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Weather Heritage, Scientific Networks and Weather Memory in Seventeenth Century Estonia, Livonia and Curonia

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Abstract. This article examines how the climate crises of the seventeenth century shaped forms of weather heritage and weather memory in Livonia and Courland, drawing on religious, economic and early scientific literature. It investigates weather-related social practices as expressions of local weather heritage. The study seeks to bridge the gap between literary studies and cultural climatology by asking how past weather events were recorded, transmitted and remembered. It argues that local weather heritage can be understood as a transcultural and trans-social set of practices shared among Estonians, Latvians and Germans, while also being connected to trans-regions and larger knowledge systems.

Keywords: Baltic history, climate history, weather memory, weather heritage, memory studies

INTRODUCTION

The seventeenth century, known in Baltic history for its confessional conflicts between Sweden and Poland, as well as for the growth of cultural production, was also a century deeply shaped by weather and climate.[1] Owing to the fragility of social structures and the environmental pressures associated with the Little Ice Age, the Maunder Minimum, and growing volcanic activity,[2] the century was framed by two severe famines.[3] It was further marked by harvest failures in the 1640s, culminating in a distinctive weather-related uprising among the local population.[4] At the same time, this period witnessed a growing need to explain weather as a phenomenon, a rediscovery of weather heritage, and the emergence of new forms of weather memory.

This article examines forms of weather heritage and weather memory, focusing on how past weather-related events were remembered and to what ends. It contributes to the field of cultural climatology[5] and

1 On the interaction between climate change and political conflicts in the seventeenth century, see M. Stoffel, C. Corona, F. Ludlow, M. Sigl, H. Huhtamaa, E. Garnier, S. Helama, S. Guillet, A. Crampsie, K. Kleemann, C. Camenisch, J. McConnell, C. Gao. Climatic, weather, and socio-economic conditions corresponding to the mid-17th-century eruption cluster. – Climate of the Past, 2022, 18, 1083–1108; C. Pfister, R. Brázdil, J. Luterbacher, A. E. J. Ogilvie, S. White. Early Modern Europe. – The Palgrave Handbook of Climate History. Ed. by S. White, C. Pfister, F. Mauelshagen. Palgrave Macmillan, London, 2018, 265–295; D. Degroot. Climate Change and Conflict. – The Palgrave Handbook of Climate History. Ed. by S. White, C. Pfister, F. Mauelshagen. Palgrave Macmillan, London, 2018, 367–385; Parker, G. Global Crisis. War, Climate Change and Catastrophe in the Seventeenth Century. Yale University Press, New Haven, 2013; G. Parker. Crisis and catastrophe: The world crisis of the seventeenth century reconsidered. – American Historical Review, 2008, 113, 1053–1079, https://doi.org/10.1086/ahr.113.4.1053; S. Ogilvie. Germany and the Seventeenth Century Crisis. – The General Crisis of the Seventeenth Century. Ed. by G. Parker, L. Smith. Routledge, London, 1997, 57–87.

2 H. Wanner, C. Pfister, R. Neukom. The variable European Little Ice Age. – Quaternary Science Reviews, 2022, 287, 107531. https://doi.org/10.1016/j.quascirev.2022.107531; H. Huhtamaa, M. Stoffel, C. Corona. Recession or resilience? Long-range socioeconomic consequences of the 17th century volcanic eruptions in northern Fennoscandia. – Climate of the Past, 2022, 18, 9, 2077–2092.

3 M. Seppel. Feeding the motherland: grain exports from the Swedish Baltic provinces during the Great Famine of 1696–1697. – Scandinavian Economic History Review, 2015, 63, 3, 215–234; M. Seppel. Peatoidusehädad Liivimaal 1629–1700. – Tuna, 2004, 3, 25–36. M. Seppel. Näljaabi Liivi- ja Eestimaal 17. sajandist 19. sajandi alguseni. (Dissertationes Historiae Universitatis Tartuensis, 15.) Tartu Ülikooli Kirjastus, Tartu, 2008; O. Liiv. Suur näljaaeg Eestis 1695–1697. – Akadeemilise Ajalooseltsi toimetised, 1938, 9; S. Vahtre. Ilmastikuoludest Eestis XVIII ja XIX sajandil (kuni 1870) ja nende mõjust põllumajandusele ning talurahva olukorrale. – Eesti NSV ajaloo küsimusi, 6 (TRÜ toimetised, 258). Tartu Riiklik Ülikool, Tartu, 1970, 43–159.

4 U. Plath, K. Vanamölder. Põrkuvad „ilmamaad" 17. sajandi Liivimaal. – Methis, 2022, 24, 30, 27–46.

5 W. A. Behringer. History of Climate. Polity Press, Malden, MA, 2010; C. Pfister. Climatic extremes, recurrent crises and witch hunts: Strategies of European societies in coping with exogenous shocks in the late sixteenth and early seventeenth centuries. – Journal of Medieval History, 2007, 10, 33–73. https://doi.org/10.1177/0971945807010000202, 2007; M. Hulme. Climate and its changes: a cultural appraisal. – Geo 2015, 2, 1, 1–11, 3; S. Bergmann. Weather, Religion and Climate change. New York, London, Routledge, 2021; H. Huhtamaa, F. C. Ljungqvist. Climate in Nordic historical research – a research review and future perspectives. – Scandinavian Journal of History, 2021, 665–695.

argues for a broader understanding of memory in climate history.[6] To date, memory here has largely been approached through the lens of large-scale catastrophes – how such events were remembered or forgotten, and how societies responded to environmental risks. In contrast, this article does not centre on disaster memory; rather, it examines whether and how climatically challenging periods were reflected in cultural production and local practices, and the extent to which these practices and understandings of weather as a phenomenon were shaped through the remembrance of past weather events.

Weather memory is not identical to climate memory. Whereas the latter seeks traces of past climates within natural archives, weather memory is concerned with human archives and the ways in which weather events – or even perceived norms and averages – were recorded, interpreted and embedded in cultural practices. These two forms of memory are, however, closely interconnected. As Peter Adamson and David Rapson have argued, "weather and climate should be considered forms of both natural and intangible cultural heritage", serving as umbrella terms for diverse forms of environmental, cultural and spatial memory and practice.[7] The question of how weather and climate were perceived across different social strata is particularly significant in Baltic history, given the complex colonial entanglements between Estonian and Latvian peasants, the German-speaking middle and upper classes, and shifting political regimes (Sweden, Poland). It is therefore necessary to ask not only how different confessional groups, but also how distinct social and cultural communities, interpreted the weather events they experienced. Can Baltic weather memory be understood as an entangled phenomenon that transcends social hierarchies and power structures as supposed in memory studies?[8] How far can we apply the

6 Historical oriented memory studies are often concentrating on disasters, see e.g. Ch. Rohr. Disaster memory and 'banished memory': General considerations and case studies from Europe and the United States (19th–21st centuries). – Dealing with Disasters from Early Modern to Modern Times Cultural Responses to Catastrophes. Ed. by H. van Asperen, L. Jensen. Amsterdam University Press, Amsterdam, 2023, 315–337.

7 G. Adamson, J. Rapson. Weather, heritage, and memory. – WIREs Climate Change, 2024, 15, 6, 1–8. https://doi.org/10.1002/wcc.913, 2. L. Plate argues in the same way: "Memory Studies could upscale the concept for a posthumanist understanding of memory and reconceive it to be about the environment at large; a true memory environment of which humans are (but) a part." (L. Plate. Climate change and the metamorphosis of memory: A response to Stef Craps. – Parallax, 2017, 23, 4, 493–497 (here 495). https://doi.org/10.1080/13534645.2017.1374519)

8 R. Crownshaw. Cultural memory studies in the epoch of the Anthropocene. – Memory Unbound: Tracing the Dynamics of Memory Studies. Ed. by L. Bond, S. Craps, P. Vermeulen. Berghahn, New York, 2017, 242–257; Transnational Memory: Circulation, Articulation, Scales. Ed. by C. De Cesari, A. Rigney. De Gruyter, Berlin, 2014; Memory in a Global Age: Discourses, Practices and Trajectories. Ed. by A. Assmann, S. Conrad. Palgrave Macmillan, Houndmills, 2010.

new environmental approaches of the fourth wave of memory studies to historical knowledge?[9] While this article cannot provide exhaustive answers, it aims to shed light on a question that merits far broader discussion.

The primary sources for this study are locally printed German-language texts. In the second half of the seventeenth century, the number of printed publications increased significantly, accompanied by new forms of knowledge transmission across regions, and new interactions between authors, publishing houses and readers. Over the past two decades, scholarly interest in seventeenth-century cultural and literary studies has grown substantially.[10] Recent research in Baltic literary history has demonstrated the extent to which international, regional and local forms of knowledge production were intertwined.[11] As shown in studies of early modern Latin literature, scholarly networks were as elsewhere a normal feature of academic life in Estonia, Livonia and Courland.[12] At the same time interest in systematic weather observation expanded following a late medieval boom centred in Nuremberg and spread particularly through Polish universities, where planetary astronomy and the production of astrological almanacs (ephemerides) flourished. What did local Baltic weather memory look like, and which concepts of weather generation were prevalent?

The sources examined in this article belong to several genres. Religious literature remained the dominant form of Baltic literary culture throughout the medieval and early modern periods. Particular attention is given here to the sermons of Samson Hermann (1579–1643), including his witch sermons of 1621[13] and his comet sermon of 1619.[14] Also central is Johannes Gutslaff's *Short Report and Instruction about the Falsely Sacred*

9 E. Gülüm, P. Leworthy, J. Tabaszewska, H. Teichler. Memory and Environment. – Memory Studies Review, 2024, 1. 3–15. https://doi.org/10.1163/29498902-20240007.

10 See the work of Martin Klöker, Aivar Põldvee, Kristi Viiding, Stefan Donecker, Meelis Friedenthal, etc.

11 Entangled Cultures in the Baltic Region. Ed. by E. Laanes = Special Issue of Journal of Baltic Studies 2020, 51, 3; J. Undusk. Baltisaksa kirjakultuuri struktuurist. Ärgituseks erinumbri lugejale. – Keel ja Kirjandus, 2011, 8–9, 561–571; L. Lukas. Estonian folklore as a source of Baltic-German poetry. – Journal of Baltic Studies 2011, 42, 4, 491–510. https://doi.org/10.1080/01629778.2011.621738.

12 Briefe, Recht und Gericht im polnischen Livland am Beispiel von David Hilchen = Letters, Law and Court in Polish Livonia: The Case of David Hilchen. Hrsg. von K. Viiding, H. Siimets-Gross, T. Hoffmann, unter Mitarbeit von M. Klöker. (Baltische literarische Kultur, 4.) LIT, Münster, 2022.

13 S. Hermann. Neun Ausserlesen vnd Wolgegründete Hexen Predigt, Darinnen der Terminus Magiae oder Zäuberey nach den Logicalischen terminis richtig vnd kürtzlich auss Gottes Wort, vnd andern Schribenten vnd Historien erkläret vnd aussgeführet worden, und in der Thumb Kirchen zu Riga öffentlich gehalten, Riga, Gerhard Schröder, 1626.

14 S. Hermann. Cometen Prediegt [!], Das ist, Christliche Unterweisung, Wie man den Cometen, (welcher sich newlich am Himmel hat sehen lassen) soll betrachten (...). Nicolaus Mollin, Riga, 1619.

River Wöhhanda in Livonia (1644), which addresses the climatic unrest of 1642 from the perspective of a local pastor.[15] In the second half of the century, we observe a rise in local economic literature. While German *Hausväterliteratur* drew on classical traditions and often produced extensive, richly illustrated works intended for rulers, the surviving Baltic examples of this genre were considerably shorter and more practical in content, as they were aimed not at kings and princes but at local manor owners and bailiffs.[16] These texts describe ideal estate management and provide insight not only into social organisation but also into weather observation as an agricultural practice.[17] This article focuses on Salomon Gubert's *Stratagema oeconomicum, oder Akker-Student*, published in four editions between 1645 and 1757,[18] itself based on a now-lost late sixteenth-century work.[19] Other texts in this genre, such as Johann Hermann von Neidenburg's *Liefflandischer Landmann* (Riga, 1662–1695)[20] and the anonymous *Faithful Bailiff*[21], contain comparatively little material on weather and are therefore not included in this study. In addition to religious and economic writings, early scientific literature addressing meteorological questions must also be considered. Accordingly, the first work devoted to the history of Baltic weather – *Prodromus Aurorae Boreae sive Historiae Meteorologicae Teutonico-Curlandicae Astrologiae* by Georg Krüger (1700), hereafter referred to as the *Weather History*[22] – will be analysed, as it retrospectively surveys weather observations

15 J. Gutslaff. Kurtzer Bericht vnd Vnterricht Von der Falsch-heilig genandten Bäche in Lieffland Wöhhanda. Daraus die Vnchristliche Abbrennunge der Sommerpahlschen Mühlen geschehen ist. Aus Christlichem Eyfer, wegen des Vnchristlichen vnd Heydnischen Aberglaubens gegeben Von Johanne Gutslaff, Pomer. Pastorn zu Vrbs in Lieffland. J. Vogel, Dorpat, 1644.

16 See U. Plath. Stille im "Haus": Hausvater, Verwalter und transnationale Gesellung auf dem baltischen Gutshof zwischen 1750 und 1850. – Ehe. Haus. Familie: Strategien und Inszenierungen häuslichen Lebens 1750–1850. Hrsg. von I. Schmidt Voges. Böhlau, Köln, 2010, 179–207; U. Plath. Kommunikation als Drahtseilakt: Verwalter auf dem baltischen Gutshof in der Frühen Neuzeit. – Das Leben auf dem Lande im Baltikum. Hrsg. von J. Heyde. Carl-Schirren-Gesellschaft, Lüneburg, 2012, 273–315.

17 Anonym. Der getreue Amt-Mann, oder, Unterricht eines guten Hauss-Halters. Georg Matth. Nöller, Riga, 1696.

18 S. Gubert. Stratagema oeconomicum oder Ackerstudent, denen jungen ungeübten Ackerleuten in Liefland zum nöthigem Unterricht (...). G. Schröder, Riga, 1645.

19 Zacharias Stopius's *Liefländische Oeconomia* was allegedly not printed for financial reasons, but contemporaries suspected that this had more to do with his role in the calendar riots and his dubious political activities, see U. Plath. Stille im "Haus".

20 J. Herman von Neidenburg. Liefflandischer Landman. Heinrich Bessemesser, Riga, 1662.

21 Anonym. Der getreue Amt-Mann, oder, Unterricht eines guten Hauss-Halters, Georg Matth. Nöller, Riga, 1696.

22 G. Krüger. Prodromus Aurorae Boreae Sive Historiae Meteorologicae Teutonico-Curlandicae Astrologiae Naturalis fundamendo exornatae & comprobatae Das ist Vortrab Teutsch= und Curländischen Gewitter=Historie Durch die wahre natürliche Astrologie bewehret und probiret, Nemlich Wie es in dem gantzen Seculo von Anno 1600 bis 1700. Jährlich von einem Qvartal oder Jahrs=Viertel zum andern / Winter / Früling / Sommer / Herbst / theils in Teutschland / theils in Curland nach dem Astrologischen Fundament gewittert / dem curieusen Liebhaber zur Nachricht / andern zum nützlichen Unterricht mit Fleiß zusammen getragen / und in dieser Forme Tafel. Nöller, Riga, 1700.

across the century. Rooted in the astrological traditions of Gdańsk, the work is linked to academic scholarship, astrology and calendar-making practices within the Polish sphere. It also represents an early example of organised weather memory and observation networks. Within Baltic climate history, it occupies a unique position, although it ultimately remained an incomplete endeavour. While the relationship between early modern calendars and climatic knowledge has been studied,[23] Krüger's *Prodromus* attracted scholarly attention in the field of communication studies and astrology mainly as a calendar maker,[24] but remained understudied within climate history and studies on weather memory.

This article compares weather-related knowledge across the three literary genres outlined above, analyses the cultural layers underpinning them and their interconnections, and evaluates the significance of weather memory and weather heritage for Baltic climate and cultural history. Its aim is to bridge the gap between climate, literary, communication, religious and memory studies.

RELIGION AND LOCAL WEATHER HERITAGE IN THE SEVENTEENTH CENTURY

Any analysis of weather-related knowledge in the early modern Baltic region cannot begin without considering the official doctrine of the Protestant Church in the first half of the seventeenth century. Samson Hermann (1579–1643),[25] superintendent of the Protestant Church in Riga, articulated a representative theological position in his widely circulated witch sermons. Within this framework, the making of weather was understood to lie exclusively in the hands of God. Any interpretation of weather conditions thus functioned as a kind of "moral

23 K. M. Smith. The Science of Astrology: Schreibkalender, Natural Philosophy, and Everyday Life in the Seventeenth-century German Lands. PhD thesis, University of Cincinnati, 2018. https://etd.ohiolink.edu/apexprod/rws_etd/send_file/send?accession=ucin1522057810431579&disposition=inline.

24 Y.-G. Mix, F. Köther, K. Kandler. Die Kalender-, Almanach- und Taschenbuchliteratur Estlands, Livlands und Kurlands (1700–1830): Analytische Bibliographie. Teil I, 2018; Teil II, 2019; http://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=krueger_georg; J. Kaminskis, J. Klētnieks. The Activities of Georgius Krüger, Secretary of the Astronomer Johannes Hevelius, in Courland. – Johannes Hevelius and His World: Astronomer, Cartographer, Philosopher and Correspondent. Ed. by R. L. Kremer, J. Włodarczyk. Instytut Historii Nauki PAN, Warsaw, 2013, 231–235.

25 P. O. Schabert. Mag. Hermann Samson, der erste livländische Superintendent: Ein Lebensbild für Jung und Alt. Jonck & Poliewsky, Riga, 1906. https://www.deutsche-biographie.de/gnd124292712.html#adbcontent.

barometer",[26] reflecting an individual's spiritual state; deviation from orthodox understanding could easily provoke suspicion and accusation.

According to Hermann, Satan, together with witches and sorcerers, sought to discern and anticipate God's meteorological design in order to deceive humanity and assert false authority over the future. He explicitly criticised Catholic beliefs for attributing excessive power to demonic forces and condemned practices associated with weather-making, as well as belief in such powers, as forms of black magic that should be prohibited.[27] At the same time, Hermann distinguished between illicit practices and the interpretation of natural signs. The latter, which he classified as *magia naturalis* (natural magic),[28] constituted a permissible – if still morally ambiguous – form of knowledge. Drawing on biblical examples, he argued that even Jesus Christ and the prophet Elijah engaged in such practices by interpreting signs in nature to anticipate weather changes.

> Christ the Lord speaks of such natural magic: In the evening, you say, It will be fair weather, for the sky is red (Matthew 16); and in the morning, you say, Today there will be a storm, for the sky is red and overcast. The great wonder-prophet Elijah also observed such natural magic when he said that it would rain, upon seeing a small cloud, like a man's hand, rising out of the sea.[29]

In Hermann's view, reading natural signs to understand imminent weather conditions was comparable to the use of medicinal plants: a minor and forgivable transgression. Nevertheless, he insisted that weather phenomena should primarily serve as occasions for praising God. Through religious contemplation, the observation of weather could and even should become a form of spiritual exercise.[30] In contrast, long-term forecasting or attempts to alter divinely ordained weather patterns were unequivocally condemned as black magic.[31] Efforts to predict the future, whether through astrology, ritual practices or sacramental

26 S. Bergmann. Weather, Religion and Climate Change. New York, Routledge, London, 2021, 71–74.

27 U. Plath, K. Vanamölder. Põrkuvad „ilmamaad" 17. sajandi Liivimaal.

28 "Vnd ist fürwar eine grosse Sünde vnnd Vermessenheit / gewisse Tage setzen / oder nennen / daran es kalt oder warm trüb oder helle / trucken oder feucht sein werde. Wie auch diejenigen sich sehr an GOtt versündigen / die im Gewitter nicht auff GOtt sehen / sondern lauffen zum Calender / vnd wollen daraus lehrnen / was für Gewitter seyn werde." Those who believed in Satan causing bad weather were cursed by the officials of the churches: S. Hermann. Neun Ausserlesen, 63, 70.

29 "Von solcher natürlichen Magia redet der HErr Christus: Deß Abends/sprecht ihr, es wird ein schöner Tag werden / denn der Himmel ist rodt (Matt. 16): Vnd deß Morgens sprecht ihr es wird heut Vngewitter sein / denn der Himmel ist rodt vnd trübe. Auff solche natürliche magiam hat auch gesehen der grosse WunderProphet Elias / inDem er gesaget / es würde regnen / da er sahe /daß eine kleineWolcke / wie eines Mannes Hand/auß dem Meer auffgienge." S. Hermann. Neun Ausserlesen, Fünffte Predigt, s.p.

30 Ibid.

31 Ibid.

interventions against storms and hail, were equated with superstition and likened to magical practices in warfare, such as attempts to render oneself invulnerable.[32] Looking into the future was thus construed as sinful, whereas reflecting on past weather events, particularly through the lens of scripture, was considered a legitimate religious practice.

The question arises as to whether such theological interpretations can also be identified in other literary genres beyond explicitly religious texts. Evidence suggests that Hermann's doctrinal position often clashed with the lived experiences and beliefs of local populations, including Estonians, Latvians, Russians and Baltic Germans, whose livelihoods depended more directly on environmental conditions. A striking example is provided by events in 1642 in southern Estonia, where a watermill belonging to a German landowner was twice destroyed by local inhabitants. The attackers believed that the mill obstructed the sacred waters of the Võhandu River, which, according to local tradition, needed to flow freely and remain pure in order to ensure favourable weather.[33] Here, local weather-related beliefs and practices came into direct conflict with both ecclesiastical doctrine and the economic interests of the ruling elite. The resulting unrest escalated into broader uprisings that required intervention by local authorities. This event prompted the local pastor Johannes Gutslaff (d. 1657) to compose an extensive theological and scholarly treatise of over 300 pages, addressing the religious interpretation of local weather practices and memory. His account reveals that participation in the unrest was not limited to peasants; local Germans and even members of clergy were implicated. Gutslaff criticised not only popular practices but also the reliance of German elites on astrology and calendrical prognostication, which – like Hermann – he categorised as forms of illicit knowledge.[34] In this sense, all segments of society were, in one way or another, accused of improperly attempting to predict or influence the weather.

Gutslaff's writings also provide valuable insight into the role of memory in sustaining weather-related practices. He reports that earlier rituals involving the periodic cleaning of rivers and springs had been

32 S. Hermann. Neun Ausserlesen, Achtes Kapitel, s.p.

33 "Denn solch Geschrey hat gantz Liefland erfüllet gehabt / also daß von Riga an biß Narva, Revall / Pernaw ec der Lettische Bawr über die Schwäti Ubbe / der Ehstnische Bawr aber über die Pöha Jöge gerufen hat. Vnd nicht alleine hat dies Aergernisse den Bawrsman berühret / sondern hat auch viele der Teutschen bethöret / vnd zwar des gemeinen Mannes den mehrerntheil / auch etzliche im hohen Stade vnnd Ansehen: Schande ist es / daß ich bekennen muß / daß auch *Pastores*, die der Gemeine Christi mit heilsamer Lehre vorstehen sollen / sich nicht geschewet haben / diesen schändlichen *Paganismus* zu *defendieren*". (J. Gutslaff. Kurtzer Bericht vnd Vnterricht, 17–18)

34 Ibid., 285–286, 302–304.

regularly performed until the conquest of southern Estonia under Charles IX of Sweden.[35] Thereafter, such practices fell into decline but were partially revived during the crises of the early 1640s, when it was remembered that ancestors had been able to influence weather conditions. Testimonies from elderly peasants affirmed the perceived efficacy of these rituals.[36] Weather-related memory extended even further back in time and across cultural boundaries. Gutslaff recounts, for instance, that "during the Russian war"[37] Tatars serving in the Russian forces forced a local peasant to clean the stream in order to ensure favourable weather conditions.[38] Memory concerning weather manipulation dated therefore back more than 50 years and included transcultural features. However, the introduction of Protestantism under Swedish rule appears to have interrupted these traditions, which resurfaced primarily in times of environmental crises. This raises the question of whether periods of climatic stress reactivated older, nearly forgotten forms of weather heritage. If so, such cases would provide concrete evidence for the adaptive strategies described by Arno Borst, who argued that medieval and early modern societies developed recurring patterns for coping with environmental crises, while modern societies simply tend to forget them. In the Baltic context, these patterns of local weather memory appear as entangled phenomena, mobilised in response to severe weather conditions and capable of bridging divisions of culture, language and social hierarchy.

35 In 1602, the Swedish king Charles IX confirmed the privileges of the knighthoods of the districts of Võnnu, Tartu and Pärnu.

36 "Es ist unser alter Glaube also/denn es haben uns die Alten also gelehret. Und sagen weiter / es haben solchees ihre Vorfahren allewege gehalten / diesen Brunn und Bäche jährlich reine zu halten / biß zur Ankunft König Caroli seligen Andenckens aus Schweden nacher Dörpat / zu der Zeit und hernach sey es verblieben und aus der acht gekommen / dass seydhero weder der Brunn noch die Bäche sey gereiniget worden. Lettuiske Michel sagte mir / es hetten die Alten durch diesen Brunn das Gewitter stellen können wie sie gewolet hetten. Denn hetten sie Regen und Ungewitter begehret, Y so hätten sie etwas in den Brunne oder die Bäche geworfen / hetten sie aber klar Wetter begehret / so hätten sie den Brunn wieder gereinigt. Einen alten Bawren mit Namen Kiwwitte A. habe ich gefraget: ob er denn wüste / dass in alten Zeiten immer böses Wetter were erfolget auf die Verunreinigunt dieser bäche. Der antwortete mir: es hettens die Alten also gesaget / were ihm abernichtes mehr bewusst als einmahl / da er noch ein Teoposiken / das ist ein Knabe gewesen / der in des Herren Arbiet hette gehen können / da sey er zu Odenpäh in der Arbeith gewesen zur Himmelfahrswoche." (J. Gutslaff. Kurtzer Bericht vnd Vnterricht, 24–25)

37 During the second part of the sixteenth century.

38 Item / Im russischen Kriege / hetten die Tattern unterm Russischen Volcke / einsmahls einen Bawren Pulli genant / Im verbeyziehen gepfändet an allem Eisenwercke / dass er solte die Bäche reine machen damit besser Wetter würde. J. Gutslaff. Kurtzer Bericht vnd Vnterricht, 28.

TOWARD TRANSCULTURAL WEATHER HERITAGE

This tendency toward a shared, transcultural local weather heritage becomes even more pronounced in economic literature from the second half of the seventeenth century. The most important source for this genre in Estonia, Latvia and Courland is the *Stratagema Oeconomicum* by Salomon Gubert (d. 1653), a pastor who served in Nītaure, Mālpils, and later Suntaži. First published in Riga in 1645, the work was reprinted multiple times (1649, 1676, 1688 and 1757), indicating its sustained relevance. Approximately one-third of the text is devoted to local weather heritage in the form of proverbs and weather lore, understood as "the knowledge of the people acquired through ordinary observation of plants and other natural phenomena, unaided by instruments", and including elements of local astrology.[39] It is notable that Gubert, despite his clerical background, did not condemn this body of local (primarily Latvian) weather knowledge. On the contrary, he sought to transmit it to German newcomers – manor owners and stewards – who lacked familiarity with local environmental conditions and practices. As he writes: "A ploughman must needs be versed in the farmer's signs and reckonings; therefore I set forth to offer the untried a modest service in what follows."[40] His work thus functions as a medium of knowledge transfer across cultural and social boundaries.

At the same time, Gubert highlights differences between German and Baltic weather traditions. Whereas in German contexts the lunar cycle played a central role in agricultural practice,[41] Baltic weather lore placed greater emphasis on winds, which were believed to exert a decisive influence and therefore required careful observation. Already at the end of the sixteenth century, Zacharias Stopius noted in his Livonian calendar the importance of observing the wind on St. Matthew's Day and warned against sowing when the wind blew from the same direction.[42] This focus

39 H. A. Hazen. The Origin and Value of Weather Lore. – The Journal of American Folklore, 1900, 13, 50, 191–198 (here 191, 192).

40 "Es ist gar nöthig einem Ackermann / dass ihme das Bawer prognosticon bekandt sey. Will demnach den Unerfahrenen hiermit nachfolgenden Dienst leisten." (S. Gubert. Stratagema oeconomicum, 69)

41 K. M. Smith. The Science of Astrology, 75ff.

42 Extract desz Sechsten Capittels Herrn Doctoris Stopii weilant Medic 'der Stadt Riga. Ersten Buchesz Liefflandischer Oeconomi oder Hauszhaltung. Worin die Verrichtung einesz fleiszigen Hauszwirtesz Vnnd Hauszwirtinnenn auf alle Monats dasz Jahr durch Vorgeschriebenn. Nebenst ein Auszug desz Stedtwehrenden Calenders vnndt abtheilung der Tage vnnd nacht lenge der Sonnen auff – vnnd Niedergang durchsz gantze Jahr auff den Polum desz Vberdunischen Furstenthumbs in Liefflandt nach dem Rigischen Seiger gestellet. Von obgedachten Herren Zachariam Stopium. National Library of Latvia, Reto Gramatu un Rokrakstu nodala R x/59 F.9.9, S. 33.

persisted into the seventeenth century, particularly in spring, when wind patterns were used to forecast the success of the harvest.[43] Northern and western winds received particular attention, and exceptionally strong winds were attributed a significance comparable to that of comets elsewhere in Europe, being associated with misfortune, war and disease.[44]

In addition to winds, Gubert records interpretations of comets and eclipses,[45] as well as numerous methods for forecasting rain based on natural observation. Many of these are expressed in the form of proverbs derived from everyday experience: rain might be expected when salt becomes damp,[46] when lice and fleas become more active,[47] when frogs croak ("Wenn die Frösche knarren / So magstu auf Regen harren"[48]), when chickens bathe in sand or chicks chirp loudly,[49] when cattle pant at noon, or when dogs dig and howl.[50] Particularly noteworthy is the distinction between "good" and "bad" rain, which is defined not by quantity but by quality. Good rain is described as warm and accompanied by thunder, whereas bad rain is cold, associated with hail, or occurs while the sun is shining – an ominous sign summarised in the proverb "Vom Sonnen-Regen werden Ungeziefer" (sun-rain breeds vermin).[51]

From the perspective of Samson Hermann, such practices would largely fall under *magia naturalis*, insofar as they aimed at short-term forecasting rather than direct manipulation of the weather. Unlike condemned forms of black magic, these practices did not seek to alter divine will but to interpret natural signs. For Gubert, they represented valuable empirical knowledge essential to agricultural practice. Since other contemporary works of *Hausväterliteratur* rarely address weather heritage in comparable depth, it would be unwise to generalise too broadly from the *Stratagema Oeconomicum*. Gubert's openness toward such knowledge may reflect a personal inclination rather than a widespread trend. Nevertheless, his text demonstrates a broad interest in diverse forms of weather heritage, including those rooted in German

43 S. Gubert. Stratagema oeconomicum, 161.
44 Ibid., 88.
45 Ibid., 87.
46 Ibid., 75.
47 Ibid., 74.
48 Ibid. These parts of the Peasant prognosticon is clearly rooted in European heritage. So we can find the saying about the frogs already two hundred years earlier in Leonhard Reynmanns's *Vo[n] warer erkantnusz des weters*: "Wenn morgens fru/mit o/ schreyen die frösch / Bedeiit ain regen darnach gar resch." (L. Reynmann. Vo[n] warer erkantnusz des weters Also das ain yeder er sey gelert oder vngelert durch alle natürliche anzaygung die endrung des weters ... wissen vnd erkennen mag. Froschauer, Augspurg, 1510, s.p.)
49 S. Gubert. Stratagema oeconomicum, 82.
50 Ibid., 80.
51 Ibid., 162.

elite culture. Alongside prayers and hymns against adverse weather[52] – practices with deep roots in earlier Catholic traditions[53] – he also records beliefs associated clearly with the upper classes, such as the notion that carrying coral or hyacinth gemstones could provide protection against lightning.[54] Such ideas, deriving from ancient gemmological traditions, illustrate the coexistence of multiple layers of weather-related belief within the context of the manor.[55]

Weather heritage at the level of the manor functioned as an entangled phenomenon, drawing primarily on local peasant knowledge while also incorporating religious practices and elements of German upper-class culture. Notably, within this body of weather lore one can also identify early forms of weather memory. Gubert, for instance, remarks: "After a winter most severe, a gentler one is wont to follow; yet in the year 1608, the very contrary came to pass."[56] Such statements indicate an emerging practice of testing traditional weather lore against observed experience. This tendency toward empirical verification gained increasing importance toward the end of the seventeenth century, pointing to a gradual shift in the epistemological status of weather knowledge.

WEATHER AND SCIENTIFIC NETWORKS

The year 1700 marks not only the outbreak of the Great Northern War, which profoundly reshaped Baltic history, but also the beginning of climate historiography in the region. In that same year, Georg Krüger (1642/1643–1707) published his *Prodromus Aurorae Boreae sive Historiae Meteorologicae Teutonico-Curlandicae* (*Weather History*) in Nīca, then part of the Polish Duchy of Courland. This work is unique in the Baltic

52 "Du grosser Himmels HErr / znser lieber Vater / ... Bewahre vnd segene znsere Ecker / Gärten / Utehe vnd Fahesel. Segene vnsere Arbeit / bescher frühe vnd spat-Regen. Behüte vns für Hagel / Milthaw / schädlichem Frost / und grawsahmen Ungewitter." (S. Gubert. Stratagema oeconomicum, 257–258) For other weather prayers, see ibid., 260–261.

53 S. Hermann. Neun Ausserlesen, 29–31, 115; A. Bernd-Brinkmann. Wetterlieder im 17. und 18. Jahrhundert. – Lied und populäre Kultur = Song and Popular Culture, 2000, 45, 89–108; C. Pfister, H. Wanner. Klima und Gesellschaft in Europa: Die letzten tausend Jahre. Paul Haupt Verlag, Bern, 2021, 141. P. Oderborn. Tröstliche Betrachtung der Wolthaten Jesu Christi / der auff den Wolcken ein Richter der Lebendigen und der Todten kommen wird. – P. Oderborn. Vier Predigten von dem Bogen Gottes in den Wolken (...). Niclas Mollyn, Riga, 1591, s.p.

54 S. Gubert. Stratagema oeconomicum, 74–75.

55 G. Rapp. Gems and man: a brief history. – EMU Notes in Mineralogy, 2019, 20, 323–344.

56 "Nach einem sehr strengen Winter / pfleget ein weicher Winter zu folgen. / aber Anno 1608. ist das Gegenthiel erfolget." (S. Gubert. Stratagema oeconomicum, 76–77)

context as it compiles a unique overview of the use of weather memory within early scientific and astrological networks.

Krüger was born in Lieberose, in the Sorbian region of Lower Lusatia.[57] He entered the University of Frankfurt (Oder) at the remarkably young age of 12 or 13 and continued his studies from 1662 in Naumburg, where he acquired foundational knowledge in astronomy. Further studies at the University of Wittenberg culminated in his promotion to Master of Philosophy in 1675, with a dissertation devoted to Sorbian history.[58] On the recommendation of his former professor Michael Strauch, he moved in 1676 to Gdańsk, where he worked for three years as secretary and assistant to Johannes Hevelius (1611–1687), one of the leading astronomers of his time.[59]

During his time in Gdańsk, Krüger developed a strong interest in astro-meteorology, seeking to understand the *influxus coelestis*, that is, the influence of celestial bodies on terrestrial weather. His central questions – whether and how the heavens shape weather patterns, and whether such knowledge could be systematised – reflect broader early modern concerns.[60] He wanted to understand "Why one year is wet / another dry / one fruitful / another barren / one too cold / another too warm".[61] In 1678 he published his first work, *Cometische Glücks- und Friedens-Fackel*, which, with an afterword by Hevelius, challenged the widespread interpretation of comets as harbingers of disaster.[62] Such beliefs were also prevalent in the Baltic, as evidenced by Gebhard Himsel's *Cometologia*

57 K.-D. Herbst. Krüger, Georg. – Biobibliographisches Handbuch der Kalendermacher von 1550 bis 1750. https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=krueger_georg. About his life, see J. Kaminskis, J. Klētnieks. The Activities of Georgius Krüger.

58 M. G. Krüger. Disputatio Historica De Serbis, Venedorum Natione vulgò dictis die Wenden qvam consensu Spectabilis Philosophicae Facultatis Praeses M. Georgius Krüger / Liberosensis Lusatus. & Laurentius Jetze / Rezens. NeoMarch. Respondens, publico Philosophorum examini submittent. horis consvetis. d. Junii 1675. In Auditorio Philosophorum. Wittenberg, 1675. https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=krueger_georg.

59 Johannes Hevelius and His World: Astronomer, Cartographer, Philosopher and Correspondent. Ed. by R. L. Kremer, J. Włodarczyk, Instytut Historii Nauki PAN, Warsaw, 2013; G. Krüger. Prodromus Aurorae Boreae, Vorrede. s.p.; J. Kaminskis, J. Klētnieks. The Activities of Georgius Krüger, 231–232.

60 "Waß von dem *influxu coelesti* oder Würkung des Himmels / der von Vielen in Zweiffel gezogen / oder wohl gar verneinet wird / zu halten: insonderheit: ob und wie der Himmel das Gewitter auf Erden würckete: item: ob und wie dieselbe Wissenschaft zu einer Regularität /worann viel desperieren, könte gebracht werden." (G. Krüger. Prodromus Aurorae Boreae, Vorrede, s.p.)

61 G. Krüger. Prodromus Aurorae Boreae.

62 G. Krüger. Cometische Glücks= und Friedens=Fackel / Welche Der Allerhöchste Gott im vergangenen 1677. Jahre den 26. (16.) Aprilis an dem hohen Himmels=Leuchter auffgesetzet / (...) Altenburg, [1678]; A. Bähr. Der grausame Komet: Himmelszeichen und Weltgeschehen im Dreißigjährigen Krieg. Reinbek bei Hamburg, Rowohlt, 2017.

(1665).[63] In contrast, Krüger interpreted the comet of 1666 as a potential sign of peace and agricultural prosperity.[64]

Krüger's career, however, was not without disruption. Following a fire in Hevelius's observatory in 1679, an event for which Krüger fell under suspicion, he left Gdańsk and relocated to Courland.[65] There, with the support of his brother, Christian Krüger, he secured positions as a teacher in Dobele/Doblen and later as rector of the St. John's school in Liepāja/Libau.[66] In 1680, he produced the first calendar made for Courland, equipped with detailed weather forecasts.[67] In 1684 he donated a *tabula meteorologica* – most likely ephemerides for Courland – in a hand-coloured version highlighting the position of Saturn, to the Duke of Courland and Semgallia, together with a practical handbook explaining its use.[68] Two years later he was appointed court astronomer by Friedrich Casimir Kettler (1650–1698). During this period, he initiated new calendar series, including the *Rigischer Curiositäten-Calender* 1699–1700 and the *Liefländischer Curiositäten-Calender* 1701–1708.

Krüger's ability to establish and maintain networks of correspondence was characteristic of early modern scientific practice.[69] Notably, he dedicated his *Weather History* not to a ruler but to regional publishers, recognising their role in disseminating knowledge and facilitating scholarly exchange.[70] His approach to communication

63 G. Himsel. Cometologia oder Anmerckung und Natürliche Muthmassung von den Cometen In dreyen Fragen als I. Ob die Cometen unter oder über den Mond zusetzen? II. Ob die Aspecten der Planeten einige Würckung selbige hervor zubringen haben? III. Ob auß den Himmlischen Zeichen in welchen sie erscheinen etwas von derer Würckung könne vorher verkündiget werden? Hamburg, 1665.

64 "Was aber unseren ietzigen Cometen betrifft / kan ein ieglicher der nur den Titul obenhin ansiehet / ihm an den Fingern abzehlen / daß ich ihm keine böse Wirck- oder Bedeutung zuschreibe. Eben zu dem Ende habe ich ihn eine Glücks- und Friedens-Fackel genennet (...) Dörffte ich dieser Glücks-Fackel noch etwas zuwerffen / so wären dieses meine wenigen Gedancken / daß wie vor 100. Jahren geschehen /auch ietztund der Comet und ein fruchtbares und gottgesegnetes Jahr anzeigen werde (...)." (G. Krüger. Prodromus Aurorae Boreae, s.p.)

65 For the whole story, see J. Kaminskis, J. Klētnieks. The Activities of Georgius Krüger, 231–232.

66 Ibid.

67 About the dating of the first calender and the finances, see https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=krueger_georg.

68 Krüger's Tabula might have looked like similar ones from the 18th century as N. Cruquius. Weather observations from Leyden, 1723. – Philosophical Transactions 1724, 33, 4–7; P. van Musschenbroek. Ephemerides Meteorological Ultrajectinae MDCCCCVIII. – Physicae experimentales,1729, 685.

69 Die Korrespondenz des Astronomen und Kalendermachers Gottfried Kirch (1639–1710). Hrsg. von K.-D. Herbst (unter Mitwirkung von E. Knobloch und M. Simon sowie mit einer Graphik von E. C. Engelmann). IKS Garamond, Jena, 2006.

70 "Seyd Ihr / Herren Buchhändler / nicht diejenigen / welche von allen raresten und *Curieusen* Büchern Wissenschafft haben / und Nachricht geben? Seyd Ihr nicht die jengen / welche zu Wasser und Lande mit grossem Hazard die Wissenschafften in der gantzen Welt ausbreiten und befordern? Seyd Ihr nicht die jenigen / welche mit denen Gelahrten in Liebe und Freundschafft so verbunden / das einer ohne den andern nicht leben kan? Seyd Ihr nicht die jenigen / ohne welchen so zu reden ein Gelahrter kein Gelahrter ist / und seyn

perhaps reflects the influence of Hevelius, who maintained extensive European networks. One the level of intellectual reception he drew on the work of earlier scholars such as Lorenz Eichstädt,[71] Johannes Kepler, Hermann IV landgrave of Hessen[72], the writings of Johannes Stöfler, David Origanus, Sethus Calvisius,[73] William Cock,[74] Jean Baptiste Morin[75] and Peter Crüger, who worked between 1607 and 1639 in Gdańsk as a professor of mathematics and poetry and taught Johannes Hevelius.[76] In addition Krüger corresponded with many contemporary colleagues. The most prominent among them was his close friend Friedrich Büthner (1622–1701), who arrived in Gdańsk in 1653 and worked there as a school rector. Between 1655 and 1699, he compiled several calendars and began systematic weather observations. In October 1677 Büthner gained the Royal privilege for printing and selling calendars in German and Polish in Prussia.[77] With this position he outcompeted other calendar

kan? Demnach so bitte / HochgeEhrte Herren / Euch alle / und einen jeden insonderheit / sie nehmen Großgünstig dieses geringe *Praesentchen* vor lieb / bis was bessers erfolget / sie blieben diesen *Prodromum* an Liebhaber aller Orten zu befordren / und erkundingen sich überall / wo etwan curieuse Liebhaber dergleiche Gewitter=*Observationes* auf alle Tage oder Qvartal *colligiret*." (G. Krüger. Prodromus Aurorae Boreae, s.p.)

71 Eichstädt worked since 1645 as a professor of mathematics and medicine at the academic gymnasium in Gdansk and took over also the duty as a town physician. In Gdansk he built up a close friendship with Johannes Hevelius, and he corresponed with many scientist all over Europe as Marine Mersenne, Joaching Jungius, Johann Amos Comenius, Stephan Fuhrmann and David Origanus. K.-D. Herbst. Eichstädt, Lorenz. – Biobibliographisches Handbuch der Kalendermacher von 1550 bis 1750. https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=eichstaedt_lorenz.

72 Hermann published in 1651 under the pseudonym Cyriandrus Uranophilus the Historia meteorologica. Das ist: Vier vnd zwantzig Jährige eigentliche vnd trewfleissige Observation vnd tägliche verzeichnüsz des Gewitters / vom 1. Januarii 1623 an / bisz zum letzten Decembris 1646. in dreyen membris verfasset. ... Zu Rettung der biszher sehr beschimpfften Meteorologia, dem kunstliebenden Prognosticanten aber zu gefallen vnd mächtiger vorarbeit sich künfftig besser in der Natur umbzusehen / ... . S. Schadewitz, Cassel, 1651; W. Lenke. Klimadaten von 1621–1650 nach Beobachtungen des Landgrafen Hermann IV. von Hessen (Uranophilus Cyriandrus). – Berichte des Deutschen Wetterdienstes, 1960, 63.

73 S. Calvisius. Opus chronologicum ex autoritate s. scripturae ad motum luminarium coelestium contextum. Thieme, Leipzig, 1605 (1st edition); Thieme, Frankfurt, 1685 (6th edition).

74 W. Cock. Meteorologiae: or, the true way of fore-seeing and judging the inclination of the air, and alteration of the weather in several regions, J. Conyers, London, 1671; German translation: W. Cock. Meteorologia Oder Der rechte Weg Vorher zu wissen / zu beurtheilen Die Veränderung der Lufft und Abwechslung des Wetters In verschiedenen Landern. Darinnen auch entdecket worden / die Ursachen / warum die gemeine (sic!) Calender Schreiber so sehr fehlen; und die rechte Weise das Wetter zu erkennen klar und deutlich erwiesen wird. Liebezeit, Hamburg, 1691.

75 J. B. Morin. Astrologia Gallica principiis & rationibus propriis stabilita, atque in XXVI. libros distributa.Non solùm astrologiae judiciariae studiosis, sed etiam philosophia, medicis, & theologis omnibus per-necessaria, quippe multa complectens eximia ad scientias illas spectantia, Hagae-Comitis: Ex typographia Adriani Vlacq, 1661.

76 K.-D. Herbst. Crüger, Peter. – Biobibliographisches Handbuch der Kalendermacher von 1550 bis 1750. https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=crueger_peter.

77 Büther was born in Bohemia, studied theology, astronomy and mathematics in Königsberg and arithmetics and geometry in Wittemberg, and worked from 1653 as the successor of the rector of St. John's School in Gdansk. Between 1655 and 1699 he compiled calendars in which he also included weather observations. K.-D. Herbst. Büther, Friedrich. – Biobibliographisches Handbuch der Kalendermacher von 1550 bis 1750. https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=buethner_friedrich.

makers in Gdańsk, most notably Gottfried Kirch (1639–1710), who had earlier served as Hevelius's assistant and can be regarded as Krüger's predecessor.[78] Kirch moved on to Leipzig in 1676, became renowned for the discovery of new comets in the early 1680s, and was appointed Royal Astronomer by the newly founded Prussian Academy of Sciences in 1700. Between 1677 and 1685, Krüger participated in Kirch's extensive scientific correspondence network, which comprised 139 correspondents. Within Kirch's circle, Krüger was the only known participant from the territories of today's Baltic region.[79] In comparison a review of Lorenz Eichstädt's ephemerides suggests that Estonia, Livonia and even the Duchy of Courland are mentioned only rarely, with Riga being the sole consistently referenced locality.[80]

Yet the distinctive strength of Krüger's work lies less in its European connections than in its integration of local observation data. His network included meteorological records from Jelgava (the *Observatio Mytaviensis*) compiled by Johann Adolphi between 1643 and 1655.[81] For the period from 1655 to 1680, he relied on observations by Johannes Liederitz, who served between 1665 and 1674 as priest for the Latvian congregation and from 1674 to 1682 for the German community in Liepāja.[82] Liederitz was married to Christine Kettler, owner of the estate Jumpraviešu (Jumpraweeten), which further embedded his observations within local manorial networks. But it was not only priests who began to record weather observations in the seventeenth century. One of Krüger's informants was Matthaeus Borra, the mayor of Kuldīga (Goldingen) in Courland, who compiled the *Observationes tempestatis*, covering the period between 1660 and 1690. This manuscript was used by Krüger and was still mentioned by Jakob Benjamin Fischer

78 K.-D.Herbst. Gottfried Kirch (1639–1710), Astronom, Kalendermacher, Pietist, Frühaufklärer. Verlag HKD, Jena, 2022.

79 K.-D. Herbst. Kirch, Gottfried. – Biobibliographisches Handbuch der Kalendermacher von 1550 bis 1750. https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=kirch_gottfried; actually only five letters have been found, https://gottfried-kirch-edition.de/?page_id=71. With that number he is among the top 30% of the 139 corresponding members

80 L. Eichstädt. Pars Prima Ephemeridum Novarvm Et Motuum Coelestium Quinquennalis, Ad Annos AErae Christianae 1636. 1637. 1638. 1639. 1640. In Luminarium motibus & Eclipsibus ex Tabulis Danicis Christiani S. Longomontani, in reliquis Planetis ex Tabulis Rudolphinis Johannis Kepleri juxta exquisitas Nob. Tychonis Brahei observationes constructis, debitâ diligentiâ elaborata & supputata. à Laurentio Eichstadio, Med. D. &. Physico Ordinario in Veteri Sedino Pomeranorum. Cum Paedia De Utendi Methodo. David Reht, Stettin, 1634, 73.

81 J. F. von Recke, K. E. Napiersky. Allgemeines Schriftsteller- und Gelehrten Lexikon der Provinzen Livland, Esthland und Kurland. Erster Band A-F. Steffenhagen, Mitau, 1827, 14–15.

82 Jahrbuch für Genealogie, Heraldik und Sphragistik, 1903. Hrsg. von Kurländische Gesellschaft für Literatur und Kunst, Steffenhagen, Mitau, 1905, 114; M. C. L. Tetsch. Curländischer Kirchen-Geschichte (...). Erster Theil. Hartknoch, Riga, Leipzig, 1767, 129.

(1731–1793) in 1782, but it appears to have been lost or destroyed in the early nineteenth century.[83] There are also no surviving traces of the weather observations made by the "good and erudite husbandman" (*ein guter und gelahrter Landmann*) named Fabritius, who lived near Bauska and whose records covered the period from 1682 to 1693. For the years 1693 to 1698, Krüger relied on observations made by his close friend, the pastor Nicolai Wittenberg (Nikolaus Wittenburg, 1653–1728) from the manor Muižciems (Muischazeem), who, after Krüger's death, even published Krüger's calendar manuscripts up to the year 1712.[84] One of Krüger's correspondents was also his brother, Christian Krüger, who participated in the Couronian colonial enterprise on Tobago between 1686 and 1690, where he began his weather observations. After returning to Courland and becoming a pastor in Altraden in 1691, he continued his observations between 1691 and 1695.[85]

As we can see, weather observations and forms of weather diary were common in seventeenth century Courland.[86] Krüger's network of correspondents covered large parts of Courland, from Jelgava to Liepāja and from Kuldīga to Bauska. The individuals involved were mainly preachers and pastors, but also manor owners and mayors. They were clearly well-educated people who were familiar with the emerging practice of systematic weather observation and skilled in maintaining networks of communication. Interestingly, Krüger's network remained largely confined to Courland and did not significantly engage with contemporaries in Livonia or Estonia. This is notable, given that Gebhard Himsel (1603–1676) in Tallinn had likewise been producing calendars since 1632, corresponded with Hevelius between 1649 and 1674, and published works on comets.[87] In contrast to Krüger, Himsel also relied on local networks, although these remained within Estonia and Livonia and did not extend to Courland or Poland. Krüger's work, in contrast, was closely connected to Poland and to the strong astrological traditions present there at the time. It is unlikely that Krüger was unaware of Himsel

83 J. B. Fischer. Beyträge und Berichtigungen zu Hrn. F. K. Gadebusch livländischer Bibliothek. Nebst andern kürzern Aufsätzen ec. (Nordische Mischellaneen, 4.) Hartknoch, Riga, 1782, 26; J. Friedrich von Recke, K. E. Napiersky. Allgemeines Schriftsteller- und Gelehrten Lexikon der Provinzen Livland, Esthland und Kurland. Erster Band: A–F. Steffenhagen, Mitau, 1827, 229.

84 L. K. Nachrichten über den Mitauschen Kalender. – Das Inland 11, 46, 1. Oktober 1846, 931–940, 931.

85 G. Krüger. Prodromus Aurorae Boreae, Vorrede, s.p.

86 Here we can add information on early Baltic weather observations given in A. Tarand, J. Jaagus, A Kallas. Eesti kliima. Tartu Ülikooli Kirjastus, Tartu, 2013.

87 K.-D. Herbst. Himsel, Gebhard. – Biobibliographisches Handbuch der Kalendermacher von 1550 bis 1750. https://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=himselius_gebhard; G. Himsel. Cometologia oder Anmerckung und Natürliche Muthmassung von den Cometen.

and his work. The absence of communication between them can be explained in several ways: they may have simply operated within different intellectual circles, had little personal inclination to collaborate, or been separated by confessional divisions or methodological approaches.

WEATHER MEMORY AS A SCIENTIFIC METHOD

Methodologically, Krüger sought to correlate weather observations with celestial phenomena, particularly planetary positions and lunar cycles. However, he repeatedly encountered the limits of such approaches, as the available data did not produce consistent or predictive patterns. He framed these difficulties in both practical and theological terms, describing them as struggles not only against illness and isolation, but also against the interference of demonic forces ruled by Satan himself. Loneliness and the heavy workload were counterbalanced not only through his primary vocation as a pastor, deeply rooted in biblical learning, but also more concretely through the assistance of hired collaborators. One of them was Georg Wagner. Only with their help was Krüger able to undertake the analysis of earlier printed data and to construct what he described as "100 years of experience".

The proper use of earlier data was a significant challenge for Krüger and his team, as it was often filled with false and superstitious information, which he interpreted as the direct influence of Satan himself.[88] He drew a clear distinction between "good" and "true" natural observations and superstitious beliefs, which he characterised as "bad" and "false". His work demonstrates an emerging form of early source criticism, separating empirical data from inherited belief systems. In doing so, he subjected earlier material to critical scrutiny and even tested established authorities such as Ptolemy against historical evidence. Ptolemy had for example argued that an eclipse would exert influence for as many years as there were hours of darkness. Demonstrating the inaccuracy of such claims required extensive effort and often resulted in long periods of unproductive and painstaking work.[89] Krüger had to contend with the scarcity and uneven reliability of earlier sources. As

88 G. Krüger. Prodromus Aurorae Boreae, Vorrede, s.p. In English: "If, as a child of God, I want to proceed in the fear of the Lord, I must first learn to distinguish between the bad and the good. I had to know / what was superstitious and or false / void and what was true and based on nature."

89 Ibid., Vorrede, s.p.

he noted: "A true and earnest devotee must possess long experience, like the forefathers Noah and Abraham, and, in its absence, attend carefully to the observations of those who came before; these he should compare with the course of the heavens, and vice versa, and test them as upon a touchstone."[90] This process – combining compilation, comparison and evaluation – represents an early step toward the historicisation of Baltic weather knowledge. As earlier research has shown, the influence of early Enlightenment thought on Körber, as on many other calendar makers of his time, is evident.[91]

Looking at the regional distribution of the data compiled in *Weather History*, a clear division between the two halves of the century becomes apparent. In the first part of the century, local information is largely absent, and Krüger instead relies on data from places with no direct connection to Courland, such as Prague, Rostock and Kassel. With the beginning of the Jelgava observations in 1643, he compares them over the following three years with data from Kassel. Interestingly, the information for both locations, derived from different sources, is often strikingly similar in wording. It is evident that Krüger emphasised similarities between different regions and showed little sensitivity to regional or climatic differences. His aim appears to have been to highlight correspondences between Courland and Germany, as already suggested by the title of his work. At the same time, it is notable that he does not include information from Estonia or Livonia, nor does he explicitly reflect on the broader spatial scope of his study.

Krüger was, in fact, working toward a three-volume work in Latin and German. The first planned volume was to address the seasons of each year according to astrological knowledge, presented in the form of short aphorisms based on observations. The second volume was intended to focus on the lunar cycle, again structured around brief aphoristic statements. Only the third volume was to deal with daily weather events across the century, primarily between 1617 and 1700, which he referred to as *Ephemerides astronomico-astrologicae seculares*. No manuscripts of these projected volumes have been found, if they ever existed. The

90 "Ein rechtschaffener Liebhaber muß eine sehr lange *Experience* haben / wie die Altväter Noah und Abraham / und in Ermangelung derselben / sich um die *Observationes* der Vorfahren bekümmern / welche er mit dem Lauf des HImmels / und vice versa conferire und als einen Probestein bewehre". (Ibid., Vorrede, s.p.)

91 Y.-G. Mix, F. Köther, K. Kandler. Die Kalender-, Almanach- und Taschenbuchliteratur Estlands, Livlands und Kurlands (1700–1830): Analytische Bibliographie. Teil I, [S.l.] 2018, 30. http://www.presseforschung.uni-bremen.de/dokuwiki/doku.php?id=krueger_georg; K.-D. Herbst. Schreibkalender der Frühen Neuzeit – eine noch wenig genutzte Quelle für die Astronomiegeschichtsschreibung. – Sitzungsberichte der Leibniz-Sozietät der Wissenschaften zu Berlin 2009, 103, 31–48.

surviving *Prodromus* appears to represent a condensed version of the first volume.[92] Krüger identified as potential readers for his planned volumes not only scholars but also merchants and economic actors in Courland, who would have required this kind of practical information in their daily activities. As noted above, he also approached publishing houses in search of sponsors for his project. This effort, however, appears to have been unsuccessful, most likely due to the outbreak of the Great Northern War, which disrupted large-scale scholarly publishing projects and curtailed international cooperation.

Although Krüger's *Prodromus* represents only a condensed version of a much longer lost manuscript, the scope of his undertaking to historicise weather observations and reconstruct a full century of climatic conditions through an extensive network of informants and sustained correspondence appears to be unique in the Baltic region. His statistical account of seventeenth-century weather begins with a description of the famine of 1601–1602, drawn from chronicles that report extreme cases of cannibalism, including within families, and the exhumation of corpses for food. It is evident that this framing of the century was shaped by the recent memory of the famine of 1695–1697. In this sense, the work marks an early attempt to historicise weather-related events and can be regarded as an early approach to the analysis of historical weather observations even though his compiled data is clearly unreliable and useless for the reconstruction of past climate.[93] It can certainly be seen as another cornerstone in the emergence of Baltic weather memory in the seventeenth century.[94]

CONCLUSION

This article has demonstrated the significance and rise of weather heritage and weather memory in the seventeenth century, a period that was climatically one of the most challenging of the medieval and early modern eras. Weather heritage, understood as the collection of reactions to weather phenomena in the human archive, should be distinguished from climate heritage, which consists of memories of past

92 G. Krüger. Prodromus Aurorae Boreae, Vorrede, s.p.

93 About the use of premodern weather compliations, see W. T. Bell, A. E. J. Ogilvie. Weather compilations as a source of data for the reconstruction of European climate during the medieval period. – Climate Change, 1978, 1, 331–348. https://doi.org/10.1007/BF00135154.

94 About climate memory, see M. Hulme. Climate change and culture. – Memory in the Twenty-First Century. Ed. by S. Groes. Palgrave Macmillan, London, 2016, 159–162.

climatic conditions preserved in the natural archive. Within weather heritage religious interpretations of weather, practical activities and observations, different forms of memory and the methods used to analyse them converge. The article examined Baltic weather heritage and weather memory in German-language sermons, economic handbooks and early scientific compilations. According to the premises of cultural climatology, weather was not only experienced but also remembered, compared and reorganised over time. As the climate changed, so too did the meanings attributed to weather among different social groups; changes in nature directly influenced their interpretation within human cultures. At the same time, people did not limit themselves to observing and interpreting weather, but also sought to actively shape it through various religious practices.

The confessional and socially fragmented Baltic space comprising Estonia, Livonia and Courland does not appear as a passive periphery with regard to weather heritage, but rather as an active site of its application and of knowledge production, a space where different forms of weather memory were intertwined. Cultural entanglements between German and local Estonian and Latvian weather traditions are clearly visible (Gutslaff, Gubert), and a certain degree of restraint or limitation in networking between Estonia and Courland can be observed (Krüger). In Hermann's works, we encounter a particularly strict religious interpretation of weather and weather knowledge, which gradually evolved over the course of the century. While Gutslaff's mid-seventeenth-century work points to the difficulties of engaging with alternative local forms of weather memory, Gubert's work demonstrates the smooth integration of such knowledge into everyday manorial practice. Despite its methodological and source-related limitations, Krüger's work represents a culminating moment in seventeenth-century weather heritage and weather memory, directly reflecting on the possibilities of using historical data in the light of early enlightenment. We can thus observe a clear development of weather heritage in the seventeenth-century Baltic region, including its transregional scope and its connections to processes unfolding in nature. There are good grounds to consider the existence and development of seventeenth-century Baltic weather heritage as an important stage in the emergence of environmental thought and historical climatology in the region.

ILMAPÄRAND, TEADUSVÕRGUSTIKUD JA ILMAMÄLU 17. SAJANDIL EESTI-, LIIVI- JA KURAMAAL

Ulrike Plath

Käesolev artikkel uurib ilmapärandi ja ilmamälu tähendust ning esiletõusu 17. sajandi Baltikumis, keskendudes Eestimaale, Liivimaale ja Kuramaale. 17. sajand oli kliimaajalooliselt üks kesk- ja varauusaja keerulisemaid perioode: seda mõjutasid väikese jääaja keskkonnatingimused, Maunderi miinimum, suurenenud vulkaaniline aktiivsus, korduvad ikaldused ning sajandi algust ja lõppu raaminud rasked näljahädad. Sellises olukorras omandas ilm mitte üksnes praktilise, vaid ka religioosse, sotsiaalse ja kultuurilise tähenduse. Artikkel küsib, kuidas ilma kogeti, tõlgendati, mäletati ja oma mälestusi edasi anti ning millist rolli mängisid mineviku ilmaoludest kujunenud teadmised kohalikes praktikates ja varauusaegses teadmusloomes.

Artikli keskne lähtekoht on eristus ilmapärandi ja kliimapärandi vahel. Ilmapärandi all mõistetakse inimmälus säilinud reaktsioone, tõlgendusi ja praktikaid, mis seostuvad konkreetsete ilmanähtuste, -märkide ja -oludega. Kliimapärand seevastu viitab loodusmälus talletunud jälgedele varasematest kliimaoludest. Ilmapärandis põimuvad religioossed seletused, praktilised tegevused, vaatluspraktikad, erinevad mälurežiimid ning ilmanähtuste analüüsimiseks kasutatud meetodid. Seetõttu ei käsitle artikkel kliimaajalugu üksnes ilmastiku- või keskkonnatingimuste ajaloona, vaid ka mäluajaloona. Ilma mitte ainult ei kogetud, vaid seda ka meenutati, võrreldi ja süstematiseeriti. Ühtlasi teisenes muutuvas kliimas ilma tähendus eri ühiskonnagruppide silmis ning looduses toimunud muutused mõjutasid otseselt nende kultuurilisi ja religioosseid tõlgendusi.

Artikkel analüüsib Balti ilmapärandit ja -mälu kolme liiki saksakeelsetes allikates: jutlustes ja religioosses kirjanduses, mõisamajanduslikes käsiraamatutes ning varastes teaduslikes ja astro-meteoroloogilistes kogumikes. Religioossete tekstide seas on keskne Samson Hermanni käsitlus ilmast kui Jumala tahte väljendusest. Hermanni teostes ilmneb rangelt teoloogiline arusaam, mille järgi ilmategemine ja pikaajaline ennustamine kuulusid Jumala meelevalda ning katsed ilma mõjutada või tuleviku ilmaolusid ette teada saada võisid kergesti liigituda ebausu, nõiduse või musta maagia valda. Siiski eristas Hermann lubamatutest praktikatest loodusemärkide tõlgendamist, mida võis mõista kui *magia naturalis*'e vormi. Seega ei välistanud religioosne raamistik täielikult

ilmavaatlusi, kuid seadis nende tõlgendamisele ranged moraalsed ja teoloogilised piirid.

Johannes Gutslaffi 1644. aasta käsitlus Võhandu jõega seotud rahutustest näitab, kui keeruline oli kohaliku ilmapärimuse ja ametliku protestantliku õpetuse vahekord. Võhandu jõe puhastamise ja vabalt voolamisega seotud uskumused osutavad kohaliku ilmamälu pikaajalisele kestusele ning selle seotusele kriisiolukordadega. Gutslaffi kirjeldatud juhtumid näitavad, et ilmaga seotud praktikad ei kuulunud ainult talurahva uskumusmaailma, vaid puudutasid ka kohalikke sakslasi ja vaimulikke. Keskkonnakriis võis taasaktiveerida vanemaid, osaliselt unustatud ilmapärimuse vorme, mis olid säilinud mälus, rituaalides ja suulises traditsioonis. Nii ilmneb Balti ilmamälu kui sotsiaalselt ja kultuuriliselt põimunud nähtus, mis ületas keelelisi ja seisuslikke piire.

17. sajandi teisel poolel muutus ilmapärimuse praktiline ja transkultuuriline mõõde eriti nähtavaks Salomon Guberti mõisamajanduslikus käsiraamatus „Stratagema oeconomicum". Gubert ei käsitle kohalikke, eeskätt lätlaste ilmateadmisi ebausu või eksitusena, vaid kasuliku empiirilise teadmisena, mida ka saksa mõisnikud ja valitsejad pidid kohalikes oludes edukaks majandamiseks tundma. Tema teos vahendab tuule, vihma, loomade käitumise, taimede, putukate, kuu faaside ja muude loodusemärkidega seotud tähelepanekuid. Eriti oluline on see, et Guberti tekstis põimuvad talurahva ilmateadmised, mõisamajanduslikud vajadused, religioossed praktikad ja saksa eliidikultuuri elemendid. Ilmapärimus ei ole siin enam üksnes konfliktne või kahtlane teadmiste kogum, vaid osa argisest majanduslikust ratsionaalsusest. Samas võib Guberti tekstis märgata ka ilmamälu varast kriitilist mõõdet: traditsioonilisi ilmaseoseid võrreldakse konkreetse aasta kogemusega ning vajadusel korrigeeritakse varasemate tähelepanekute paikapidavust.

Georg Krügeri 1700. aastal ilmunud „Prodromus Aurorae Boreae sive Historiae Meteorologicae Teutonico-Curlandicae" märgib Balti ilmapärimuse ja ilmamälu kulminatsiooni. Krüger püüdis koondada varasemaid ilmavaatlusi, siduda neid astroloogiliste ja astronoomiliste arusaamadega ning luua sajandit hõlmav ilmastikuajalugu. Tema töö põhines ulatuslikul, kuigi piirkondlikult piiratud võrgustikul, kuhu kuulusid peamiselt Kuramaa pastorid, õpetatud mõisnikud ja linnaametnikud. Krügeri ettevõtmine näitab, kuidas ilmamälu võis muutuda teadusliku meetodi osaks: mineviku ilmaandmeid koguti, võrreldi, hinnati kriitiliselt ja püüti asetada laiemasse seletusraamistikku. Kuigi tema andmestik oli tänapäevase kliimarekonstruktsiooni seisukohalt

ebaühtlane ja metoodiliselt problemaatiline, on see oluline tunnistus varauusaegsest katsest ilma ajalooliselt süstematiseerida.

Konfessionaalselt, poliitiliselt ja sotsiaalselt killustunud Balti ruumi ei käsitleta artiklis ilmapärandi suhtes passiivse perifeeriana. Vastupidi, Eesti-, Liivi- ja Kuramaast kujunes aktiivne teadmusloome ja ilmapärandi rakendamise piirkond, kus põimusid saksa, eesti ja läti pärimus, religioossed tõlgendused, mõisamajanduslik praktika ning varased teadusvõrgustikud. Samal ajal ilmnevad ka piirangud: Krügeri võrgustik jäi valdavalt Kuramaa-keskseks ega haakunud kuigivõrd Eesti- ja Liivimaa kalendritegijate ja ilmavaatlejatega. See osutab Balti ruumi sisemisele killustatusele, kuid ka teadmiste lokaalsele trajektoorile.

Kokkuvõttes näitab artikkel, kuidas Baltikumi ilmapärand arenes religioossest ja kriisiolukordades aktiveeruvast mälust praktilise mõisamajandusliku teadmise ning lõpuks varase ajaloolis-meteoroloogilise refleksiooni suunas. Ilmaga seotud teadmised olid ühtaegu kohalikud ja rahvusülesed, sotsiaalselt põimunud ja hierarhiliselt vahendatud, praktilised ja teoloogiliselt laetud. Seetõttu on põhjust käsitleda Balti ilmapärandi ja -mälu kujunemist 17. sajandil kui olulist etappi regiooni keskkonnamõtlemise ning kultuurilise ja ajaloolise klimatoloogia arengus.