with 32,000 people affected ("Vermischte Nachrichten". *Dörptsche Zeitung*, 31, Sunday, 16 April 1816: 5).

¹¹² At the end of March 1816 there were massive snowfalls in Calabria (Italy), followed by uninterrupted rains brought by a strong storm. ("Rom, vom 17. April". *Dörptsche Zeitung*, 41, Sunday, 21 May 1816: 5).

¹¹³ On March 7, 1816, a storm struck Nischni-Nowgorod, destroying the roofs of buildings, knocking adults to the ground, and raising children in the air. ("Nischni-Nowgorod". *Dörptsche Zeitung*, 23, Sunday, 19 March 1816: 1).

¹¹⁴ A strong storm, with snow and rain, is reported on April 4, 1816 in Solmtal / Styria ("Wien, vom 6. April". *Dörptsche Zeitung*, 34, Wednesday, 26 April 1816: 1).

¹¹⁵ On April 2, 1816, floods of the Vilenka River took place in Vilnius ("Überschwemmung in Wilna, vom 19. April". *Dörptsche Zeitung*, 39, Sunday, 14 May 1816: 1).

May 1816 was cold, with prevalent hail that caused great damage to agriculture in the Russian Empire (Minsk¹¹⁶, Perm¹¹⁷, Chernigow¹¹⁸, Nowosybkow¹¹⁹).

In June 1816, there was a storm in the Banat that completely destroyed the grain, affected the houses and “*the earth turned black*”¹²⁰. The Tisa floods in the spring of 1816 destroyed 300 houses in Salonta [Nagyszalonta/Großsalontha] (Bihar County). Here, for a long time – a whole year – the inhabitants had to travel by rafts through the locality, until the waters receded¹²¹.

According to Joseph Dück, in the summer of the year 1816, there were great floods from the river Mureş in the territory of Transylvania, which destroyed almost all the crops in the area. An extreme food crisis began, and the people had to eat whatever they could find¹²². In June and July, 1816, there were floods in the Banat. At Pentecost (June 9, 1816), in Bihar Country, in the village of Chiraleu / Berettyókirályi, heavy rain and hail destroyed the wheat fields¹²³. This is one of the few references to hail in the studied area among the records analysed during this period. In Transylvania, it was known as “ice rain”¹²⁴.

In June 1816, a great diversity of extreme thermal phenomena was observed. While in France¹²⁵ and German Confederation¹²⁶, winter temperatures were recorded, in Russia there was a hot summer with extreme phenomena (Woronesch¹²⁷, Chernevo¹²⁸). The low temperatures in German Confederation and France were followed by cloudbursts, e.g. in Bamberg¹²⁹, and floods in Halle¹³⁰ and Obersaône¹³¹. The cold and rainy weather of June 1816 led to the deterioration of fruits and vegetables, and as such to the increase of prices¹³².

In Ianoşda [Jánosd] (Bihar County), the rains “*fell for several days in a row, starting with July 7, 1816*”, wreaking havoc¹³³.

¹¹⁶ On May 8, 1816, a strong hailstorm that damaged summer grains was recorded in Slobodskoy, near Minsk (in Kirow Oblast, Belarus). (“Nowotscherkassk, vom 26. Mai”. *Dörptsche Zeitung*, 54, Wednesday, 5 July 1816, 2).

¹¹⁷ In the Russian city of Perm, heavy snow fell on May 16, 1816, which was followed by a cooling of the temperature until May 22. (“Perm, vom 25. Mai”. *Dörptsche Zeitung*, 53, Sunday, 2 July 1816, 1; “Vermischte Nachrichten”. *Zuschauer*, 1283, from 1 July 1816).

¹¹⁸ In the localities of the Russian constituency of Chernigov (today Ukraine), on May 19, 1816, a large hailstorm killed cattle and birds. (“Vermischte Nachrichten”. *Zuschauer*, 1283, from 1 July 1816).

¹¹⁹ The great hail that fell on the plains around the Russian city of Nowosybkow on May 19, 1816, destroyed crops and gardens, and harmed animals. (“Nowosybkow, im Guv. Tschernigow, vom 30. Mai”. *Dörptsche Zeitung*, 53, Sunday, 2 July 1816: 1).

¹²⁰ Valeriu Leu, *Cartea veche din Bisericile Eparhiei Caransebeşului*, Reşiţa, 1996: 44.

¹²¹ Ciorba: *Marea Foamete*: 115 says, the water has remained for a year.

¹²² Joseph Dück, “Auszug aus ‘Zeidner Denkwürdigkeiten’ [1432–1847]”, in: *Quellen zur Geschichte der Stadt Brassó*, Julius Gross (ed.) IV/1 (Brassó: 1903): 329.

¹²³ Florian Dudaş, *Cartea veche românească în Bihar. Sec. XVI-XVII*, (Oradea: Comitetul de cultură și Educație Socialistă, 1977): 81.

¹²⁴ Gherman, *Meteorologia*: 123.

¹²⁵ In Bordeaux, winter temperatures, cold rains, and storms were recorded in June 1816, affecting mainly vineyards. (“Bordeaux, den 15. Juni 1816”. *Rigasche Zeitung*, 53, from 1 July 1816).

¹²⁶ On June 8, 1816, it snowed in Lindau (Bavaria) and in Ober-Schwaben and the snow remained for a long time. (“München, den 20. Juni 1816”. *Rigasche Zeitung*, 53, from 1 July 1816); “Vermischte Nachrichten”. *Zuschauer*, 1283, from 1 July 1816).

¹²⁷ In June 1816 in Woronesch (Russia) temperatures rose to 30° Ré (37.50° C). A strong wind from the north-east brought cold rain and hail on June 9 (“Inländische Nachrichten 1816”. *Zuschauer*, 1293, from 25 July 1816); “Woronesh, vom 20. Juni 1816”. *Rigasche Zeitung*, 60, from 26 July 1816). The Lithuanian newspaper *Rigasche Zeitung* mentions only 20° Ré (25°C) as the highest temperature. (“Woronesh, vom 20. Juni 1816”. *Rigasche Zeitung*, 60 from 26 July 1816).

¹²⁸ In June 1816 in Chernevo, near Porchow (north-western Russia) a tornado destroyed the roofs of houses. This was followed by a storm of apple-sized hailstones, which destroyed the grain and injured the animals. (“Porchow, vom 16. Juni”. *Dörptsche Zeitung*, 54, Wednesday, 5 July 1816, 2).

¹²⁹ On June 15/16, 1816, a cloudburst took place in Bamberg, causing material damage in 17 villages, with 15 people killed as well as many domestic animals. (“Vermischte Nachrichten”. *Zuschauer*, 1283, from 1 July 1816; “Vermischte Nachrichten”. *Dörptsche Zeitung*, 53, Sunday, 2 July 1816: 5; “Vermischte Nachrichten”. *Zuschauer*, 1283 from 1 July 1816).

¹³⁰ The floods of the Saale River on June 21, 1816, caused by uninterrupted rains, caused material damage in the localities around the city of Halle. Many cattle were drowned (“Halle, den 24. Juni 1816”. *Rigasche Zeitung*, 54 from 5 July 1816); “Halle, den 24. Juni”. *Dörptsche Zeitung*, 55, Sunday, 9 July 1816: 5).

¹³¹ In June 1816, there were major floods in France, with the department of Obersaône being most severely affected (“Paris, vom 28. Juni 1816”. *Zuschauer*, 1286 from 8 July 1816).

¹³² “Aus einem Privatschreiben aus Württemberg, vom 24. Juni 1816”. *Rigasche Zeitung*, 53, from 1 July 1816).

¹³³ Ciorba: *Marea Foamete*, 106.

The months of July and August 1816 were characterized by heavy rains and floods in Western Europe, especially in what is now Germany, notably in Cologne.¹³⁴ On July 5, 1816, large floods from the Rhine were recorded at Wesel¹³⁵ and Düsseldorf¹³⁶, which led to the destruction of agricultural production. A similar situation occurred with the Main, which flooded in Frankfurt¹³⁷. A storm on July 5, 1816 brought damage to the Kadnikow area (north-western Russia)¹³⁸. Major damage was caused by the storm in Werchouralsk¹³⁹, Stavropol and Bogojawlensk¹⁴⁰ (Russia), as well as in what is now Germany¹⁴¹, and Slovenia¹⁴². The precipitation over parts of Europe during the summer of 1816 was therefore abnormal¹⁴³.

For the period of July–December 1816, the records from the geographical areas analysed here are missing. In this time, early frosts were mentioned in Europe – in Switzerland¹⁴⁴, France (Besançon¹⁴⁵ and Bordeaux¹⁴⁶), the north of the German Confederation¹⁴⁷ and the Crimean Peninsula¹⁴⁸.

The variability of the weather in Transylvania led to the extension of the grazing season for the sheep in the southern Carpathian territories. In the context of transhumance, sheep were moved from Transylvania to the south of the Carpathian chain. This form of long-distance grazing has been practised over the Southern Carpathians for centuries. The prolongation of the cold season in Transylvania caused herders to stay longer in the areas south of the Carpathians, which were not very much affected by the changing weather. Here, however, where negative weather impacts were not so drastic¹⁴⁹, Romanian sheep from Transylvania were subject to abuses by the Greek and Wallachian administrations¹⁵⁰. A severe drought was attested in 1816 and 1817 in Satu Mare (Partium), which generated a food crisis, perceived as unprecedented by contemporaries¹⁵¹.

On December 15, 1816, a hail and snow storm occurred in the German region of Schwedt an der Oder, which lasted all night and uprooted the trees¹⁵².

On December 1, 1816, it began to snow in Codlea (Zeiden / Feketehalom) over the frozen ground. This snow remained until 1817, and between February 7 and 10 it snowed continually, day and night,

¹³⁴ On July 3, 1816, a cloudburst occurred in Cologne, after a severe drought, which led to flooding of the rivers Roer and Erft, which caused damage to agriculture ("Köln, den 5. Juli". *Dörptsche Zeitung*, 58, Wednesday, 19 July 1816: 4).

¹³⁵ "Wesel, den 5. Juli 1816". *Rigasche Zeitung*, 57 from 15 July 1816.

¹³⁶ "Düsseldorf, den 5. Juli 1816". *Rigasche Zeitung*, 57 from 17 July 1816.

¹³⁷ In July 1816, heavy rains and clouds broke out in the Frankfurt area, leading to the flooding of the Main River. ("Frankfurt, vom 19. Juli". *Dörptsche Zeitung*, 56, Wednesday, 12 July 1816: 6; "Naturmerkwürdigkeiten". *Zuschauer*, 1392, from 15 March 1817).

¹³⁸ "Wologda, den 19. Juli 1816". *Dörptsche Zeitung*, 66, Sunday, 16 August 1816: 1–2.

¹³⁹ Massive floods occurred in August 1816 in Werchouralsk (Orenburg, Russia), caused by uninterrupted rains for seven days, which destroyed bridges, buildings and autumn grain ("Inländische Nachrichten". *Zuschauer*, 1338, from 7 November 1816); "Werchouralsk (im Gouvern. Orenburg) den 1. September 1816". *Rigasche Zeitung*, 90 from 08 November 1816).

¹⁴⁰ A strong storm occurred in the Stavropol region on August 4, 1816, then another on August 12 in Bogojawlensk (Tambow area), destroying grain and over 100 houses. ("Inländische Nachrichten". *Zuschauer*, 1324, from 5 October 1816).

¹⁴¹ At Rothenburg ob der Tauber, the storm of August 5, 1816 destroyed the communal barn, with 250 sheep perishing on this occasion ("Rothenburg". *Dörptsche Zeitung*, 70, Wednesday, 30 August 1816: 5).

¹⁴² The rains caused floods of the Drau river at Ptuj / Pettau in August 1816 ("Vermischte Nachrichten". *Dörptsche Zeitung*, 65, Sunday, 13 August 1816: 6).

¹⁴³ Luterbacher & Pfister, "The year without a summer": 246.

¹⁴⁴ On October 22, 1816, a frost was recorded in Switzerland, which destroyed the vineyards ("Vom Main, vom 2. November 1816". *Rigasche Zeitung*, 90, from 8 November 1816).

¹⁴⁵ Snowfall in October 1816 destroyed grain in the fields of Besançon ("Naturmerkwürdigkeiten". *Zuschauer*, 1378, from 10 February 1817).

¹⁴⁶ The rains and hail of November 1816 destroyed the vineyards in Bordeaux, and the storm knocked down the trees ("Aus einem Schreiben aus Paris, vom 21. November". *Dörptsche Zeitung*, 99, Sunday, 10 December 1816: 2).

¹⁴⁷ The frost of November 1816 prevented port activity in Hamburg ("Hamburg, den 22. November 1816". *Dörptsche Zeitung*, 96, Wednesday, 29 November 1816, 4; "Hamburg, den 22. November 1816". *Rigasche Zeitung*, 95, from 25 November 1816).

¹⁴⁸ In Odessa, the autumn days lasted until November 5, 1816, when snow and frost appeared, accompanied by a strong storm, so that during the night people and animals froze on the streets of the city and outside it. ("Odessa, vom 9. November 1816". *Dörptsche Zeitung*, 101, Sunday, 17 December 1816, 1; "Odessa". *Zuschauer*, 1356, from 19 December 1816).

¹⁴⁹ Ioana Constantinescu, "Climă, agricultură și societate în Țara Românească și Moldova sub fanarioți", *Revista de istorie*, Tom 42, No. 3 [1989]: 269.

¹⁵⁰ Liviu Moldovan and Viorel Grama, "Situția oierilor români transilvăneni în Țara Românească pe timpul domniei lui Ioan Caragea (1812–1818)". *Marisia*, No. IX (1979): 237–45.

¹⁵¹ Csérveni, *Cronica*: 21.

¹⁵² "[Natur-Merkwürdigkeiten]". *Zuschauer*, 1357, from 21 December 1816).

more heavily than it had done during the time “*that anyone still alive can remember*”. This snow did not melt until the end of April, so the autumn wheat was almost completely destroyed under it. People felt compelled to till the land again and to plant summer wheat, and especially millet¹⁵³, because they could no longer wait for winter crops. There was very little seed available – some people had 1–2 buckets, others only 2–3 quarts¹⁵⁴. In the spring, when the very heavy snowfall began to melt in the mountains, the Bârsa river swelled so much that it flooded large area of lands and caused damage of more than 1,000 Florins¹⁵⁵. The sum indicated by the chronicler Dück seems to be quite small. Fifty years earlier, the nobleman Taldalagy paid 2,000 Fl. for the construction of his palace in Târgu-Mureș, and the journey of the same to Vienna cost 5,000 Fl. for one year¹⁵⁶. During this time, England was also affected by rains that caused floods¹⁵⁷, as well as a devastating storm.¹⁵⁸

February 1817 was characterized by warm weather and rainfall throughout Central Europe. While in Partium, the river Crișul Repede and its tributary Peța flooded Oradea (the waters receding only in March)¹⁵⁹, the weather in Vienna was so warm that some trees blossomed earlier than usual¹⁶⁰. The storms mentioned in Hamburg¹⁶¹ and in Brandenburg on February 7¹⁶² and 8¹⁶³, 1817, followed the warm days that prevailed in northern German Confederation at that time and which led to the budding of trees. Other devastating storms occurred in Bavaria¹⁶⁴ and Tyrol¹⁶⁵.

In March 1817, there were high temperatures in Saxony¹⁶⁶ and in Denmark¹⁶⁷, numerous storms and floods in what is now North Germany (Hanover¹⁶⁸, Emden¹⁶⁹, Lüneburg¹⁷⁰, and Hamburg¹⁷¹), Bavaria¹⁷², Silesia¹⁷³, and the south-west of what is now Germany (Rheinland-Pfalz¹⁷⁴ and Baden-Württemberg)¹⁷⁵.

¹⁵³ The cultivation of millet was obligatory in the empire from 1817 (Hietzinger, *Statistik*, II: 142).

¹⁵⁴ The Bucket = Kübel (germ.) was in Transylvania very different, from a region to other. One Kübel was there 60 Liters, in this case we can have between 60 and 120 Liters; 2-3 quarts = 30-45 Liters.

¹⁵⁵ Dück, “Auszug”: 329.

¹⁵⁶ Imreh István *Viața cotidiană la secui (1750-1850)* [*The everyday life at the Szekler people (1750-1850)*], Bucharest, Kriterion, 1982, 322-23.

¹⁵⁷ Uninterrupted rains began in England on January 6, 1817, causing the Medway River to overflow, which caused extensive property damage. (“London, den 14. Januar 1817”. *Rigasche Zeitung*, 7 from 24 January 1817).

¹⁵⁸ On January 19, 1817, a strong storm from the south-east caused property damage in London as well as among ships stationed in the harbor. (“Naturmerkwürdigkeiten: *Zuschauer*, 1378, February 10, 1817).

¹⁵⁹ Susana Tóth, “Tîrgurile din Oradea (III). Aspecte etno-demografice ale tîrgurilor din Oradea”. *Biharea*, IV, Oradea, 1978: 114.

¹⁶⁰ [Die Witterung zu Wien]. *Zuschauer*, 1379, from 13 February 1817).

¹⁶¹ On February 7, 1817, a big storm with rain, snow and hail was recorded in Hamburg, but it did not cause any damage. (“Hamburg, den 7. Februar 1817”. *Rigasche Zeitung*, 12 from 10 February 1817).

¹⁶² On February 7, 1817, a hailstorm caused damage in Brandenburg (“Naturmerkwürdigkeiten: *Zuschauer*, 1378, from 10 February 1817).

¹⁶³ On February 8, 1817, uninterrupted rains and storms took place in Berlin and Brandenburg (“Vermischte Nachrichten”. *Zuschauer*, 1376, from 6 February 1817).

¹⁶⁴ A storm recorded in Landshut (Bavaria) on the evening of February 26, 1817 ended with the appearance of a large ball of fire in the sky, similar to the full moon, which disappeared with a loud clap of thunder (“Naturmerkwürdigkeiten”. *Zuschauer*, 1392, from 15 March 1817).

¹⁶⁵ On February 28, 1817, an avalanche occurred in the Ober-Inntal, where it had been raining continuously for two weeks. This avalanche destroyed six households, killed 13 people, 20 cattle, two horses, and 30 sheep; the damage was estimated at between 12,000 and 15,000 Gulden (“München, den 10. März 1817”. *Rigasche Zeitung*, 23, from 21 March 1817).

¹⁶⁶ “Vermischte Nachrichten”. *Zuschauer*, 1388, from 16 March 1817).

¹⁶⁷ “Kopenhagen, den 11. März 1817”. *Rigasche Zeitung*, 22 from 17 March 1817).

¹⁶⁸ In early March 1817, heavy storms and rains occurred in the Hanover region. On March 4, there was a windstorm which damaged the buildings (“Naturmerkwürdigkeiten”. *Zuschauer*, 1392, from 15 March 1817).

¹⁶⁹ On March 4, 1817, a flood occurred in Emden (Niedersachsen) which was combined with strong winds, causing significant material damage (“Naturmerkwürdigkeiten”. *Zuschauer*, 1392, from 15 March 1817).

¹⁷⁰ In Lüneburg, a strong storm took place on March 7, 1817, with thunder and lightning, followed by spring weather.

(“Naturmerkwürdigkeiten”. *Zuschauer*, 1392, from 15 March 1817).

¹⁷¹ In Hamburg on March 4, 1817 incessant rains and a hail storm, which caused floods, were reported. “Hamburg, den 4. März 1817”. *Rigasche Zeitung*, 19, from 7 March 1817; “Hamburg, den 8. April 1817”. *Rigasche Zeitung*, 29, from 11 April 1817).

¹⁷² On March 4 and 5, 1817, two major storms occurred in Landshut (Bayern), causing damage to buildings and forests. (“Naturmerkwürdigkeiten”. *Zuschauer*, 1392, from 15 March 1817).

¹⁷³ At Strahlen in Silesia there was a big storm on March 7, 1817 that damaged the buildings, with the lightning causing fires (“Naturmerkwürdigkeiten”. *Zuschauer*, 1392, from 15 March 1817).

¹⁷⁴ On March 8, 1817, a flood caused by snow and ice melts occurred in Winden (Rheinland-Pfalz). (“Naturmerkwürdigkeiten”. *Zuschauer*, 1392, from 15 March 1817).

¹⁷⁵ On May 27, 1817, floods occurred in Baden-Württemberg, due to overflows of the Neckar River (“Stuttgart, den 29. Mai 1817”. *Rigasche Zeitung*, 45, from 5 May 1817).

The rains continued in Partium in the spring of 1817. On May 29, 1817, it was reported that in the village of Tinca [Tenke] (Bihar Country in Partium) autumn sowing could not be done, because the soil was still full of water¹⁷⁶.

During this time, in the south of the continent there was a prolonged drought, which was most severe in France¹⁷⁷, Italy¹⁷⁸, and Spain¹⁷⁹.

In June 1817, a severe hailstorm caused significant damage to the Banat¹⁸⁰.

Similar phenomena occurred in other parts of Europe, such as Russia¹⁸¹, Italy¹⁸², Austria (Carinthia)¹⁸³, and northern German Confederation (Sachsen-Anhalt)¹⁸⁴. In the same month, high temperatures were recorded in Italy¹⁸⁵, and drought in France¹⁸⁶.

The hailstorm in the Banat in June 1817 was the last contemporary recording of a weather anomaly in the analysed areas. Although the documents of the time do not talk about the “restoration” of the usual weather and the cheapening of food products, from the end of 1818 they do contain reports of weather anomalies covering the scale of several years as well. A note from an old book from the village of Bălnaca [Körösbánlaka] (Bihar County) relates the fact that between 1812 and 1817 there were cold summers, and after 1817 “*excessive water and rain, so nothing grew*”¹⁸⁷.

In 1817, there was a drought, and a poor grain harvest, although there was a rich fruit harvest in the vineyards in Wallachia. Cereals were exported from Wallachia to Transylvania, where there was famine, with massive grain deliveries to the island of Ada-Kaleh; there was massive export of cattle from Moldova to Austria; the price of cereals increased; agriculture was expanding in Wallachia, encouraged by the export to Transylvania¹⁸⁸.

The last months of the year 1817 were unstable in Europe. Thunderstorms were recorded in Rome¹⁸⁹ and Brest¹⁹⁰, as well as sudden changes of temperature in Marseille¹⁹¹, Russia¹⁹², and Denmark¹⁹³.

¹⁷⁶ Ciorba: *Marea Foamete*: 113.

¹⁷⁷ In March 1817, there was a prolonged drought in France; in Languedoc there was no rainfall for seven months, with the temperatures as high as in June (“Paris, den 10. März 1817”. *Rigasche Zeitung*, 24, from 24 March 1817).

¹⁷⁸ The prolonged and intense drought in Corsica led to fires in the canton of Venaco. In April 1817 in the village of Poggio, 15 houses were burning. (“Aus Italien, vom 29. April 1817”. *Rigasche Zeitung*, 40, from 19 May 1817).

¹⁷⁹ In May 1817, the drought ended in Spain, when public prayers for rain were raised in the presence of the king. “Spanien”. *Zuschauer*, 1413, from 3 May 1817).

¹⁸⁰ *Penticostar* [Pentecostarion], Râmnic, 1743, copy from Grădinari (Caraș Severin Country) kept in the “Old Romanian Book” Fund Reșița, Inventory 1771, apud Dudaș, *Catastrofe*: 45.

¹⁸¹ On June 6, 1817, a strong storm was recorded in the Russian port of Arkhangelsk, which damaged about 100 ships and caused losses to traders. (“Archangelsk, den 15. Juni 1817”. *Rigasche Zeitung*, 56, from 14 July 1817).

¹⁸² In Pisa, on June 16, 1817, a strong storm was recorded (“Italien”. *Zuschauer*, 1444, from 14 July 1817).

¹⁸³ On July 12, 1817, a storm was recorded in Carinthia that uprooted trees and damaged houses. Hail caused damage to agriculture (“Wien, den 23. Juli 1817”. *Rigasche Zeitung*, 61, from 1 August 1817).

¹⁸⁴ In the village of Buch in der Altmark (Sachsen-Anhalt), a strong storm in June 1817 brought a great hailstorm, causing cattle to drown in the Elbe. (“Vermischte Nachrichten”. *Rigasche Zeitung*, 44, from 2 June 1817).

¹⁸⁵ In Naples, the temperatures reached 29° Ré in August (36.25° C) (“Neapel, den 12. August 1817”. *Zuschauer*, 1489, from 11 September 1817).

¹⁸⁶ On August 14, 1817, a procession took place in Toulouse to end the drought, which was followed by a long rain. (“Paris, den 25. August 1817”. *Rigasche Zeitung*, 71, from 5 September 1817).

¹⁸⁷ Dudaș, *Memoria*: 298.

¹⁸⁸ Constantinescu, “Climă, agricultură și societate”: 269.

¹⁸⁹ In September 1817, a storm in Rome after a two-month drought caused property damage (“Vermischte Nachrichten”. *Zuschauer*, 1474, from 22 September 1817).

¹⁹⁰ The storm of December 10, 1817, destroyed many buildings in Brest; the shipwreck of an English ship with 240 passengers off the French coast was recorded (“Brest, den 12. Dezember 1817”. *Rigasche Zeitung*, 104, from 29 December 1817).

¹⁹¹ In November 1817, there was a sudden change in temperature in Marseille, from hot and dry to cold and humid weather. ([Vermischte Nachrichten]. *Zuschauer*, 1495, from 10 November 1817).

¹⁹² In Hrodna (Grodno-Belarus) the temperatures of December 1817 dropped to -25° Ré (-31.25° C). On December 27, the weather suddenly warmed up, reaching spring temperatures on January 5, 1818 (“Grodno, den 5. Januar 1818”. *Dörptsche Zeitung*, 11, Wednesday, 6 February 1818: 1).

¹⁹³ In December 1817, the warmth in Denmark led to the flowering of trees (“Kopenhagen, den 8. Dezember 1817”. *Rigasche Zeitung*, 100, from 14 December 1818).

In 1817/18 in Wallachia there was a mild winter, without snow, but at the end of May, in the north of Moldova, the abundant snow and the hoar-frosts caused great damage to the seeds and orchards; there was a lack of food in Moldova; corn was expensive. 1818 was an especially fruitful year in Wallachia. In Moldova measures were taken to improve the crops of millet and potatoes¹⁹⁴.

The year 1818 was also characterized by weather anomalies throughout Europe, with the full range of phenomena: there were storms in Poland¹⁹⁵, Ukraine¹⁹⁶, Hamburg¹⁹⁷, Copenhagen¹⁹⁸, Königsberg/[Kaliningrad]¹⁹⁹, Holland²⁰⁰, Bohemia (Jistebnice/Gistebnitz²⁰¹, Karlovy Vary, Prague²⁰²), Belgium²⁰³, Switzerland²⁰⁴, Vienna²⁰⁵, Hungary²⁰⁶, and Russia (Smolensk²⁰⁷, Pereyaslaw²⁰⁸, Nowotscherkassk²⁰⁹, Wladimir²¹⁰, Borißow²¹¹, Kasan²¹², Kursk²¹³). Massive, damaging floods took place in Hamburg in January²¹⁴ and February to March²¹⁵ in England²¹⁶, Sweden²¹⁷, and Auxerre²¹⁸. There were temper-

¹⁹⁴ Constantinescu, "Climă, agricultură și societate": 269.

¹⁹⁵ In Bialystok (today in Poland) a strong storm occurred on January 5, 1818, damaging buildings and uprooting trees in forests. ("Bjalostok, den 7. Januar 1818". *Dörptsche Zeitung*, 10, Sunday, 3 February 1818: 1).

¹⁹⁶ On January 5, 1818, a strong storm took place in Hrodna (Grodno), destroying the roofs of houses and uprooting the trees in the forest. ("Grodno, den 19. Januar 1818". *Dörptsche Zeitung*, 12, Sunday, 10 February 1818: 1).

¹⁹⁷ In Hamburg, the storm of January 8/9, 1818 destroyed a new building ("Vermischte Nachrichten". *Rigasche Zeitung*, 23 from 20 March 1818).

¹⁹⁸ In Denmark, in Copenhagen, a windstorm was recorded on the night of January 15/16, 1818. Many buildings were struck by lightning and hail. ("Vermischte Nachrichten". *Dörptsche Zeitung*, 11, Wednesday, 6 February 1818: 4).

¹⁹⁹ In Königsberg, the storm, which began on January 15 and ended on January 17, 1818, destroyed the roof of a church. ("Königsberg, den 29. Januar 1818". *Dörptsche Zeitung*, 10, Sunday, 3 February 1818: 3).

²⁰⁰ A windstorm hit the Dutch coast from Dünkirchen to Ostend in March 1818, causing extensive human and material damage. ("Amsterdam, den 17. März 1818". *Rigasche Zeitung*, 24 from 23 March 1818).

²⁰¹ On May 10, 1818, a tornado with a diameter of over 20 fathoms was recorded in the town of Jistebnice/Gistebnitz (Bohemia), which broke trees and roofs ("Wien, den 13. Juni 1818". *Rigasche Zeitung*, 50, from 22 June 1818).

²⁰² In Bohemia, a storm brought heavy damage to Karlovy Vary/Karlsbad and Prague on June 28, 1818. The streets were covered with house tiles, carts were overturned, and forests were alight ("Wien, den 8. Juli 1818". *Rigasche Zeitung*, 57, from 17 July 1818). At the beginning of July 1818 there were strong storms and rains in Bohemia ("Wien, den 8. Juli 1818". *Dörptsche Zeitung*, 58, Sunday, 21 July 1818: 4).

²⁰³ On June 18, 1818, a hail storm devastated the towns of Waterloo and Isque ("Brüssel, vom 21. Juni 1818". *Zuschauer*, 1593, from 27 June 1818).

²⁰⁴ On August 23, 1818 there was a windstorm in Switzerland, with lightning that caused material damage to Rigiberg ("Vermischte Nachrichten". *Dörptsche Zeitung*, 76, Sunday, 22 September 1818: 4).

²⁰⁵ In Vienna, on January 8, 1818, a 24-hour snowfall began, impeding the movement of people on the streets. The Viennese arm of the Danube was covered with ice ("Wien, den 10. Januar 1818". *Dörptsche Zeitung*, 7. Wednesday, 23 January 1818: 2).

²⁰⁶ In Hungary, on Pentecost 1818 (May 24), a cloudburst killed a woman and three children, knocked down 11 houses and caused extensive damage ("Wien, den 13. Juni 1818". *Rigasche Zeitung*, 50 from 22 June 1818).

²⁰⁷ A sudden change of weather was registered in Smolensk in July 1818, the warm weather being interrupted by cold rains and snow that affected agriculture ("Smolensk, den 12. Juli 1818". *Dörptsche Zeitung*, 62, Sunday, 4 August 1818: 1).

²⁰⁸ In Pereyaslaw, it rained continuously from the beginning of June 1818, affecting the growth of cereals. ("Pereslawl, den 2. Juli 1818". *Dörptsche Zeitung*, 62, Sunday, 4 August 1818: 1).

²⁰⁹ At Nowotscherkassk, the right bank of the Don was flooded on July 14, 1818, due to a heavy hail storm which also destroyed grain ("Nowotscherkassk, den 30. Juli 1818". *Dörptsche Zeitung*, 62, Sunday, 4 Aug. 1818: 1–2).

²¹⁰ On March 26, 1818, a windstorm ripped off the church tower in the Russian city of Wladimir ("Wladimir, den 30. März 1818". *Dörptsche Zeitung*, 36, Sunday, 5 May 1818: 2).

²¹¹ On March 26, 1818, a strong storm broke out in Borißow, Minsk Oblast, leading to damaged buildings and uprooted trees, making the road to Minsk impassable. ("Borißow, im Gouvernement Minsk, den 2. April 1818". *Dörptsche Zeitung*, 35, Wednesday, 1 May 1818: 2).

²¹² A big storm occurred in Kasan on April 14, 1818, with lightning, thunder and hail, an unusual phenomenon for the area in April. ("Kasan, den 15. April 1818". *Dörptsche Zeitung*, 40, Sunday, 19 May 1818: 2).

²¹³ On August 4, 1818, there was a strong hailstorm near the Russian city of Kursk, damaging crops ("Kursk, den 9. August 1818". *Dörptsche Zeitung*, 74, Sunday, 15 September 1818: 1).

²¹⁴ On January 12, 1818, the floods in Hamburg submerged the lower part of the city ("Von der Niederelbe, vom 13. Januar 1818". *Rigasche Zeitung*, 6 from 19 January 1818).

²¹⁵ In Hamburg, there were rains and blizzards in February and March 1818. On March 4, 1818 the Elbe overflowed, flooding the lower part of the city ("Hamburg, den 4. März 1818". *Rigasche Zeitung*, 19 from 7 March 1818).

²¹⁶ On March 27, 1818, parts of England were flooded, including London, with the largest floods at Oxford. ("London, den 27. März 1818". *Dörptsche Zeitung*, 29, Wednesday, 10 April 1818, 4; "Oxford". *Rigasche Zeitung*, 28 from 6 April 1818).

²¹⁷ On June 23, 1818, the snow in Sweden melted due to the heat, with the water overflowing the dams and passing ½ cubits above them ("Stockholm, den 23. Juni 1818". *Dörptsche Zeitung*, 55, Wedn, 10 July 1818: 3).

²¹⁸ On June 18, 1818, a cloudburst flooded the entire area of Auxerre, with rain and hail destroying the harvest of 19 communes, causing great damage ("Paris, den 30. Juni 1818". *Dörptsche Zeitung*, 58, 21 July 1818: 1).

ature variations, consisting of temperatures that were high in winter and low in summer, as mentioned in Leipzig²¹⁹, Pereyaslaw²²⁰, Saratov²²¹, Buguruslan²²², Kasan²²³, Schytomyr²²⁴, Borissow²²⁵, St. Petersburg²²⁶, and Wessjegonsk²²⁷.

Another important phenomenon recorded in 1818 was the drought, which affected what is now Germany (Hamburg²²⁸, North-Rhine-Westphalia²²⁹), Sweden²³⁰, and France (Perpignan²³¹, Paris²³², Straßbourg²³³).

During the late summer and early autumn of 1818, a great deal of rain fell in southern Transylvania²³⁴.

CONCLUSIONS AND OUTLOOK

The information provided by the chronicles, the notes in the church books, and newspapers greatly enhances the body of knowledge that we have regarding the weather anomalies, the fluctuations in prices and the food crisis in the territories in question. Numerous climatic events after 1815 can be related to the effects of the eruption of Mount Tambora, thus falling within the general phenomena generated by it. At the same time, they could be the effect of a chain of changes at the zonal meteorological level. Future research will have to present the regional diversity of weather anomalies within the diverse environments of the study area more systematically.

Analysed texts reveal that Transylvania, the Banat and Partium were affected by severe weather events, which caused the decrease of agricultural production (arable farming and animal husbandry) and the increase of food prices, which led to economic crisis and to major food crisis – at some places in the study area food crisis seems to have been more severe than in any other part of Europe, but fur-

²¹⁹ Leipzig was very hot on January 6, 1818, with high temperatures leading to melting snow and the beginning of plowing ("Leipzig". *Zuschauer*, 1527 from 24 January 1818).

²²⁰ At Pereyaslaw, in present-day Ukraine, the temperatures of January 1818 were high and the snow scarce; in early February, the snows arrived and the temperatures dropped ("Perejaslawl, den 3. Februar 1818". *Dörptsche Zeitung*, 20, Sunday, 10 March 1818: 1).

²²¹ In Saratov, Russia, January 1818 was mild, and in February 1818 it snowed profusely and temperatures dropped ("Saratow, den 9. Februar 1818". *Dörptsche Zeitung*, 21, Wednesday, 13 March 1818: 2).

²²² In Buguruslan, in the Russian province of Orenburg, the winter of 1817/18 was mild, with temperatures falling sharply on December 24, 1817 until the mercury froze in Réamour thermometers. Between February 1 and 7, 1818, temperatures dropped to -21–30° Ré (= -26.25° C to -37.50° C). On February 13, the thaw began. ("Buguruslan, im Gouvernement Orenburg, den 13. Februar". *Dörptsche Zeitung*, 28, Sunday, 7 April 1818: 1).

²²³ In Kasan, in south-western Russia, the winter of 1817/18 lasted quite a long time, and between 11 and 25 February 1818 the temperatures dropped to -20–30° Ré (= -25° C to -37.50° C) ("Kasan, den 25. Februar 1818". *Dörptsche Zeitung*, 28, Sunday, 7 April 1818: 1).

²²⁴ In Schytomyr (Ukraine), spring weather prevailed between March 25 and April 1, 1818. On March 30, 1818, it was 20° Ré (25° C) in the shade. It started to rain on April 1, and snowed on April 2, 1818, with the temperatures falling to 1° Ré (1.25° C) that day, and to -1° Ré (-1.25° C) on April 8 ("Shitomir, den 8. April 1818". *Dörptsche Zeitung*, 35, Wednesday, 1 May 1818: 2).

²²⁵ In Borissow, March 29 and 30 saw warm weather, and on March 31, 1818 there was a particularly strong storm, which brought snow and low temperatures. ("Borißow, im Gouvernement Minsk, den 2. April 1818". *Dörptsche Zeitung*, 35, Wednesday, 1 May 1818: 2).

²²⁶ In St. Petersburg, the night of April 13/14, 1818 began with frost and snow, followed by rain; on Sunday, April 15, temperatures dropped to 1° Ré (1.25° C) with heavy thunder and lightning ("Inländische Nachrichten". *Dörptsche Zeitung*, 34, Sunday, 28 April 1818: 1).

²²⁷ In the Russian city of Wessjegonsk (Twer Oblast), the snowfall was so high on April 24, 1818, that the roads were impassable ("Weßjegonsk, im Gouvernement Twer, den 24. April 1818". *Dörptsche Zeitung*, 39, Wednesday, 15 May 1818: 3).

²²⁸ In June 1818, a drought was recorded in Hamburg, with temperatures reaching 24° Ré (30° C) ("Hamburg, den 15. Juni 1818". *Dörptsche Zeitung*, 51, Wednesday, 26 June 1818: 4).

²²⁹ In November 1818, the drought in North-Rhine-Westphalia caused a water crisis, so that the inhabitants of Lippstadt had to look for water far away from the town. ("Vermischte Nachrichten". *Rigasche Zeitung*, 94 from 23 November 1818).

²³⁰ Beginning with June 11, 1818, a drought affected Sweden, around the city of Gothenburg, causing forest fires ("Stockholm, den 19. Juni 1818". *Dörptsche Zeitung*, 52, Sunday, 30 June 1818: 7).

²³¹ In Perpignan in July 1818 the heat was so great that several rivers dried up, leaving many layers of salt ("Paris, den 22. Juli 1818". *Dörptsche Zeitung*, 62, Sunday, 4 August 1818, 5; "Paris, den 22. Juli 1818". *Rigasche Zeitung*, 61 from 31 July 1818).

²³² Due to the heat, several diseases broke out in Paris in August 1818 ("Paris, den 12. August 1818". *Rigasche Zeitung*, 67 from 21 August 1818).

²³³ In Straßbourg, the drought led to the multiplication of mice, with the authorities offering a reward for their destruction ("Paris, den 5. September 1818". *Rigasche Zeitung*, 74 from 14 September 1818).

²³⁴ Toader Nicoară: "Variații climaterice și mentalități colective în sec. al XVIII-lea și începutul secolului al XIX-lea (1700–1830)". *Studii și Comunicări*, No. VII–VIII (1986–1987): 255.

ther contextualisation is needed to support this conclusion.²³⁵ Future research will need to better embed these historical climatological data in the context of both regional and European social, economic, and political history.

Moreover, these data will need to be embedded in the context of existing historical climatology studies dealing with observed timeframe in Europe.

The documentary sources used here, which consist of notes written in religious books and local / regional chronicles, do not cover the entire surface of the territories under analysis. For example, one can observe the lack of information regarding the central parts of Transylvania, where it is possible that the Romanian priests could read, but not write. Also, many chroniclers recorded only the natural events in their own village or its neighbouring area, so the magnitude of any major phenomena that occurred elsewhere were not noted by them.

The lack of a divine scheme in the interpretation of these events is explained either by the rationalization of the discourse, in the case of Saxon and Hungarian writings, or by the fact that the notes in liturgical books are in fact of a register type, particularly in the case of the Romanian ones. Thus, for the Orthodox priests, recording of unusual natural events and the increase of food prices was as relevant as the notes regarding material purchases for the church or other civil events. However, while divine punishment is lacking as an explanation in the case of calamities and hunger, the presence of God's mercy appears in the case of returning to normality, in such expressions as "God has given rich fruit".

LITERATURE

Archives, museum and parish collections

1. Arhivele Naționale ale României [National Archives of Romania] Bucharest, Inventory *Microfilme din Austria*, No. 1192, Microfilm 67.
2. Noul Testament de la Bălgrad, [New Testament from Alba Iulia] 1648, from Poienița, Mureș Country, kept in the Old Book Collection of the Church of Târgu-Mureș, information from Elena Mihiu.
3. *Noul Testament*, Alba Iulia, 1648, copy from Poienița, Mureș, found in the Old Book Collection of Mureș Country, Târgu-Mureș, Inventory No. 781.
4. *Penticostar*, Blaj, 1768, copy from Urisiul de Jos, Mureș country, information from Elena Mihiu.

Secondary literature

5. Badea, Lucian (Ed.). *Geografia României. III. Carpații românești și depresiunea Transilvaniei* [Geography of Romania. The Romanian Carpathians and the Depression of Transylvania]. București, 1987.
6. Barițiu, George. *Părți alese din istoria Transilvaniei* [Selected parts of Transylvania's history], Brașov: Inspectoratul pentru cultură, 1993.
7. Bârlea, Ion. *Însemnări din bisericile Maramureșului* [Notes from the churches of Maramureș], București: Atelierele grafice, 1909.
8. Bâzâc, Gheorghe. *Din istoria meteorologiei* [From the history of the meteorology], (București, Ed. Științifică și Enciclopedică), 1985.
9. Behringer, Wolfgang. *Tambora und das Jahr ohne Sommer. Wie ein Vulkan die Welt in die Krise stürzte*, München: Beck, 2015.
10. Bielz, Eduard Albert. "Beitrag zur Geschichte merkwürdiger Naturbegebenheiten in Siebenbürgen". *Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenschaften*, No. 4 (1862): 1–74.
11. Bocșan, Nicolae, Duma, Mihai, and Bona, Petru. *Franța și Banatul 1789–1815* [French and the Banat]. Reșița. Muzeul de istorie al Județului Caraș Severin, 1994.
12. Bolovan, Ioan. "Realități demografice în Regimentul II românesc de graniță (secolul al XIX-lea)" [Demographic realities in the Romanian Border Regiment II (19th century)], In *David Prodan. Puterea modelului*, edited by Nicolae Bocșan, Nicolae Edroiu, Liviu Maior, Aurel Răduțiu, and Pompiliu Teodor, Cluj-Napoca: Centrul de Studii Transilvane, 143–56.
13. Buzilă, Ștefan. *Documente bisericești* [Church documents]. *Arhiva Someșană*, No. 15 (1831): 15–54.
14. Cernovodeanu, Dan, and Binder, Pavel. *Cavalerii Apocalipsului* [The King of the Apocalypse], București: Silex, 1990.
15. Ciorba, Ioan. *Marea Foamete din Transilvania dintre anii 1813–1817* [The Great Hunger in Transylvania between 1813 and 1817]. Cluj-Napoca: Centrul de Studii Transilvănene, 2017.

²³⁵ Many thanks to the anonymous reviewer for this comparative observation.

16. Colta, Elena Rodica. "Însemnări de pe cărțile românești vechi din județul Arad" [Notes from the old Romanian books from the Arad county] *Ziridava*, XI, Arad, No. XI (1979), 1059–80.
17. Constantinescu, Ioana. "Climă, agricultură și societate în Țara Românească și Moldova sub fanarioți" [Climate, agriculture and society in Walachia and Moldova under Phanariots] *Revista de istorie*, Tom 42, Nr.3 (1989): 259–72.
18. Corfus, Ioan. *Însemnări de demult* [Notes from a long time ago]. Iași: Junimea, 1975.
19. Cotoșman, Gheorghe. *Din trecutul Banatului. Comuna și bisericile din Nerău* [From Banat's past. The commune and the churches in Nerău], vol. V, Timișoara, s.n. 1935.
20. Cservény, Anton. *Cronica calamităților și epidemiilor din Ardeal, Banat și teritoriile mărginașe de la 1007–1872 (Din izvoare ungurești)* [Chronicle of the calamities and epidemics in Transylvania, Banat and the marginal territories from 1007–1872 (From Hungarian sources)]. Cluj: Gloria, 1934.
21. Csetri, Elek, and Imreh, István. *Erdély változó társadalma 1767–1821 (Történelmi tanulmány)* [Evolution of social structure in Transylvania. Historical study]. București: Kriterion, 1980.
22. Csetri, Elek. *Erdélyi ezredekek a francia forradalom és a napóleoni idők háborúiban (1792–1815)* [Transylvanian regiments in the wars of the French Revolution and Napoleonic times (1792–1815)]. Kolozsvár: Múvelődés, 2005.
23. Dück, Joseph. "Auszug aus 'Zeidner Denkwürdigkeiten' [1432–1847]". In: *Quellen zur Geschichte der Stadt Brassó*. 4. *Chroniken und Tagebücher*. 1. (1143–1867), 293–41, edited by Julius Gross, Brassó, 1903.
24. Dudaș, Florian. *Catastrofe naturale în Transilvania în lumina însemnărilor scrise pe cărți românești vechi, între anii 1500 și 1900* [Natural disasters in Transylvania in the light of the notes written on old Romanian books, between 1500 and 1900]. Oradea: Lumina, 1999.
25. Dudaș, Florian. *Cartea veche românească în Bihor. Sec. XVI–XVII* [The old Romanian book in Bihor. 16th–17th Century]. Oradea: Comitetul de Cultură și Educație Socialistă, 1977.
26. Dudaș, Florian. *Memoria vechilor cărți românești. Însemnări de demult* [The memory of the old Romanian books. Notes from a long time ago]. Oradea: Editura Episcopiei Române a Oradiei, 1990.
27. Dumitrescu, Florin and Iacobini, Mircea. "Calamitățile naturale și lucrările de amenajare a râurilor din județul Arad reflectate în documente de arhivă" [Natural disasters and river development works in Arad County reflected in archive documents]. *Ziridava*, Arad, XIX–XXX, 1999, 425–35.
28. Edroiu, Nicolae. "Despre situația din Munții Apuseni în prima jumătate a secolului al XIX-lea. Protocolul parohiei din Mărgău (Huedin)". [About the situation in the Apuseni Mountains in the first half of the 19th Century. Protocol of the parish of Mărgău (Huedin)] *Anuarul Institutului de Istorie și Arheologie*, Cluj-Napoca, XXIV, 1981, 354–64.
29. Fabian, Iosif. *Considerații cu privire la obligațiile în muncă ale locuitorilor din Gurbediu (comitatul Bihor) între anii 1722–1834*. [Considerations regarding the work obligations of the inhabitants of Gurbediu (Bihar County) between 1722 and 1834]. *Crisia*, No. XIII, 1983, 509–15.
30. Farca, Ioan. "'Însemnare' de pe un Ceaslov aparținător bisericii din Sintești (jud. Timiș)" ['Note' from a Horologion belonging to the church in Sintești (Timiș County)]. *Mitropolia Banatului*, No. 7-8 (1984) 517–18.
31. Gherman, Traian. *Meteorologia populară. Observări, credințe, obiceiuri*, [Peasant's meteorology. Observations, beliefs, customs]. București: Paideia, 2002.
32. Gyémánt, Ladislau. "Contribuții statistice privind agricultura Transilvaniei, Banatului și Bucovinei în perioada 1720–1871". [Statistical contributions regarding the agriculture of Transylvania, Banat and Bukovina between 1720 and 1871] *Anuarul Institutului de Istorie și Arheologie Cluj-Napoca*, No. 27 (1985–1986), 161–84.
33. Hain, Dietmar. "Beiträge zur Witterungskunde Siebenbürgens". In: *Programm des evangelischen Gymnasiums in Schässburg und der damit verbundenen Lehranstalten zum Schluss des Schuljahres 1853/4*, edited by Gymnasialdirektion Kronstadt, 1854, 1–35.
34. Haltrich, Joseph. "Zur Geschichte von Sächsisch-Regen seit letzten hundert Jahren, In: Archiv des Vereins für siebenbürgische Landeskunde", N.F. Nr. 3, (1858), 274–32.
35. Harrington, Charles Richard. *The Year without a Summer*. Ottawa, 1992.
36. Hațeganu, Lucia. *Cartea veche românească în Biblioteca Muzeului Unirii din Alba-Iulia. III* [The old Romanian book in the Library of the Museum of Union in Alba-Iulia. III]. *Apulum*, No. XIV (1976), 225–50.
37. Herkle, Senta; Holtz, Sabine and Kollmer-von Oheimb-Loup, Gert (Eds.): *1816 – Das Jahr ohne Sommer. Krisenwahrnehmung und Krisenbewältigung im deutschen Südwesten* (Veröffentlichungen der Kommission für geschichtliche Landeskunde in Baden-Württemberg, Reihe B: Forschungen). Stuttgart, 2019.
38. Hietzinger, Carl Bernhard Edlen von. *Statistik der Militärgränze des österreichischen Kaisertums*, Vol. 1–3, Vienna: Carl Gerold, 1817–1823.
39. Imreh, István. *Viața cotidiană la secui 1750–1850. (Studii)*. [Daily life at Szekler 1750–1850 (Studies)]. București: Kriterion, 1982.
40. Iorga, Nicolae. *Scrisori și inscripții ardeleni și maramureșene. II. Inscriptii și însemnări* [Letters and inscriptions from Transylvania and Maramures. Inscriptions and notes]. București: atelierele grafice Sococ & co., 1906.

41. Juneja, Monica, and Muelshagen, Franz. "Disasters and Pre-Industrial Societies: Historiographic Trends and Comparative Perspectives". *The Medieval History Journal*, 10 (2007), 1&2, 1–31.
42. Kiss, Andrea. *Floods and Long-Term Water-Level Changes in Medieval Hungary*, doctoral dissertation, Budapest, 2011.
43. Kiss, Andrea and Csernus-Molnár. "Időjárás viszonyokhoz kapcsolható szélsőségek területi vonatkozásai a Temesi Bánságban: 1780–1800" [Areal consequences of weather-related extremes in the Temesi Bánság/Banat area: 1780–1800], 2008: 101–106.
44. Kiss, Andrea and Csernus-Molnár, Pécsik: "18th-century daily measurements and weather observations in the SE-Carpathian Basin: A preliminary analysis of the Timișoara series (1780–1803)". *Journal of Environmental Geography* 7/1–2, 2014: 1–9.
45. Klingaman, Nicholas and Klingaman, William. *The Year Without Summer: 1816 and the Volcano That Darkened the World and Changed History*. New York, 2013.
46. Leu, Valeriu. *Banatul între arhaic și modern. Mentalități în Veacul Luminilor* [Banat between archaic and modern. Mentalities in the Age of Enlightenment]. Reșița: Muzeul de Istorie al Județului Caraș-Severin, 1993.
47. Leu, Valeriu. *Cartea veche din Bisericile Eparhiei Caransebeșului* [The old book from the Churches of the Diocese of Caransebeș]. Reșița: Banatica, 1996.
48. Moldovan, Liviu, and Grama, Viorel. "Situația oierilor români transilvăneni în Țara Românească pe timpul domniei lui Ioan Caragea (1812–1818)" [The situation of the Romanian Transylvanian herdsmen in Wallachia during the reign of Ioan Caragea (1812–1818)]. *Marisia*, No. IX, (1979), 237–45.
49. Mușlea, Ion. "'Însemnările' popii Nicolae Grid despre Șcheii de altădată și biserica lor" ['The notes' of priest Nicolae Grid about the Șcheii of yesteryear and their church]. *Țara Bârsei*, No. 4 (1931), 341–52.
50. Neamțu, Alexandru. "Un proiect din anul 1817 privind măsuri de îmbunătățire a situației țărănimii din Transilvania" [A project from 1817 on measures to improve the peasant situation in Transylvania]. *Anuarul Institutului de Istorie și Arheologie Cluj-Napoca*, No. II (1980), 487–95.
51. Neamțu, Alexandru. "Date noi despre foametea din anii 1814–1816 pe domeniul Zlatnei" [New data on the famine of the years 1814–1816 in the Zlatna area]. *Anuarul Institutului de Istorie Cluj*, No. XIX, (1976), 315–42.
52. Negruți Ecaterina. "Informații noi privind emigrările din Bucovina în prima jumătate a secolului al XIX-lea" [New information on the emigrations from Bucovina in the first half of the 19th century]. *Anuarul Muzeului Județean Suceava*, No. VIII (1981), 257–63.
53. Nicoară, Toader. "Variații climaterice și mentalități colective în sec. al XVIII-lea și începutul secolului al XIX-lea (1700–1830)" [Climatic variations and collective mentalities in the 18th and early 19th century (1700–1830)]. *Studii și Comunicări*. No. VII-VIII (1986-1987), 257–64.
54. Nussbaumer, Josef. *Gewalt der Natur. Eine Chronik der Naturkatastrophen von 1500 bis heute*. Basel: Sandkorn, 1996.
55. Oppenheimer, Clive. *Eruptions that Shook the World*. Cambridge: University Press, 2011.
56. Pal, Judith. *Procesul de urbanizare în scaunele secuiești în secolul al XIX-lea* [The process of urbanization in the Szekler seats in the 19th century]. Cluj-Napoca: Presa Universitară Clujeană, 1999.
57. Pop, Dariu. *Mărturii strămoșești. Note paleografice pe margini de cărți bisericești sătmărene* [Ancestral testimonies. Palaeographic notes on the margins on church books of Satu Mare]. Satu Mare: Athenaeum, 1938.
58. Rácz Lajos. *Climate History of Hungary Since 16th Century: Past Present and Future*. Pécs: Centre for Regional Studies of the Hungarian Academy of Sciences, 1999.
59. Radosav, Doru. "Les entrées royales în Transilvania și Banat (sec. XVIII-XIX). Discurs oficial – discurs imaginar". [Les entrées royales in Transylvania and Banat (18th–19th centuries). Official speech – imaginary speech]. *Colloquia, Journal of Central European Studies, sec XXI*, No. 1–2, (2004), 110–60.
60. Radu, Iacob. *Istoria vicariatului greco-catolic al Hațegului* [History of the Greek Catholic vicarage of Hațeg]. Lugoj: Gutenberg, 1913.
61. Rohr, Christian. *Extreme Naturereignisse im Ostalpenraum. Naturerfahrung im Spätmittelalter und am Beginn der Neuzeit*. Köln, Weimar, Wien: Böhlau, 2007.
62. Roșu, Titus. *Însemnări și inscripții bihorene* [Notes and inscriptions from Bihor]. Beiuș: Universitatea Stahl, 1941.
63. Schenk, Gerrit Jasper and Engels, Jens-Ivo (Eds.). *Historische Katastrophenforschung. Begriffe, Konzepte und Fallbeispiele* (Historical disaster research. Concepts, methods and case studies. Historical Social Research 32, 3, Special Issue). Köln, 2007.
64. Stoica de Hațeg, Nicolae. *Cronica Banatului* [The Chronicle of the Banat] Timișoara: Facla, 1981.
65. Stoica de Hațeg, Nicolae. *Scrieri: Cronica Mehădiei* [Notes. The Chronicle of Mehădia]. Timișoara: Facla, 1984.
66. Szabó, Nicolae. "Dezvoltarea agriculturii țărănești din scaunul Mureș în secolul al XVIII-lea și primele decenii ale secolului al XIX-lea" [The development of rural agriculture from the Mureș country in the 18th century and the first decades of the 19th century]. *Cercetări de Științe Sociale*, 12 (1982), 225–52.

67. Ștefănescu, Barbu. "Începuturile introducerii tehnicii moderne în agricultura Bihorului" [The beginnings of introducing modern technology in the agriculture of Bihor country]. *Biharea*, No.1 (1981), 7–38.
68. Tóth, Susana. "Tîrgurile din Oradea (III). Aspecte etno-demografice ale tîrgurilor din Oradea" [The markets in Oradea (III). Ethno-demographic aspects of the markets in Oradea]. *Biharea*, IV, Oradea (1978), 105–48.
69. Trommelt, Fabian and Hitz, Florian. *Das Jahr ohne Sommer: Die Hungerkrise 1816/17 im mittleren Alpenraum*. Innsbruck: Wagner Verlag, 2017.
70. Trócsányi, Zsolt. *Az erdélyi parasztság története 1790–1848* [The history of the Transylvanian peasantry between 1790–1848]. Budapest: Akadémiai Kiadó, 1956.
71. Újfalvi, Sándor. *Emlékiratok* [Memories]. Budapest: Szépirodalmi Könyvkiadó 1990.
72. Without Author. "Auszug aus 'Annales Czeidinenses' (1597–1840)", in *Quellen zur Geschichte der Stadt Brassó. Chroniken und Tagebücher*, 2 (1392–1851) edited by Julius Gross, Brassó, 1909.
73. Without Author. "Ziarul grănicerului Vasile Crăciun din Nepos" [The diary of the board-guarders Vasile Crăciun from Nepos]. *Arhiva Someșană*, 20 (1936), 233–55.
74. Wood, Gillen. *Tambora. The eruption that changed the world*. Oxford: Princeton University Press, 2014.
75. The Paper *Dörptsche Zeitung*, Dorpat, 1815–1818.
76. The Paper *Rigasche Zeitung*, Riga, 1815–1818.
77. The Paper *Zuschaer*, Riga, 1815–1818.

Economic- and Ecohistory
Ekonomska i ekohistorija

Journal for Economic History and Environmental History

Časopis za gospodarsku povijest i povijest okoliša

Topic / Tema broja

Historical Climatology in the Context of Human and
Environmental History of the Eastern Adriatic, the
Carpathian Basin and the South-Eastern Alps

*Povijesna klimatologija u kontekstu povijesti ljudi i okoliša istočnog
Jadrana, Panonske nizine (Karpatskog bazena) i jugoistočnih Alpa*

Volume XVI / Number 16

Zagreb – Samobor 2020

ISSN 1845-5867

UDK 33 + 9 + 504.3

Publishers / Nakladnici:

Društvo za hrvatsku ekonomsku povijest i ekohistoriju
Society for Croatian Economic History and Environmental History
Ivana Lučića 3, HR – 10000 Zagreb
sites.google.com/site/ekoekohist/

Izdavačka kuća Meridijani
p.p. 132, 10430 Samobor
tel.: 01/33-62-367, faks: 01/33-60-321
e-mail: meridijani@meridijani.com
www.meridijani.com

Co-publisher / Sunakladnik:

Ekohistorijski laboratorij Centra za komparativnohistorijske i interkulturalne studije
Filozofskog fakulteta Sveučilišta u Zagrebu
Ivana Lučića 3, 10000 Zagreb, Hrvatska
www.ffzg.unizg.hr; <http://ckhis.ffzg.unizg.hr/>

Editor-in-chief / Glavni i odgovorni urednik:

Hrvoje Petrić, Žiga Zwitter (guest editor)

Editorial Staff / Uredništvo:

Dragutin Feletar, Željko Holjevac, Mira Kolar-Dimitrijević, Dubravka Mlinarić, Nenad Močanin,
Hrvoje Petrić, Drago Rokсандić, Mirela Slukan Altić, Ivica Šute, Žiga Zwitter

International Editorial Board / Međunarodno uredničko vijeće:

Drago Rokсандić – president/predsjednik (*Zagreb*), Daniel Barić (*Sorbonne-Paris, Francuska*), Marija Benić Penava (*Dubrovnik*), Slaven Bertoša (*Pula*), Zrinka Blažević (*Zagreb*), Tatjana Buklijaš (*Auckland, New Zealand*), Ljiljana Dobrovšak (*Zagreb*), Goran Đurđević (*Požega*), Josip Faričić (*Zadar*), Borna Fürst Bjeliš (*Zagreb*), Boris Golec (*Ljubljana, Slovenija*), Hrvoje Gračanin (*Zagreb*), Paul Hirt (*Tempe, SAD*), Andrej Hozjan (*Maribor, Slovenija*), Egidio Ivetic (*Padova, Italija*), Silvije Jerčinović (*Križevci*), Karl Kaser (*Graz, Austrija*), Isao Koshimura (*Tokio, Japan*), Marino Manin (*Zagreb*), Christof Mauch (*München, Njemačka*), Kristina Milković (*Zagreb*), Ivan Mirnik (*Zagreb*), Mirjana Morosini Dominick (*Washington D.C., SAD*), Géza Pálffy (*Budimpešta, Mađarska*), Daniel Patafta (*Zagreb*), Hrvoje Petrić (*Zagreb*), Lajos Rácz (*Szeged, Mađarska*), Gordan Ravančić (*Zagreb*), Marko Šarić (*Zagreb*), Mladen Tomorad (*Zagreb*), Jaroslav Vencalek (*Ostrava, Češka*), Milan Vrbanus (*Slavonski Brod, Zagreb*), Frank Zelko (*Honolulu, SAD*), Zlata Živaković Kerže (*Osijek*), Ivana Žebec Šilj (*Zagreb*)

Article's UDC markups / UDK oznake članka:

Ivica Zvonar

Layout / Prijelom:

Saša Bogadi

Journal directors / Za nakladnike:

Petra Somek, Hrvoje Petrić, Miljenko Šimpraga

ISSN 1849-0190 (Online)

ISSN 1845-5867 (Tisak)

Print by / Tisak:

Bogadigrafika, Koprivnica 2020.

Mailing addresses / Adresa uredništva:

Hrvoje Petrić (editor/urednik)
Odsjek za povijest, Filozofski fakultet
Ivana Lučića 3, HR-10000 Zagreb
e-mail: hrvoje.petric@ffzg.hr
ili Vinka Vošickog 5, HR-48000 Koprivnica

Print supported by Ministry of science and education of Republic of Croatia / Tiskano uz potporu Ministarstva znanosti i obrazovanja RH**Cover / Na naslovnici:**

Picture of Zadar from 1486 from the travelogue of Konrad von Grünemberg. View from the southwest.
(From: Badische Landesbibliothek, Karlsruhe)

Ekonomsku i ekohistoriju referiraju:

CAB Abstracts
HISTORICAL ABSTRACTS, ABC CLIO Library, Santa Barbara, California, USA
AMERICA: HISTORY AND LIFE, Washington, USA
JOURNAL OF ECONOMIC LITERATURE (JEL), Pittsburgh, USA
CENTRAL AND EASTERN ONLINE LIBRARY, Frankfurt am Main, Deutschland
ECONLIT – AMERICAN ECONOMIC ASSOCIATION, Nashville, USA