

“grand froit – ungeheure kelte – frigitas magna”.

How cold was experienced and described in the 1430s, one of the coldest decades of the last millennium

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Abstract – During the 1430s, Europe experienced a sequence of unusually cold winters. Medieval narrative texts of that era contain a detailed account of the temperatures and their consequences for nature, economy and society. The contents of the authors’ writings indicated that people experienced extraordinary cold, such cold temperatures causing serious damage to humans, animals and plants. In the medieval chronicles the impact of these low temperatures are mentioned in some detail. Of significance are the reported freezing of several water bodies. This information can be used to classify the intensity of cold in the reported winter seasons. However, ice drifts and ice-covered waterways might have damaged infrastructure, disrupted transportation routes and disturbed trade. Nevertheless, the cold was not only experienced as a threat, as people also enjoyed building snow houses, towers and animals.

Human societies are vulnerable to weather conditions, as has been shown by many examples throughout human history,¹ the Little Ice Age period (1300 to about 1850) being no exception. This period was characterized by short-term changes in climate with repeated sequences of cold anomalies.² Even though average temperatures were lower in the long term there were also remarkable hot and dry phases. Nonetheless, some seasons stood out due to their exceptionally cold temperatures. As Hubert Horace Lamb, one of the pioneers of Historical Climatology, mentions, the

¹ Christian Pfister and Rudolf Brázdil, “Social vulnerability to climate in the ‘Little Ice Age’: An example from Central Europe in the early 1770s”, *Climate of the Past*, vol. 2, 2006, p. 115.

² Brian Fagan, *The Little Ice Age. How climate made history 1300-1850*, New York, Basic Books, 2002, p. 48; Emmanuel Le Roy Ladurie, *Histoire humaine et comparée du climat. Canicules et glaciers, XIII^e-XVIII^e siècles*, Paris, Librairie Artème Fayard, 2004, p. 9.

“1430s produced a very remarkable sequence of severe winters, or winters which at least included long severe spells, in central and western Europe”.³ It is probable that no other decade in the entire millennium had the same number of cold winters or severe cold spells except for several time periods during the 1690s.⁴ The years overlap with an early phase of the Spörer Minimum, a period with reduced solar activity from about 1420 to 1570.⁵ Keeping this in mind, it is surprising that the topic did not yet attract more attention from Historical Climatologists until recent years.⁶ In the natural sciences, even though the phenomenon of the Spörer Minimum is known, its implications have not been explored in any great detail.⁷ Some of the available literature has described the famine that occurred in the same decade, especially the work of Christian Jörg, which should be mentioned in this context.⁸ Whereas the Spörer Minimum and its consequences have hardly been investigated, research on the impact of climate in more recent times is more advanced.⁹ In particular, in terms of the Late Maunder Minimum, more is known about a solar minimum that occurred between 1675 and 1715, the differences in atmospheric circulation possibly linked to it, the prevailing weather conditions of the

3 Hubert Horace Lamb, *Climate History and the Modern World*, London, Methuen, 1982, p. 187.

4 *Ibid.*

5 Martin Kappas, *Klimatologie. Klimaforschung im 21. Jahrhundert – Herausforderung für Natur- und Sozialwissenschaften*, Heidelberg, Spektrum, 2009, p. 262.

6 Chantal Camenisch *et al.*, “The 1430s: A cold period of extraordinary internal climate variability during the early Spörer Minimum with social and economic impacts in Northwestern and Central Europe”, *Climate of the Past*, vol. 12, 2016, p. 2107-2126.

7 John A. Eddy, “The maunder minimum”, *Science*, n° 192, 1976, p. 1189-1202; Juan G. Roederer, “Solar variability effects on climate”, Burkhard Frenzel, Teresa Nanni, Menotti Galli and Birgit Gläser (eds), *Solar output and climate during the Holocene*, Stuttgart, Gustav Fischer, 1995, p. 1-21; Raphael Roth and Fortunat Joos, “A reconstruction of radiocarbon production and total solar irradiance from the Holocene ¹⁴C and CO₂ records: Implications of data and model uncertainties”, *Climate of the Past*, vol. 9, 2013, p. 1879-1909.

8 Christian Jörg, *Teure, Hunger, Großes Sterben. Hungersnöte und Versorgungskrisen in den Städten des Reiches während des 15. Jahrhunderts*, Stuttgart, Anton Hiersemann, coll. “Monographien zur Geschichte des Mittelalters”, 2008.

9 Wolfgang Behringer, Hartmut Lehmann and Christian Pfister (eds), *Kulturelle Konsequenzen der “Kleinen Eiszeit” – Cultural consequences of the “Little Ice Age”*, Göttingen, Vandenhoeck & Ruprecht, coll. “Veröffentlichungen des Max-Planck-Instituts für Geschichte”, 2005; Daniel Krämer, „Menschen grasten nun mit dem Vieh“. *Die letzte grosse Hungerkrise der Schweiz 1816/17*, Wirtschafts-, Sozial- und Umweltgeschichte 4, Basel, Schwabe, 2015. A broader state of the art is provided by Rudolf Brázdil, Peter Dobrovolný, Jürg Luterbacher, Anders Moberg, Christian Pfister, Dennis Wheeler and Eduardo Zorita, “European climate of the past 500 years: New challenges for historical climatology”, *Climatic Change*, vol. 101, 2010, p. 7-40.

period and its social, cultural and economic impact.¹⁰ People’s perception of the natural occurrence of such phenomena during the Middle Ages and more generally in the Early Modern Period has been investigated by Christian Rohr.¹¹

This paper focuses on the cold spells that occurred during the winter and spring seasons throughout the 1430s. Important questions are how cold it was during this time period, people’s experiences of these arctic winters, as well as how the chroniclers described such anomalies, and the comparisons authors used to express the coldness and its associated climatic proxies employed for this purpose. The extremely low temperatures were followed by severe economic and social impacts. Other issues to be discussed include the extent to which medieval chroniclers linked the cold period to these socially important impacts, and whether people were aware of these relationships. There are a number of presumed causes of the climate variability that occurred during the Little Ice Age, such as a decline in solar radiation, changes in the ocean-atmosphere system and volcanic eruptions.¹² The consequences of this climate variability were serious. Climate and its social impact are linked in many ways. A climate-society-interaction-model developed by Daniel Krämer and Christian Pfister illustrates how climate anomalies influence the economy, society and culture.¹³

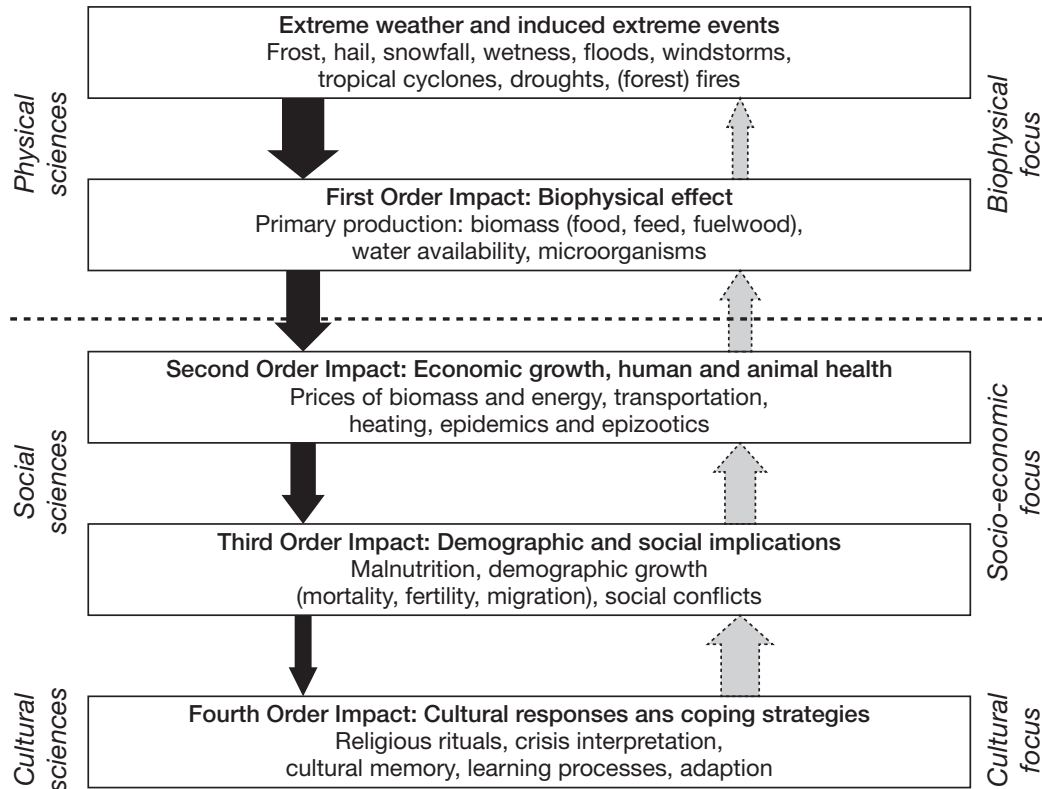
¹⁰ Christian Pfister, “Climatic extremes, recurrent crises and witch hunts: Strategies of European societies in coping with exogenous shocks in the late sixteenth and early seventeenth centuries”, *The Medieval History Journal*, vol. 10, 2007, p. 73; Jürg Luterbacher, Ralph Rickli, Elena Xoplaki, Chantal Tinguely, Christoph Beck, Heinz Wanner and Christian Pfister, “The late maunder minimum (1675–1715) – A key period for studying decadal scale climatic change in Europe”, *Climatic Change*, vol. 49, 2001, p. 441-462.

¹¹ Christian Rohr, *Extreme Naturereignisse im Ostalpenraum. Naturerfahrungen im Spätmittelalter und am Beginn der Neuzeit*, Cologne, Böhlau, Umwelthistorische Forschungen 4, 2007.

¹² Wolfgang Behringer, *A Cultural History of Climate*, Cambridge, Polity, 2010, p. 86-87; Brian Fagan, *op. cit.*, p. 55-56; Christian Pfister, *Wetternachhersage. 500 Jahre Klimavariationen und Naturkatastrophen*, Bern, Haupt, 1999, p. 52-53; Heinz Wanner, Martin Grosjean, Jürg Luterbacher, This Rutishauser, Roland Widmer and Elena Xoplaki, “Die Kleine Eiszeit – mögliche Gründe für ihre Entstehung”, André Kirchhofer, Daniel Krämer, Christoph Maria Merki, Guido Poliwođa, Martin Stuber and Stephanie Summermatter (eds), *Nachhaltige Geschichte. Festschrift für Christian Pfister*, Zurich, Chronos, 2009, p. 91-108.

¹³ Daniel Krämer, *op. cit.*, p. 89.

Figure 1. Climate-society interaction model by Daniel Krämer and Christian Pfister



Source: Daniel Krämer, *op. cit.*, p. 89.

According to this model, which is shown in Figure 1, the first-order impact of extreme weather events is crop failure. As a second-order impact, the prices of these types of goods increase, leading to malnutrition and demographic decline as third-order impacts. Fourth-order impacts have their effects on learning processes, adaptation and religious rituals. With every increase in the impact level, not only would there be a worsening in the weather condition, but there would be further adverse outcomes such as famine.

In Historical Climatology, documentary sources upon which reconstructions are based can be categorized in terms of individual and institutional sources depending on their origin. In the Late Middle Ages,

chronicles, annals, memoirs and journals are rich sources containing both individual and subjective information.¹⁴ Institutional sources often have an administrative origin, such as town, toll or manorial accounts.¹⁵

These source types contain two different types of data. The first are direct data that include descriptions of weather events for instance. These direct data involve rather extreme events since there were more reasons for recording such information. In addition, there are indirect data, the so-called proxy-data that provide indirect information on weather conditions. Phenological data such as wine harvest dates and information about drift ice on water bodies belong to this category.¹⁶

Chronicles, annals and journals are narratives that contain descriptions of a variety of events, including climate anomalies and natural hazards. Rather scarce and precious resources for Historical Climatology have been provided by weather-sensitive authors who have given brief accounts of weather phenomena observed during almost every season. Examples of such authors are Jean Brandon in Ter Duinen Abbey, Philippe de Vigneulles in Metz and William Merle in Lincolnshire.¹⁷ Narrative texts contain information about the weather, as well as its economic and social consequences. It is a considerable advantage that this source type covers all four seasons. However, chronicles and annals are

¹⁴ Rudolf Brázdil *et al.*, *op. cit.*, p. 8-12.

¹⁵ For instance, climate reconstructions based on institutional sources that include the medieval period were published by Kathleen Pribyl *et al.* and Oliver Wetter (Kathleen Pribyl, Richard Cornes and Christian Pfister, “Reconstructing medieval April-July mean temperatures in East Anglia, 1256-1431”, *Climatic Change*, vol. 113, 2012, p. 393-412; Oliver Wetter and Christian Pfister, “Spring-summer temperatures reconstructed for northern Switzerland and southwestern Germany from winter rye harvest dates, 1454–1970”, *Climate of the Past*, vol. 7, 2011, p. 1307-1326).

¹⁶ Rudolf Brázdil *et al.*, *op. cit.*, p. 10.

¹⁷ Jean Brandon, “Chronique de Jean Brandon avec les additions d’Adrien de But”, *Chroniques des religieux des Dunes, Jean Brandon – Gilles de Roze – Adrien de But. Chroniques relatives à l’histoire de la Belgique sous la domination des ducs de Bourgogne*, edited by Joseph Maria Bruno Constantin Kervyn de Lettenhove, Brussels, F. Hayez, 1870, vol. 1, p. 1-166; Philippe de Vigneulles, *Chronique. Vol. 2: de l’an 1325 à l’an 1473*, edited by Charles Bruneau, Metz, Société d’histoire et d’archéologie de la Lorraine, 1929; William Merle, *Consideraciones temperici pro 7 annis. The earliest known journal of the weather kept by the Rev. William Merle, 1337-1344*, edited by George James Symons, London, E. Stanford, 1891; John Aberth, *An Environmental History of the Middle Ages. The Crucible of Nature*, London, Routledge, 2013, p. 50-51.

mostly, or at least in part, a compilation of older texts. The reliability of such sources varies quite markedly so that each source requires its own critical assessment.¹⁸

Christian Pfister established a seven-point scale for Historical Climatology that could be used to assess temperature and precipitation, allowing such measures to be compared prior to the introduction of instrumental measurement.¹⁹ Separate temperature and precipitation indices, obtained for all four seasons during the entire 15th century, can be used to classify the winters of the 1430s. The criteria listed in Table 1 explain the classification of the winter temperature index.

Table 1. Index values, descriptions and criteria relevant for indices related to winter temperatures (the example refers to the Low Countries).²⁰

Index value	Description	Criteria
3	Extremely warm	<ul style="list-style-type: none"> no frost or very few frost periods mentioned no snow cover considerable phenological anomalies winter described as extremely mild
2	Very warm	<ul style="list-style-type: none"> almost no frost periods mentioned almost no snow cover remarkable phenological anomalies winter described as mild
1	Warm	<ul style="list-style-type: none"> rain rather than snow little frost mentioned
0	Normal	<ul style="list-style-type: none"> a few days of frost sporadic days with drifting ice
-1	Cold	<ul style="list-style-type: none"> repeated periods with drifting ice repeated frost periods
-2	Very Cold	<ul style="list-style-type: none"> small rivers and brooks frozen frost mentioned over a period of about one month plants damaged by frost
-3	Extremely cold	<ul style="list-style-type: none"> large rivers and lakes frozen but passable frost mentioned over a period of about two months rye and trees damaged by frost

¹⁸ Pierre Alexandre, *Le climat en Europe au Moyen Âge. Contribution à l'histoire des variations climatiques de 1000 à 1425, d'après les sources narratives de l'Europe occidentale*, Paris, Éditions EHESS, coll. "Recherches d'histoire et des sciences sociales", 1987, p. 19-22.

¹⁹ Christian Pfister, *Wetternachhersage. 500 Jahre Klimavariationen und Naturkatastrophen*, *op. cit.*, p. 44-46. Christian Pfister, Chantal Camenisch and Petr Dobrovolný, "Analysis and Interpretation: Temperature and Precipitation Indices", Sam White, Christian Pfister and Franz Mauelshagen (eds), *The Palgrave Handbook of Climate History*, London, Palgrave Macmillan, 2018, p. 115-129.

²⁰ Chantal Camenisch, *Endlose Kälte. Getreidepreise und Witterungsverlauf in den Burgundischen Niederlanden im 15. Jahrhundert*, Wirtschafts-, Sozial- und Umweltgeschichte 5, Basel, Schwabe, 2015, p. 60.

During the 1430s a concentration of very cold and extremely cold winters was noted. Four winter seasons of category –3 (extremely cold) and two of category –2 (very cold) occurred during this decade. The winter seasons of 1431/32, 1432/33, 1434/35 and 1436/37 belong to the extremely cold winter category (–3), whereas the winter seasons of 1433/34 and 1437/38 were very cold (–2).²¹ Between the years 1431 and 1438, only the winter of 1435/36 was not exceedingly cold.

Medieval authors used a variety of expressions to emphasize the intensity of the cold. For example, temperatures were described as “grand froit”, “ungeheure kelte” or “frigitas magna”, which can be translated as great or enormous cold.²² Frequently, frost was mentioned in association with the cold weather. A Dutch chronicler chose the phrase “het vroom dat het kraakte in deze winter”,²³ a very expressive description of the cracking sound that occurs when frost damages trees or when one is walking on frozen ground. In winters that clearly deviate from the average winter, the authors often mention the frost periods. During the winter of 1433/34, frost lasted for 15 weeks.²⁴ In 1434/35, a frost period of 13 weeks was reported.²⁵ However, two years later the freezing temperatures lasted at least 11 weeks.²⁶ Closely linked to hibernal cold and frost are snowfalls and snow cover. In a sequel to the chronicle of Peter von Duisburg, the following description of the 1431/32 winter was provided: “Fuit [...] maxime nives, ita quod terra undique nivibus

²¹ *Ibid.*

²² Bourgeois de Paris, *Journal d'un bourgeois de Paris, de 1405 à 1449*, edited by Colette Beaune, 4th ed., Paris, Librairie générale française, 2009, p. 324; Magdeburger Schöffenchronik, *Die Chroniken der niedersächsischen Städte: Magdeburg 1. Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert 7*, edited by Karl Janicke, Max Dittmar and Gustav Hertel, Leipzig, S. Hirzel, 1869, p. 381; Cölner Jahrbücher des 14. und 15. Jahrhunderts, *Die Chroniken der niederrheinischen Städte: Cöln 2. Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert 13*, edited by Hermann Cardauns, Leipzig, S. Hirzel, 1876, p. 199. The medieval orthography is preserved in the direct source quotations.

²³ *De Tielse kroniek. Een geschiedenis van de Lage Landen van de Volksverhuizingen tot het midden van de vijftiende eeuw, met een vervolg over de jaren 1552-1566*, edited by Jan Kuys, Leontien de Leeuw, Vaentijn Paquay and Remi van Schaik, Amsterdam, Verloren, 1983, p. 163.

²⁴ Geeraard Bertrijn, *Chronijck der stad Antwerpen*, edited by Gustav van Havre, Antwerp, Kockx, coll. “Maatschappij der Antwerpsche Bibliophilen”, 1879, p. 10; Johann Nicolaes Despars, *Cronijcke van den Lande ende Graefscpe van Vlaenderen vol 3*, edited by Jan Antoon de Jonghe, Rotterdam, W. Meschert, 1840, p. 337; *Memorieboek der stad Ghent van 't jaer 1301 tot 1738*, edited by Andreas van Heule and Polydore-Charles Vander Meersch, Gent, Annoot-Braeckman, 1852, p. 199.

²⁵ Cölner Jahrbücher, *op. cit.*, p. 124.

²⁶ Bourgeois de Paris, *op. cit.*, p. 364.

densissimis operta videretur [...]”²⁷ There was so much snowfall that the ground was completely covered with deep snow. If the temperatures were low enough, the snow did not melt for an extended period of time, as occurred in Cologne in the winter of 1434/35 when an amazing 36 consecutive days of snow were recorded.²⁸

Medieval chroniclers often equate *cold* with *winter*. In that context, expressions such as “fuit permaxima hyems”²⁹, “horribilis hyems”³⁰ and “fortis et intens fuit hyems”³¹ are frequently used. Therefore, the duration of cold temperatures is synonymous with the duration of the winter season, as is illustrated by a Dutch example for the winter of 1431/32: “de winter van 1432 was zeer streng, durede lang en kende veel vorst”.³² Other narrative texts contain similar descriptions of the following winter such as “was ain uissermaissen lank winter”³³, “was dit jaer ouch so langen winter”³⁴ and “de winter van 1433 was zeer streng en langdurig”³⁵. Also later in the decade, such as in 1434/35, the following description was recorded: “was so ein kalt winter [...] ind duerde i dri maende lank”.³⁶ The chroniclers were aware of the fact that this sequence of cold spells was exceptional. Hence, they mentioned that the cold winters were not unique during this time period.³⁷ In any case, these authors highlighted the intensity of the cold by emphasizing how long it had been before there was another winter with such low temperatures. They described one winter as being much colder than anyone could remember: “ein so kalden winter, als man ie gedenken kunte”.³⁸ A Lorrain chronicler noted

27 Conrad Bitschin, “Fortsetzung zu Peter von Duisburgs Chronik”, *Scriptores rerum Prussicarum*, edited by Max Poeppen, Leipzig, Minerva, vol. 3, 1866, p. 497.

28 Cölner Jahrbücher, *op. cit.*, p. 124.

29 Jean Maupoint, *Journal Parisien 1437-1469*, edited by Gustave Fagniez, Paris, H. Champion, 1878, p. 23.

30 Cölner Jahrbücher, *op. cit.*, p. 199.

31 Conrad Bitschin, *op. cit.*, p. 497.

32 *De Tielse kroniek*, *op. cit.*, p. 162. The winter of 1432 was severe, it lasted a long time and was accompanied by a lot of frost.

33 Johann Koelhoff, *Chronica van der hilliger stat von Coellen bis 1499. Die Chroniken der niederrheinischen Städte 2. Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert 14*, edited by Hermann Cardauns, Leipzig, S. Hirzel, 1877, p. 771. This was an unusually long winter.

34 Dietrich Westhoff, “Chronik 750-1550”, *Die Chroniken der westfälischen und niederrheinischen Städte: Dortmund und Neuss 1. Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert 20*, edited by Joseph Hansen and Johannes Franck, Leipzig, S. Hirzel, 1887, p. 308.

35 *De Tielse kroniek*, *op. cit.*, p. 163.

36 Johann Koelhoff, *op. cit.*, p. 774.

37 Dietrich Westhoff, *op. cit.*, p. 308-309; Cölner Jahrbücher, *op. cit.*, p. 168.

38 Cölner Jahrbücher, *op. cit.*, p. 167.

that for at least a hundred years there had been no colder winters than the one experienced in 1434/35: “il fit ung merveillux yver, et le plus grant qu’il heust fait de cent ans devent [...]”.³⁹ Even more remarkable is another statement concerning the same winter: “do was der kaldeste winter, der sint gotz geburte je gewas.”⁴⁰ This author even suggested that this was the coldest winter since the birth of Jesus Christ.

Humans perceive the cold in different ways. On the one hand, chroniclers described how people enjoyed the abundance of snow. In the winter of 1434/35, houses, castles, towers, bears and lions were built from the snow that had fallen in Cologne. Other people went sledding on the snow-covered roads.⁴¹ Examples from other decades show that contemporary witnesses were often astonished by the extreme cold.⁴² On the other hand, the cold was obviously threatening people’s livelihood. Beggars were afraid that they would perish in the cold.⁴³ According to a French author, in the winter of 1437/38 paupers froze to death.⁴⁴ Also, cattle, vineyards and crops were endangered by extremely low temperatures. In agrarian societies like Europe in the Late Middle Ages, crop failure and livestock losses rapidly became a matter of life and death for the inhabitants.⁴⁵ So it was not unusual for medieval chroniclers to measure the degree of cold by describing the damage caused by low temperatures, as occurred during the 1430s. At that time, various types of grain were the most frequently mentioned plants that were damaged by the cold weather.⁴⁶ As wine was a highly valued part of the medieval diet, the authors paid particular attention to vineyards.⁴⁷ In some cases,

³⁹ Philippe de Vigneulles, *op. cit.*, p. 238.

⁴⁰ Cölner Jahrbücher, *op. cit.*, p. 170.

⁴¹ Cölner Jahrbücher, *op. cit.*, p. 170; Johann Koelhoff, *op. cit.*, p. 774.

⁴² Christian Rohr, *op. cit.*, p. 446.

⁴³ Bourgeois de Paris, *op. cit.*, p. 376-377.

⁴⁴ Jean Maupoint, *op. cit.*, p. 23.

⁴⁵ Bruce Campbell, “Four famines and a pestilence: Harvest, price, and wage variations in England, 13th to 19th centuries”, *Agrarhistoria på många sätt; 28 studier om människan och jorden. Festskrift till Janken Myrdal på hans 60-årsdag*, edited by Britt Liljewall, Iréne A. Flygare, Ulrich Lange, Lars Ljunggren and Johan Söderberg, Stockholm, Kungliga Skogs-och Lantbruksakademien, 2009, p. 29.

⁴⁶ Hector Mülich, “Chronik 1348-1487 mit Zusätzen von Demer, Walther und Rem”, *Die Chroniken der schwäbischen Städte: Augsburg 3. Chroniken der deutschen Städte vom 14. Jahrhundert bis ins 16. Jahrhundert 22*, edited by Ferdinand Frensdorff, Matthias Lexer and Friedrich Roth, Leipzig, S. Hirzel, 1892, p. 75; Johann Koelhoff, *op. cit.*, p. 777; Cölner Jahrbücher, *op. cit.*, p. 174.

⁴⁷ Cölner Jahrbücher, *op. cit.*, p. 174; Hector Mülich, *op. cit.*, p. 75.

frost damage to trees was also mentioned.⁴⁸ Cattle and other animals suffered so much from the cold that during the winter of 1437/38 even cattle perished as a result of the extreme weather.⁴⁹

Continuously low temperatures led to ice drifts on bodies of water, a phenomenon that was frequently reported during the winter seasons of the 1430s in various parts of northwest Europe.⁵⁰ If it were sufficiently cold, ice drifts would freeze to form a compact ice sheet, a phenomenon that was frequently reported during the 1430s. During this time, the freezing cold temperatures led to a thick ice cover of the Rhine in the vicinity of Cologne and on other rivers in that region. In some years, the ice cover was passable for people, horses and carriages.⁵¹ For example, the Meuse and the Waal were frozen yet passable by horse-drawn carriages.⁵² In Paris, the river Seine was covered by ice in 1432/33.⁵³ As a result of the frozen rivers in 1431/32 the commonly used transportation routes for firewood and charcoal were disrupted leading to a shortage of heating materials.⁵⁴ For the same reason, mills were stopped or damaged by ice, resulting possibly in a shortage of flour.⁵⁵ A French journal reported how closely cold and scarcity were linked, and how detailed many of the descriptions of the cold and its impact were. In his short account on the winter of 1432/33 an anonymous citizen of Paris described the extremely low temperatures in January and how they affected the inhabitants of Paris.⁵⁶ Following his description, a terrible frost occurred around the

⁴⁸ "Anonyme Chronik von 991-1483", *Die Chroniken der schwäbischen Städte: Augsburg 3. Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert* 22, edited by Ferdinand Frensdorff, Matthias Lexer and Friedrich Roth, Leipzig, S. Hirzel, 1892, p. 483; Philippe de Vigneulles, *op. cit.*, p. 238-239.

⁴⁹ Chronik des Dietrich Westhoff, *op. cit.*, p. 311; Cölner Jahrbücher, *op. cit.*, p. 174.

⁵⁰ *De Stadsrekeningen van Arnhem, vol. 5: 1428-1432*, edited by Wybe Jappe Alberts, Arnhem, Gemeentearchief Arnhem, 1985, p. 96, 100, 109, 116, 134, 163; Jan Buisman, *op. cit.*, p. 504-505, 523; Johann Kerkhörde, "Chronik von 1405-1465." *Die Chroniken der westfälischen und niederrheinischen Städte: Dortmund und Neuss 1. Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert* 20, edited by Joseph Hansen and Johannes Franck, Leipzig, S. Hirzel, 1887, p. 61; *De Tielse kroniek*, *op. cit.*, p. 166; Bourgeois de Paris, *op. cit.*, p. 364.

⁵¹ Cölner Jahrbücher, *op. cit.*, p. 124, 199; Dietrich Westhoff, *op. cit.*, p. 308; Conrad Bitschin, *op. cit.*, p. 497; Johann Koelhoff, *op. cit.*, p. 774; *Memorieboek der stad Ghent*, *op. cit.*, p. 199; Johann Nicolaes Despars, *op. cit.*, p. 337; Geeraard Bertrijn, *op. cit.*, p. 10.

⁵² *De Tielse kroniek*, *op. cit.*, p. 163.

⁵³ Bourgeois de Paris, *op. cit.*, p. 323.

⁵⁴ Cölner Jahrbücher, *op. cit.*, p. 166.

⁵⁵ Dietrich Westhoff, *op. cit.*, p. 309.

⁵⁶ Bourgeois de Paris, *op. cit.*, p. 323.

8th of January.⁵⁷ At the same time the river *Seine* overflowed its banks onto the *rue de Mortellerie* next to the *place de Grève*.⁵⁸ The frost was so bad that for two nights and one day the *Seine* was frozen solid until the 22nd of January. This was the reason why the prices of food and provisions increased, especially for grain used to make flour and bread. Wheat cost eight *francs* and the two- or three-year-old field beans that people would use to feed pigs cost five *francs* per setier.⁵⁹ Barley cost five or six *francs*, and vetches and corn cockles, and just about everything else, were quite expensive. In Paris, people ate bread that was generally intended for consumption by dogs. The size of this bread was so small that a loaf of four *deniers paris* was the size of the palm of a man's hand.⁶⁰ According to the *Bourgeois de Paris*, the cold, the food shortage and the resulting high prices for staple food were closely linked.

Conclusion

The medieval chroniclers wrote frequently about cold temperatures during the winter seasons of the 1430s. On the one hand, cold was a common experience and it was nothing unusual for them. On the other hand, the duration and intensity of cold spells during this decade were excessive. With one exception, the winters from 1431 to 1438 were all significantly colder than average. People did not experience the cold in the same way. Their perception of the cold weather ranged from that of townspeople who enjoyed the snow by building houses, towers and snow statues to that of beggars who were afraid they would perish from the cold. This means the cold could be an exciting and most wondrous event but also a potential risk for food supply or even a deadly peril. Medieval chroniclers used a variety of expressions to describe the cold they had experienced. Often frost and snowfalls, as well as the snow cover, were closely associated. The words *cold* and *winter* were often used synonymously so that the winter's duration was equated with the presence of cold weather. In their most common accounts of the effects of the cold

⁵⁷ In the original text the date is given in the Julian calendar style. To convert dates from the 15th century into the modern Gregorian calendar style, nine days need to be added.

⁵⁸ Nearby the City Hall in Paris.

⁵⁹ Measure of capacity.

⁶⁰ During the Middle Ages the price of the cheapest bread did not vary but its size changed according to the grain prices.

weather, medieval chroniclers attempted to classify cold temperatures by describing their impact, especially their adverse effects on humans, animals, plants and infrastructure. Records of ice drifts and ice covering bodies of water are significant in this respect. For the medieval chronicler, the weather, the low harvest yield and high food prices were closely linked. Repeatedly, they described these phenomena as being closely and logically associated.