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Isolated data showers: exploring nineteenth century weather observations by the first Ordnance Survey of Ireland.

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Abstract: Recent digitisation of major meteorological sources has offered valuable insights into Ireland's past climate. However, more localised historical weather data remain sparse for most of the country. A largely unexplored resource lies in the early nineteenth century Ordnance Survey (OS) statistical reports collected as a component of the first OS of Ireland. This paper sets out how researchers applied diverse techniques from text analysis and corpus linguistics, Artificial Intelligence, Geographic Information Science and sentiment analysis to explore the early OS weather records. Weather Journals from fifteen parish "memoirs" across seven northern counties were identified in the OS sources, providing qualitative weather observations and quantitative temperature and pressure data. The records were extracted, explored and visualised revealing localised weather insights from the early nineteenth century and shedding light on the experiences and practices of OS staff. The mixed methods employed illustrate the wider potential application of this suite of techniques to early weather diaries and other qualitative source materials, showcasing the possibilities of using a combination of data types and approaches in historic weather research, and contributing to a deeper understanding of Ireland's meteorological and survey history.

Keywords: *Ordnance Survey Ireland; Digital Humanities; Climate; Weather; GIS; Sentiment Analysis*

Introduction

The question of human impact on temporal climatic cycles (and vice versa) has prompted researchers from various fields to examine it using complex computational models. Weather variables are a key component of many of these models, serving as indices for a wide range of environmental factors. For example, temperature data provide insights into climatic variability (Mateus *et al.* 2020), precipitation data inform soil moisture

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levels (Briffa *et al.* 2009), and wind data help researchers trace the movement of weather events globally (Barriopedro *et al.* 2013). Together, these data offer critical insights into past social, economic, and political decisions while also contributing to climate prediction models and shaping future policy decisions (Ashcroft *et al.* 2018).

Today, as scientists strive to enhance climate models and predictors, historical data have become increasingly vital for refining datasets and providing greater context, particularly regarding the rise in extreme weather events (Brunet and Jones 2011; Barriopedro *et al.* 2013). Consequently, the identification, preservation, and digitisation of historical weather data are crucial, especially as many of these manuscript records face the risk of permanent loss (Ashcroft *et al.* 2018). Early nineteenth century records, predating the emergence of national weather services in Europe around 1850 (Brönnimann *et al.* 2019), are particularly valuable for offering insights into weather patterns and trends before the advent of standardised global data collection. However, the digitisation process remains slow and labour intensive (Brönnimann *et al.* 2006), with many scholars turning to citizen science to alleviate these issues (Hawkins *et al.* 2022; Ryan *et al.* 2018; 2020). In Ireland, while official Met Éireann daily temperature archives date back to 1855, historical datasets have recently extended temperature records for some areas to as early as 1831 (Mateus *et al.* 2020). Comprehensive historical meteorological data for Ireland though remain limited outside key centres such as Dublin. This gap has been partially addressed through the digitisation of British Meteorological Office rainfall and temperature data (Hollis *et al.* 2019; Hawkins *et al.* 2022) and, specific to Ireland, additional records from Met Éireann and other historical sources (Mateus *et al.* 2020; Murphy *et al.* 2018; Ryan *et al.* 2018; 2020).[1]

Recovering, preserving, and digitising these records is crucial, as the earliest weather observations in Ireland date to the late seventeenth century (Shields 1983; Murphy *et al.* 2018), with systematic collection in a few places beginning in the eighteenth century (Murphy *et al.* 2018; Brönnimann *et al.* 2019). Additional snippets of weather information can be found in early publications like Patterson (1804) and newspaper excerpts (Mateus 2021 Jobbová *et al.* 2024), though these often lack raw data. Sourcing weather-related data for Ireland prior to 1840 remains particularly challenging, especially at a localised level.

This paper explores one largely overlooked source of localised weather information collected during the early nineteenth century by Ireland's first Ordnance Survey (OS). By exploring and visualising these data through innovative mechanisms, it aims to show the untapped potential of these records to enhance our understanding of early local weather in Ireland and provide valuable insight into the processes and practices of OS staff.

[1] Data collected after 1936 for the counties of Ireland now classed as Northern Ireland, part of the United Kingdom, are under the remit of the Meteorological (Met) Office, UK.

Weathering the weather

> *"He devoted every available moment of the fine weather to observation, and when baffled by fogs or storms, he calmy seated himself in his tent, and as if in the quiet of his office, proceeded with his calculations" (Portlock (1869: 157) on Colby).*

Land surveying and weather are inherently linked. While hostility is often cited as the primary challenge for early land surveyors in Ireland, evidence suggests weather posed a more consistent obstacle. The demands of year-round, itinerant work in a harsh climate even impacted the health of surveyors—one sixteenth century surveyor, Robert Lythe, reportedly becoming lame and nearly blind due to the inclement conditions (Lythe 1571; Dunlop 1905; Porter 2021). Similarly, in the nineteenth century, the pursuit of geodetic accuracy and other related survey work in Ireland often exposed the staff of the first OS to severe weather. Thomas Drummond, a Royal Engineer (R.E.) and key team member, almost dying from exposure while testing new instrumentation (McLennan 1867).

The weather also influenced data collection methods, driving technological innovation. Drummond invented the Drummond Lamp (now commonly known as the limelight) to improve visibility of survey stations over long distances and penetrate Ireland's "inveterate haze and fogginess" (Colby 1826, cited in Andrews 1975, 42). Similarly, Thomas Colby, the survey director, along with Drummond's keen assistance, developed the 'compensation bar' to counteract the temperature induced expansion and contraction of measuring tools. These tools were crucial for measuring the highly accurate baseline near Lough Foyle, which served as the foundation for the entire survey and later other survey enterprises elsewhere in the world.

Much like travelogues from recent centuries, the OS letters, one of the core surviving archives of the survey, highlight the prominent role played by Ireland's weather. George Petrie's correspondence, related to his work on the OS memoir scheme, describes conditions as "unfavourable to the pursuits of an artist or sketcher" (Petrie 1841, cited in Stokes 1868, 135). More vivid accounts came from John O'Donovan (1839a), writing from Sixmilebridge, County Clare, who having suffered illness prior to his OS employment (Herity 2007), found Ireland's extreme weather an enduring challenge to his health.

Rain and cold temperatures are frequent themes in the correspondence, which document the impact of weather on local agriculture (Petrie 1838, cited in Stokes 1868: 124). They describe flooded roads and fields, freezing conditions, and reflections on how Ireland's climate had seemingly changed within the writers' lifetimes (O'Donovan 1834; 1836; 1838).

A developing interest in climate and weather

In addition to creating detailed maps of the country, the OS undertook supplementary projects, including those with an interest in climate. This enthusiasm stemmed from growing societal and academic efforts to measure and understand weather phenomena. By 1830, the Royal Irish Academy (RIA) had formally questioned whether climate change

had occurred in Ireland and Joseph McSweeny's detailed 1831 response for the RIA reviewed various theories and studies on weather observations from the early nineteenth century (McSweeny 1831).

Almost simultaneously, Alexander von Humboldt, by then a globally renowned figure, was advancing ideas on climate as a dynamic interaction between the earth and atmosphere, while emphasising humanity's role in climate change (Strobl 2021). Humboldt's revolutionary perspective suggested antiquarians go beyond identifying weather and climate predictors to actively participating in the study of these processes. The significance of climate studies within learned society is evident from the contributions of RIA members in 1850, many of whose work in atmospheric sciences remains influential. Among them was RIA president Humphrey Lloyd, who initiated "a country wide systematic observation of daily meteorological conditions" in 1851 (Tyrrell 1997: 66; Dixon 1970). Prominent OS staff involved in the first OS of Ireland, including Thomas Frederick Colby, Thomas Aiskew Larcom, and George Petrie, were also RIA members who would not only have encountered these ideas but actively participated in the research and debates surrounding them.

A weather memoir

Amid growing scientific enthusiasm for weather, in the 1820s, under Colby's direction, the OS in Ireland seized the opportunity to train staff in meteorological data collection. Staff were instructed in surveying techniques and the use of measuring instruments, with "the camp on Divis [becoming] a school not merely of geodesical but meteorological science" (Portlock 1869: 126). Divis was the first location where OS staff recorded Irish weather data, and from 1825–1831, weather observations were gathered at fifteen trigonometric stations. Much of the data are recorded as being collected by Portlock, Larcom, and Beatty, with James Crean assuming responsibility in 1830, though many unnamed others would also have assisted. Weather data were also gathered from non-trig points after 1831, but this appears to have been the initiative of individual staff members rather than part of an organised effort (Mateus 2021, citing Cameron 1856).

Following this, in 1829 at the Ordnance headquarters in Mountjoy House, Phoenix Park, Dublin (Cameron 1856), under the then Assistant Director Larcom, the OS initiated efforts to collect meteorological data on a systematic basis. This included barometric pressure—considered by Larcom to be "the greatest peculiarity of the Irish climate" (Portlock (1869: 233) on Larcom)—as well as temperature (from 1831), rainfall, wind, and humidity (Andrews 1975). These Dublin records have been maintained continuously to the present day, alongside data from Armagh Observatory (temperature and pressure from 1795, and rainfall from 1838) (Butler 2007), and together, they represent the most valuable continuous meteorological datasets for the island (Ryan *et al.* 2020).

Building on Colby's directive that staff should record interesting observations during survey (Andrews 1971), and in an effort to expand statistical observations nationwide, in 1832 Larcom authored a pamphlet outlining instructions for collecting 'statistical'

reports. These reports, later known as the OS 'memoirs', were designed to complement the maps by providing additional parish-level information not represented on the final map. The pamphlet included four sections: 'geography or natural state,' 'topography or artificial state,' 'the people or present state,' and administrative land divisions. Climate was addressed within one of these sections, though no specific instructions on meteorological measurement were provided to staff.

The original goal of collecting nationwide meteorological data, however, was not fully realised and was limited to key centres, with more spatially diverse continuous data not collected by the OS until the 1860s.[2] Furthermore, involvement in Larcom's statistical reports was voluntary, and data collection procedures being open to interpretation, varied in depth depending on staff interest and training (Andrews 1975). Notable detailed memoirs were produced by staff like Lieutenant John Chaytor (Fermanagh) and civilian James Boyle (Antrim), while other parish reports extended to only a few pages. Although memoir-style content appears in later OS materials, such as field name books and correspondence, the statistical reports were ultimately discontinued due to cost and were not compiled for more southerly parishes leaving the unpublished memoirs covering only northern counties of the island.[3]

One branch of the OS that continued after the closure of the memoir scheme was the geological survey. As Portlock noted in his 1843 publication on the geology of counties Derry/Londonderry, Tyrone, and Fermanagh, "Of all subjects of conversation, the weather is perhaps the most engrossing, and in few countries is it so much a subject of complaint as in Ireland" (1843: 649). In the 'Climate – Drainage' section, he proposed improvements in land drainage, compared Ireland's weather to England's, and presented tabulated weather data collected from various sources for estates under study, as well as for selected settlements, counties, and provinces from 1836 to 1841.[4] Portlock also advocated for maintaining local weather registers to eliminate ambiguity, a suggestion likely aligned with Larcom's earlier intention to include climate data in the memoirs, at least in the short term.

Although nationwide meteorological data was not a central focus of the OS memoir scheme, some military and civilian staff succeeded in recording localised weather-related information. It is unclear whether these staff had pre-existing skills or had been trained in the use of meteorological equipment, such as that mentioned by Cameron (1856) in the 1820s school on Divis. Nonetheless, weather data, in various formats and with differing content, exist for several northern parishes. To this author's knowledge, only Jupp (1994), Shields and Fitzgerald (1989), and Mateus (2021) have referenced the memoir weather records in their research, and before now the information has not yet been fully extracted or analysed.[5]

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[2] Note that by the 1870s the British survey in India observed and recorded daily weather reports from various stations (Black, 1891) deemed an essential scientific component of a national survey.

[3] The memoir scheme was cancelled by the master-general on 1st July 1840 with only Templemore, County Derry/Londonderry published in 1837.

[4] Sources include the Royal Society, Dr J. Apjohn, Register of the College of Surgeons, Register at the Linen Hall Library, and G. Wilkinson, Esq., Architect to the Poor Law Commission.

[5] Trainor (1969) lists some the parishes that include meteorological records but does not transcribe or discuss them in any detail.

Methodology and Results

The following details the steps taken by way of a preliminary investigation of 'weather' in the OS memoirs, and those who collected the information. This includes a suite of methods, techniques and tools drawn from text analysis and corpus linguistics, Artificial Intelligence, Geographic Information Science and sentiment analysis. The purpose is to provide an initial exploration of the weather information contained within the memoirs rather than a comprehensive analysis of the data and to make what is described reproducible in other contexts.

Distant and close reading of weather in the memoirs

The OS memoirs, written between 1829 and 1840, have been made available in various formats and publications. While only one parish memoir was published in the nineteenth century (Templemore, County Derry/Londonderry (Colby 1837)), the full archive of manuscript material was deposited by the OS at the RIA Library in Dublin where it remains today. In 1969, the Public Record Office Northern Ireland (PRONI) published the memoir for County Antrim, though it omitted the weather data and lists only eleven parishes as having included weather journals (Trainor 1969). In the 1990s, the Institute of Irish Studies at Queen's University Belfast (QUB), in collaboration with the RIA, transcribed and published the full memoir text in forty volumes, totalling approximately 4.8 million words. As part of the Research Ireland and Arts and Humanities Research Council co-funded project, 'OS200: digitally re-mapping Ireland's Ordnance Survey,' the entire transcribed text was made available in digital format to the project team and has since been published online.[6]

As a first stage of exploration, open source corpus linguistic tools (Anthony 2023) were used to conduct a distant reading of the complete memoir text, identifying mentions of the keyword 'weather' to determine the depth and spatial extent of related information. One common approach in exploring text via such open source tools, and more generally in Natural Language Processing (NLP), is to assess the co-occurrence of keywords of interest (in this case 'weather') with other words in a text. This permits a measurement of 'collocation' whereby two words more frequently appear adjacent to one another than would be expected by chance, possibly revealing patterns of significance.

The top collocates of 'weather' revealed that 'journal' was the most common (Table 1).[7] Close reading of the keyword in context confirmed that specific 'weather journals' were included for some parishes, detailing place, date, and weather conditions with varying levels of detail and time spans. Other weather-related words, such as 'dry,' 'wet,' 'calm,' and 'stormy,' also ranked highly among the top collocates. Upon close reading, these terms

[6] With thanks to Angelique Day. The authors checked the accuracy of a sample of the transcripts versus the original manuscripts held at RIA and were satisfied to proceed with an analysis of the 1990s transcription. The transcription used contains the weather information omitted from the 1990s publication, including Carrickfergus parish. The information can be viewed and downloaded at https://dri.ie/os200

[7] The span, or collocation window was set to 5 tokens to the left and right of the keyword. A token in this case refers to a word in the text, 5 tokens equalling 5 words.

appear in both more formal meteorological records and descriptions of local weather in more general contexts. For example, major weather events like the 'big wind' of January 1839 were recorded in detail. Boyle, in Carrickfergus parish, noted, "On the 6th, at about 10.00, a gale commenced which rose to be a perfect hurricane in a couple of hours and continued until between 3 and 4 o'clock in the morning of the 7th. This storm will be long remembered in this country as it committed more devastation amongst trees and caused more injury to houses than any on record" (Boyle 1839). The same storm was also recorded elsewhere, such as in correspondence sent by John O'Donovan from Wicklow (O'Donovan 1839; Shields and Fitzgerald 1989). Other collocates describe contemporary and historic weather related to events, agriculture, rivers, the sea, infrastructure, and more.

The top collocates also include the words 'features' and 'natural,' which refer to the sub-sections of the memoirs containing more detailed weather reports, or 'weather journals', in line with Larcom's (1832) original instructions for structuring the field recording. While 'climate' is used as a section header, it does not appear in the top 50 collocates of 'weather,' even when the collocation window is expanded to include 10 tokens (left and right). Surprisingly, given reports from OS staff in correspondence, 'dry' weather ranks higher than 'wet' weather. However, among the top 100 collocates, terms related to poor weather are more prevalent than positive weather-related language.

Table 1: The top collocates with the word 'weather' in the OS memoirs, including their frequency left and right of the keyword at a 5 token span

Collocate	Rank	Frequency Left of "weather"	Frequency Right of "weather"
journal	1	13	79
dry	2	49	6
wet	3	40	4
features	4	73	1
natural	5	72	0
calm	6	24	0
stormy	7	22	0
fine	8	42	2

The initial exploration therefore reveals that weather is mentioned not only in passing landscape descriptions but also in more detailed sub-sections, under the title 'Weather Journal' recorded as part of the 'Natural Features' of a parish. Further investigation shows that weather journals are included for fifteen parishes across the counties of Antrim, Armagh, Donegal, Down, Derry/Londonderry, Monaghan, and Tyrone (Figure 1).

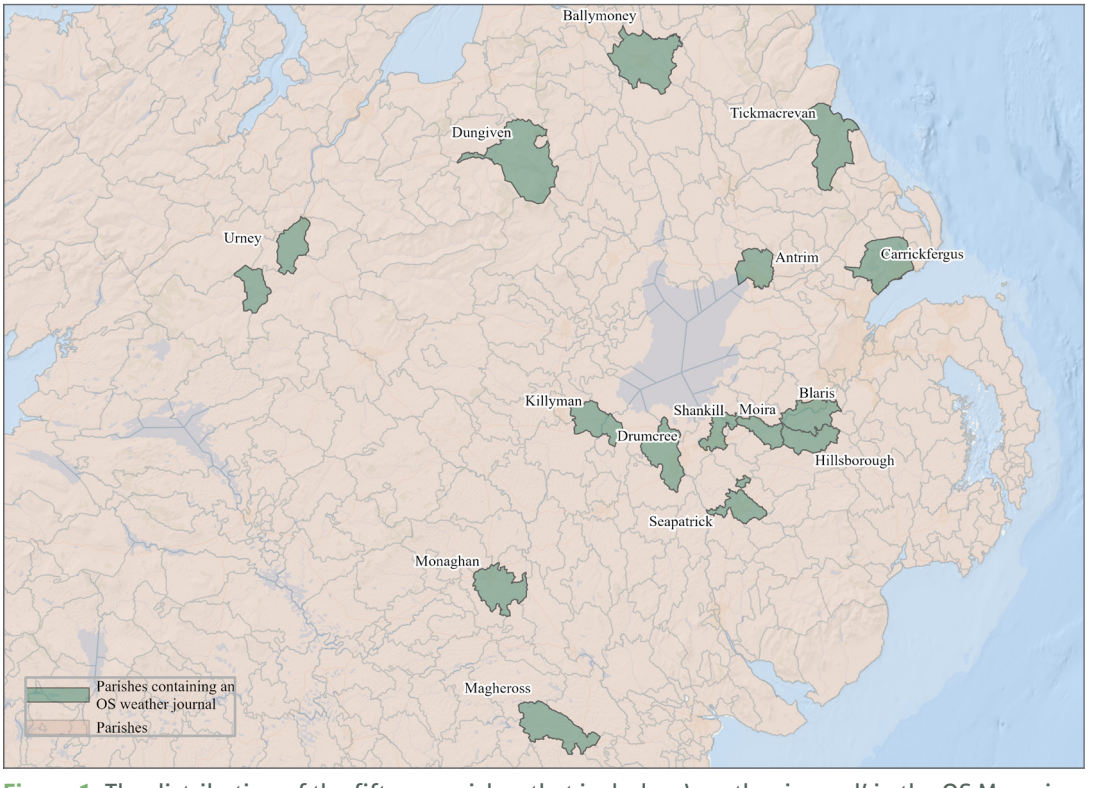
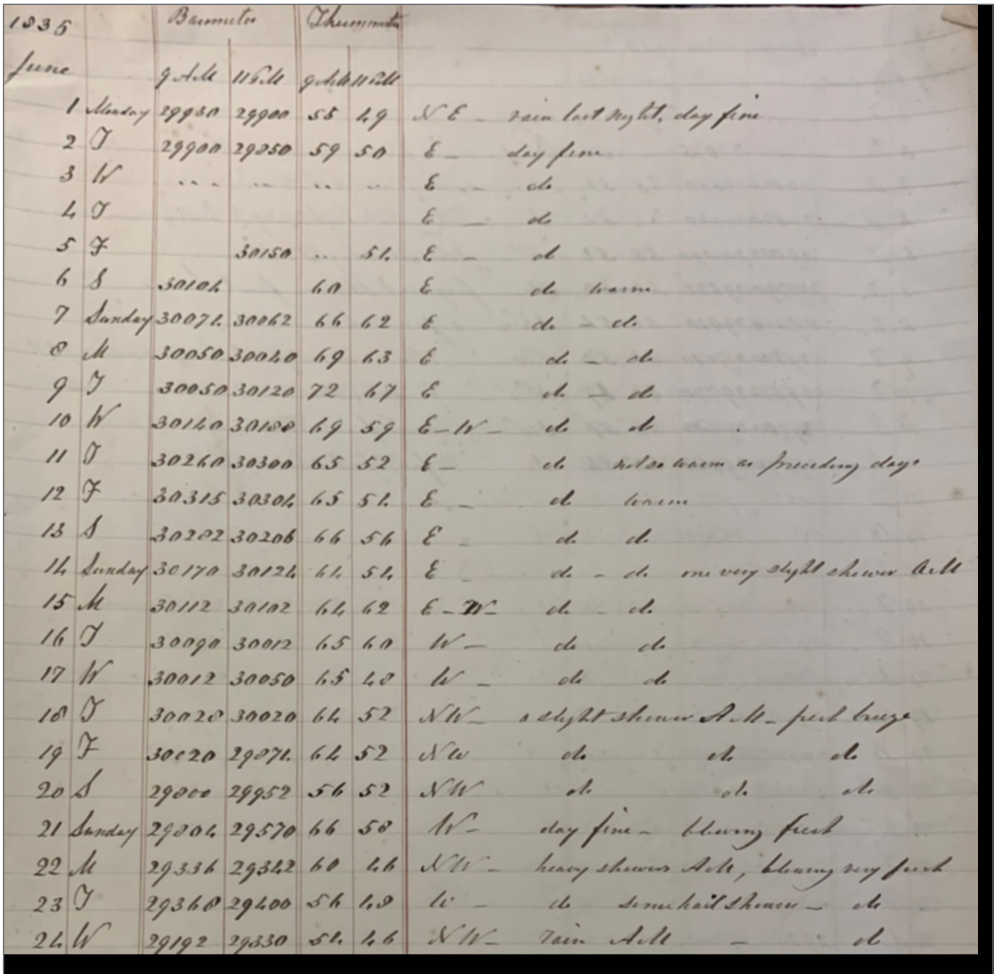


Figure 1: The distribution of the fifteen parishes that include a 'weather journal' in the OS Memoirs.

From memoir to database

Approximately 47,000 words of text detailing the weather journals were manually extracted from the raw memoir text. For each of the fifteen parishes, the location, date range, and various weather-related information are included under field headers corresponding to the original manuscripts. Figure 2 shows an example of one manuscript weather journal (dated June 1835) held at the Royal Irish Academy and an example of the raw text file used in this research extracted from the weather journal for Antrim parish, County Antrim.

Given the string layout of the input as shown in Figure 2, manually processing the information into tabular format was deemed a laborious task and prone to human error. Automating the extraction process through scripting was complicated by the data variation



1835

June		Barometer 9 AM	Barometer 11 PM	Thermometer 9 AM	Thermometer 11 PM	
1	Monday	29980	29900	55	49	NE – rain last night, day fine
2	T	29900	29950	59	50	E – day fine
3	W	...	...	...	...	E – do
4	T					E – do
5	F		30150	..	51	E – do
6	S	30104		60		E do warm
7	Sunday	30074	30062	66	62	E do – do
8	M	30050	30040	69	63	E do – do
9	T	30050	30120	72	67	E do – do
10	W	30140	30180	69	59	E–W – do do
11	T	30260	30300	65	52	E – do also warm as preceding days
12	F	30315	30304	65	51	E – do warm
13	S	30202	30206	66	56	E – do do
14	Sunday	30170	30124	61	54	E – do – do one very slight shower Aft
15	M	30112	30102	64	62	E–W – do – do
16	T	30090	30012	65	60	W – do do
17	W	30012	30050	65	48	W – do do
18	T	30020	30020	64	52	NW – a slight shower Aft – fresh breeze
19	F	30120	29974	64	52	NW do do do
20	S	29900	29952	56	52	NW do do do
21	Sunday	29904	29570	66	50	W – day fine – blowing fresh
22	M	29336	29342	60	46	NW – heavy shower Aft, blowing very fresh
23	T	29360	29400	56	49	W – do some hail Shower – do
24	W	29192	29330	54	46	NW – rain Aft – do

"Meteorological register kept at Antrim from the 4th May 1836 to the 30th August 1837. [Table contains the following headings: date, state of the weather in the morning, noon, afternoon and night, direction of wind]. 1836, May. 4th: windy, showery, dry, windy, northerly; 5th: dry cold, dry, dry, dry, northerly; 6th: mild, mild, mild, mild, northerly; 7th: mild, mild, mild, mild, northerly; 8th: mild, mild, mild, mild, south easterly; 9th: heat, mild, heat, dry, southerly; 10th: heat, heat, heat, dry, southerly; 11th: windy, windy, windy, windy, westerly; 12th: windy, dry, dry, windy, south westerly; 13th: slight showers, dry, dry, dry, south westerly;"

Figure 2: Manuscript weather journal page for June 1835 recorded by James Boyle (1835) in the memoir for Carrickfergus. By permission of the Royal Irish Academy © RIA and an example of the raw text from the memoirs extracted from the 1990s publication (The Institute of Irish Studies in association with The Royal Irish Academy).

in both its original collection and formatting, and detailing the multitude of exceptions was deemed too time intensive. Since the data totalled less than 50,000 words, this project chose to harness open source Artificial Intelligence (AI) technologies in the form of a popular Large Language Model (LLM) (OpenAI 2024) for extraction and tabulation, making this step of the data preparation cost free and reproducible by others. The authors provided the extracted text of each parish journal to the LLM and instructed it to tabulate the information according to the headings as set out by the original recorders. Some trial and error were needed to instruct the AI to produce a table with the correct fields for each parish and as the LLM learned the requirements this process became more efficient. Once the data were tabulated and moved to separate storage in spreadsheet format, the quality-checking process revealed only minor errors in the tabulation, resulting in a final tabulated dataset of weather journals from the fifteen parishes.

A first look at the OS weather journals

Table 2 summarises the fifteen weather journals, including the recorder's name, location, date range, and the forms of meteorological data present. Spanning from 1834 to 1839, the records total almost 4,000 weather observations across all parishes.[8] Most data were collected daily, but the temporal range varies from two months to sixty months across the parishes.

The memoir recorders, both military and civilian, were assigned to different parishes, sometimes multiple times (e.g., McIlroy four times, Boyle three times, Scott and Ward twice, and Boteler, Cumming Innes, Wilkinson, Hore, and McGann once). Assessing the weather journals more closely, there was little standardisation in the information collected, with varying types and styles of information depending on the location and the recorder. However, some recorders followed a pattern of collecting weather data at morning, noon, afternoon and night, likely a learned or instructed practice. The lack of standardisation is most evident in the qualitative 'observed conditions' (e.g., 'wet', 'windy', 'warm') recorded at different times of the day, as well as wind direction and some similarities can be seen with 'Weather remarks' recorded by Larcom in the Phoenix Park data series. While two parishes include temperature data and one records barometric pressure, none include rainfall data—despite rainfall being a key weather measurement—however, many qualitative observations do mention various forms of precipitation.

[8] The memoirs from Urney parish are dated 1836, but some of the information provided appears to be sourced from historical datasets (1821) rather than collected by the OS staff. The weather journal is also dated 1821, and there are several lists of data from the 1821 census for the same parish, including townland acreage, contents, and inhabitants' names. Urney is not listed as containing a weather journal in other publications.

Table 2: Location, recorder, date range, number of records and contents of OS memoir weather journals (C=Conditions, W=Wind, T=Temperature, P=Pressure, O=Observations).

Location	Recorder Name	Date Recorded	Record Count	Data Recorded
Antrim, Antrim	James Boyle	Mar 1835 – Apr 1838	769	C, W
Ballymoney, Antrim	James McGann	Jul 1834 – May 1835	323	C, W, O
Blaris, Antrim	George Scott	Feb 1835 – Mar 1835	55	C, W
Carrickfergus, Antrim	James Boyle	Nov 1834 – Jun 1839	1685	C, W, T, P, O
Drumcree, Armagh	Thomas McIlroy	Oct 1837 – Nov 1837	42	C, W
Dungiven, Londonderry	C.W. Ligar	Feb 1835 – Apr 1835	72	C, W
Hillsborough, Down	Thomas McIlroy	Apr 1837 – Jul 1837	113	C, W
Killyman, Tyrone	George Scott	Jul 1835	28	C, W, O
Magheross, Monaghan	Lieutenant R. Boteler	Nov 1834 – Aug 1835	289	C, W, T, O
Moira, Down	J.R. Ward and Thomas McIlroy	Jul 1837 – Sep 1837	41	C, W
Monaghan, Monaghan	J.R. Ward	Feb 1838 – Apr 1838	69	C, W, O
Seapatrick, Down	J. Cumming Innes	Nov 1836 – Apr 1837	160	C, W
Shankill, Armagh	Thomas McIlroy	Sep 1837 – Oct 1837	40	C, W
Tickmacreven, Antrim	Thomas Hore and James Boyle	Aug 1834 – Nov 1834	112	C, O
Urney, Donegal	Lieutenant I.I. Wilkison	Aug 1821 – Sep 1821	61	C, W, O

It is unknown why weather journals are included for some parishes and not others. There is no meaningful geographical pattern to their inclusion and the cluster of parishes located to the south of Lough Neagh appears to have no relevance. The number of records in each parish journal, as detailed in Figure 3, also varies in both detail and timescale, the reasons for which are again unclear. Further, while some employees recorded weather journals for some (though notably, not all) of the parishes under their charge, others did not, despite the assumption that all would have had access to Larcom's (1832) instructions on the memoir scheme. This speaks to the lack of definitive collection strategy provided by the OS in Dublin or possibly to a more ad hoc approach by individuals and is also seen elsewhere in the memoirs.

Carrickfergus parish has the longest continuous temporal range of weather information and the most detailed quantitative data, including temperature and pressure recordings, as well as notes on the types and placement of the instruments used.[9] James Boyle, believed to have been a resident of County Antrim (Day 1991), and who was responsible for this parish, is arguably the most frequently referred to memoir recorder due to his extensive work on other aspects of the memoirs, and he was one of only three staff members who worked through to the close of the memoir scheme in 1839–1840.

[9] Recording gaps are present across all years.

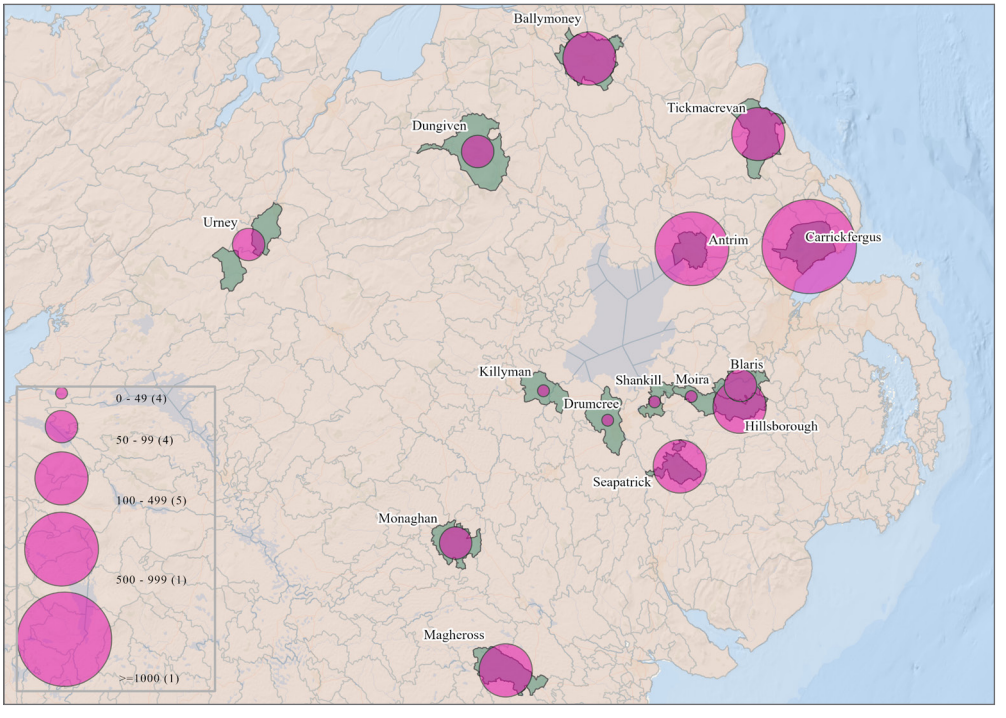


Figure 3: The fifteen parishes where weather journals were recorded (green) indicating the count of records collected (pink) and the number of parishes in each class.

Visualising the OS weather journals

To explore the weather journal content further, it was necessary to consider how best to analyse and visualise the information across time and space, a well-known challenge for researchers (Andrienko *et al.*, 2010; Peuquet 2001; Travis 2014). For the OS weather journals, this challenge is compounded by the lack of a standardised recording structure, the mix of qualitative and quantitative records, and their varied temporal and spatial range. The following section details methods to explore these records through visualisation.

Temperature and pressure readings

The average daily temperature in degrees Fahrenheit for Carrickfergus parish, which has the most complete set of quantitative measurements, was first plotted as a calendar 'heat map' using Python, providing a first visualisation of the temperature data (Figure 4).[10][11] This shows the nearly continuous data collection over four years (1835–1838), plus the

[10] Temperature readings are in Fahrenheit according to the original records collected by the OS.

[11] The code pivots the data to draw months as rows and days as columns and a diverging colourmap is applied from blue ('cold') to red ('hot').

months of November and December in 1834, and January to June in 1839. Notably, Boyle recorded data during the winter period in all years except for 23rd December 1835 to 8th January 1836 (recording gaps shown in white). This heat map permits the researcher to investigate temporal trends and anomalies in the data such as a slightly warmer than average early April in 1835, followed by higher summer temperatures. It also illuminates the gaps in data collection, most prominent in 1835 and 1836.

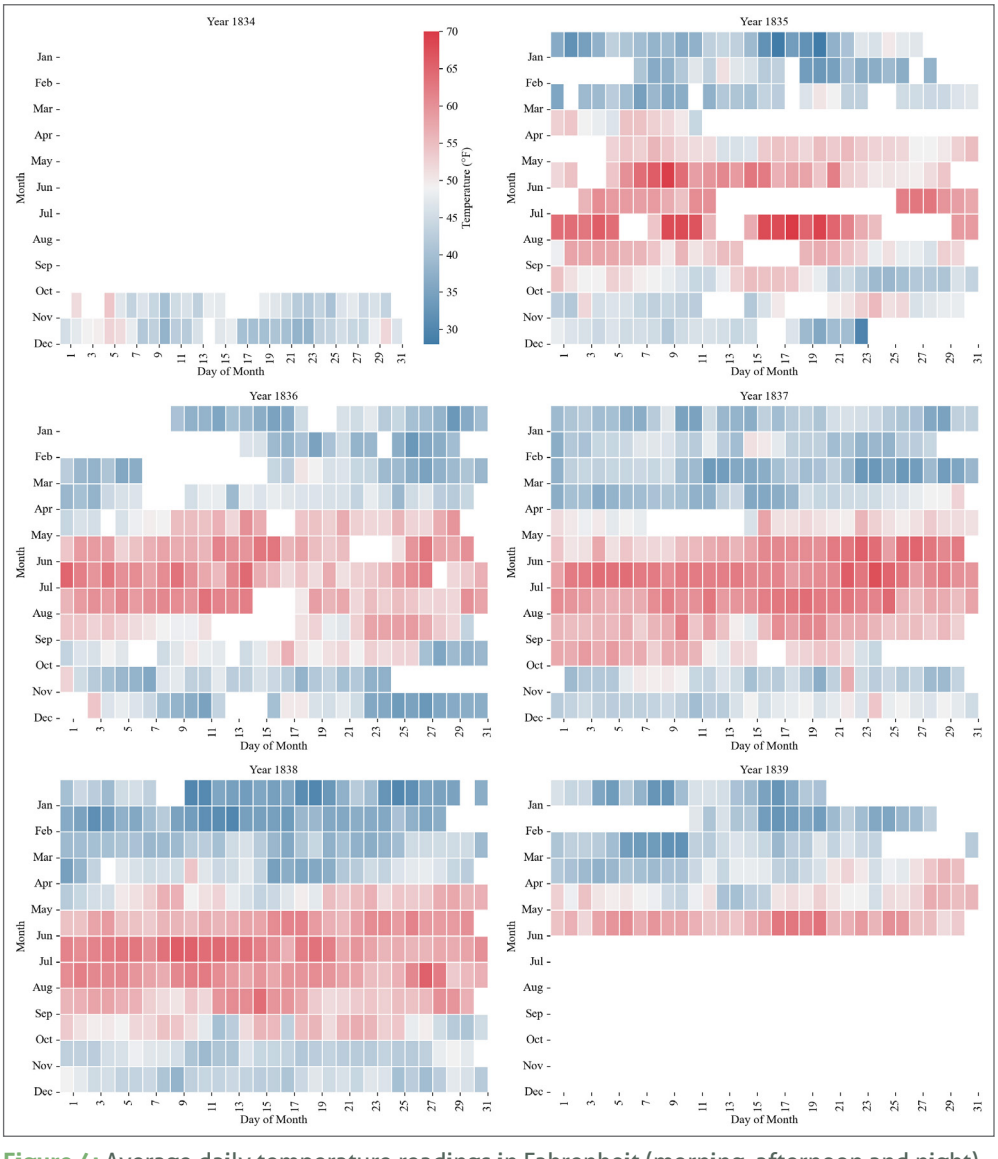


Figure 4: Average daily temperature readings in Fahrenheit (morning, afternoon and night) for Carrickfergus parish (1834–1839).

Additionally, a second form of visualisation displays the average monthly temperatures for the parish over the entire temporal range of data collection in the form of a line graph (Figure 5). This alternative visualisation reveals an expected seasonal pattern of cooler temperatures in the winter months and warmer temperatures in the summer. Although this pattern is largely expected, the data for 1836 reveal a cooler summer and for 1837–1838 suggest a particularly cold winter (Figure 5). This 'dip' in temperature aligns with analysis of weather data across Europe indicating a significant cold winter during this period (Barriopedro *et al.* 2013).

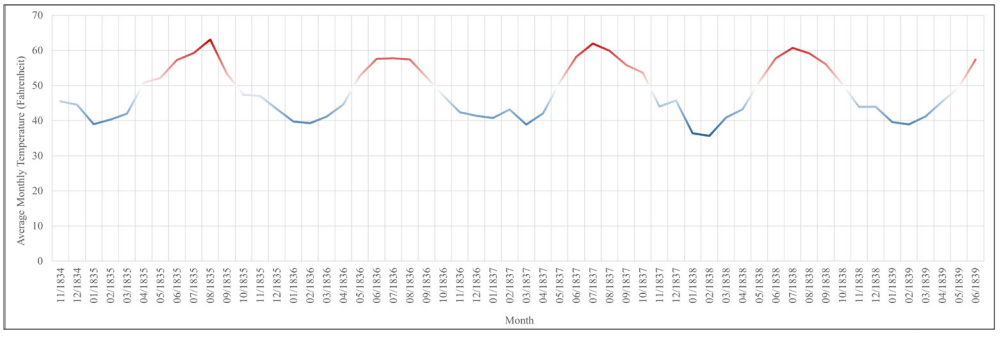


Figure 5: Average monthly temperature readings in Fahrenheit for Carrickfergus parish (1834–1839).

Pressure records for Carrickfergus parish measured in inches (inHg) (to 3 decimal places), also collected by Boyle, exhibit trends similar to the temperature data, with expected pressure fluctuations throughout the collection period (Figure 6).[12] As with the temperature data, records were collected from November 1834 through to June 1839. Similar to the temperature data, gaps in the daily records indicate periods when readings were not recorded.

Comparing the temperature and pressure heat maps, there are some discrepancies in the data collection. For example, temperature data is recorded for most of May 1837, but pressure data is only recorded for the first seven days of the month. There is also one higher than average pressure reading on 4th May 1838 when the weather was described as 'fine', and there is no known contemporary evidence, including the OS temperature readings on that day, to suggest why this was so.[13]

As Boyle was likely a native of County Antrim (Day 1991), his civilian status and possibly more stable circumstances, compared to the often transient nature of military OS employees, may have allowed him to record the weather in greater detail, potentially from his home which is suggested in his introduction to the Carrickfergus register (Boyle 1839). However, given the nature of his employment, it seems unlikely that he participated in the earlier meteorological training of the military staff at Divis. In Boyle's introduction to what he termed the "Meteorological Register" for Carrickfergus, he demonstrates

[12] Pressure analyses showed 3 transcription errors from the manuscript to 1990s publication with a pressure of 209 recorded instead of 29.

[13] This is due to the afternoon pressure reading of 36.054 inHg, raising the average of the daily record above other readings in the scale.

knowledge of how the equipment operates and the importance of its placement (Boyle 1839) which indicates prior knowledge. This also suggests that the equipment, which is described as being in somewhat poor and uncalibrated condition, was possibly borrowed for the purpose of the weather readings rather than officially supplied by his employer, marking another a departure from the original meteorological data collection plans set out by the OS.

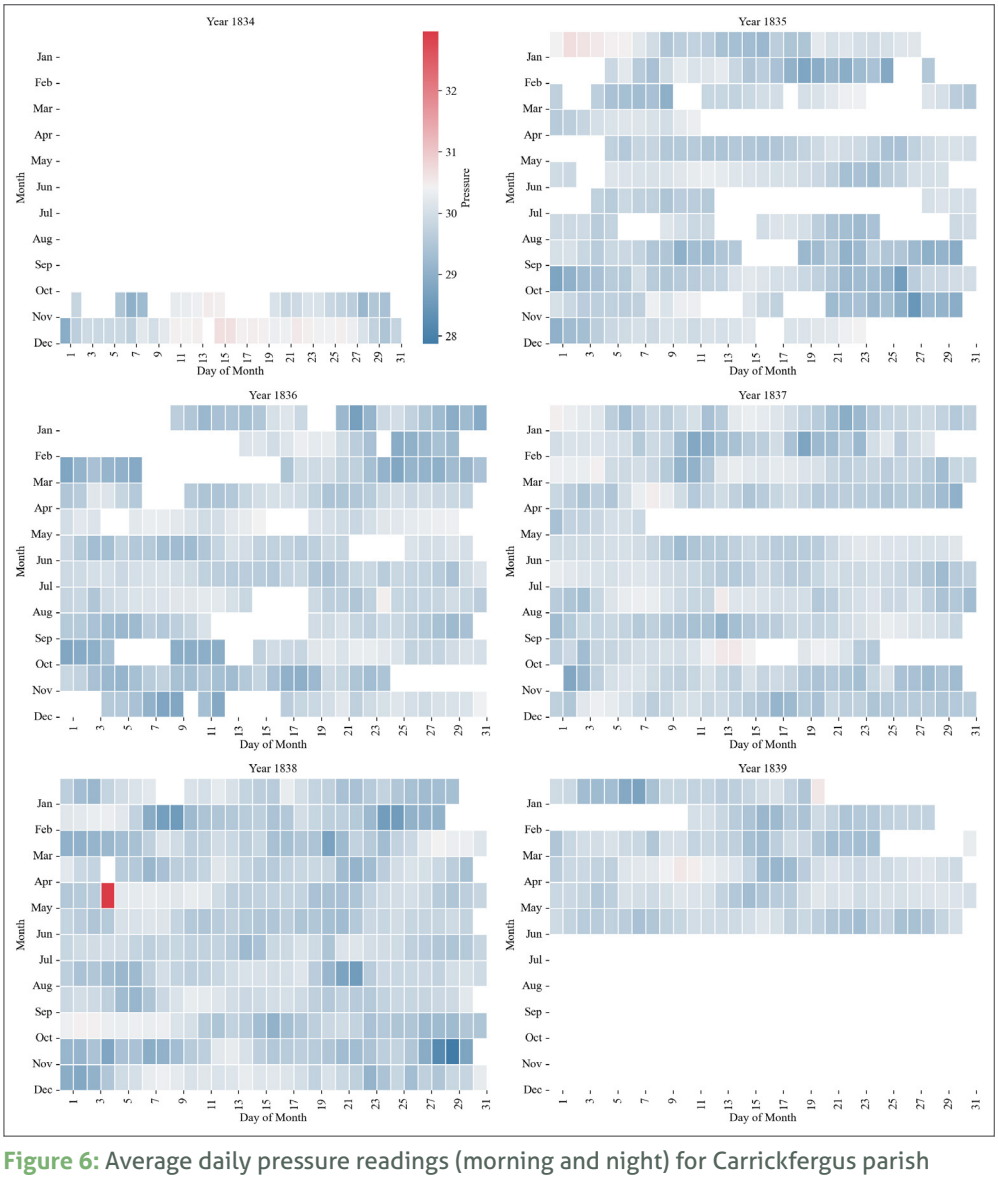


Figure 6: Average daily pressure readings (morning and night) for Carrickfergus parish (1834–1839).

Wind readings

Prevailing wind direction was recorded for all but one parish (fourteen in total).[14] While there are some gaps in the data, like the temperature and pressure data, the average percentage of cardinal directions for each parish was calculated and plotted as a radar chart or 'wind rose' using Python (Figure 7). Though the exact location within the parishes where measurements were taken and the methods employed are unknown, this visualisation provides a temporal and spatial proxy for wind direction and could in further analysis look at this temporally, too.[15] It reveals that the predominant wind across all recorded areas was south-westerly, followed by westerly and northerly winds. Looking specifically at Boyle's readings for Carrickfergus, we also know there was room for error, Boyle stating that "the winds may be considered as having been, during the day, very variable and unsteady, probably at times blowing from many more points than those indicated" (Boyle 1839).

Notably, the inclusion of wind direction in the memoirs predates some of the data collected by Larcom's team in Dublin, with wind direction having been recorded for Ballymoney parish, County Antrim, by James McGann as early as 1834, whereas similar recordings did not begin in Dublin until 1839 (Andrews 1975).[16]

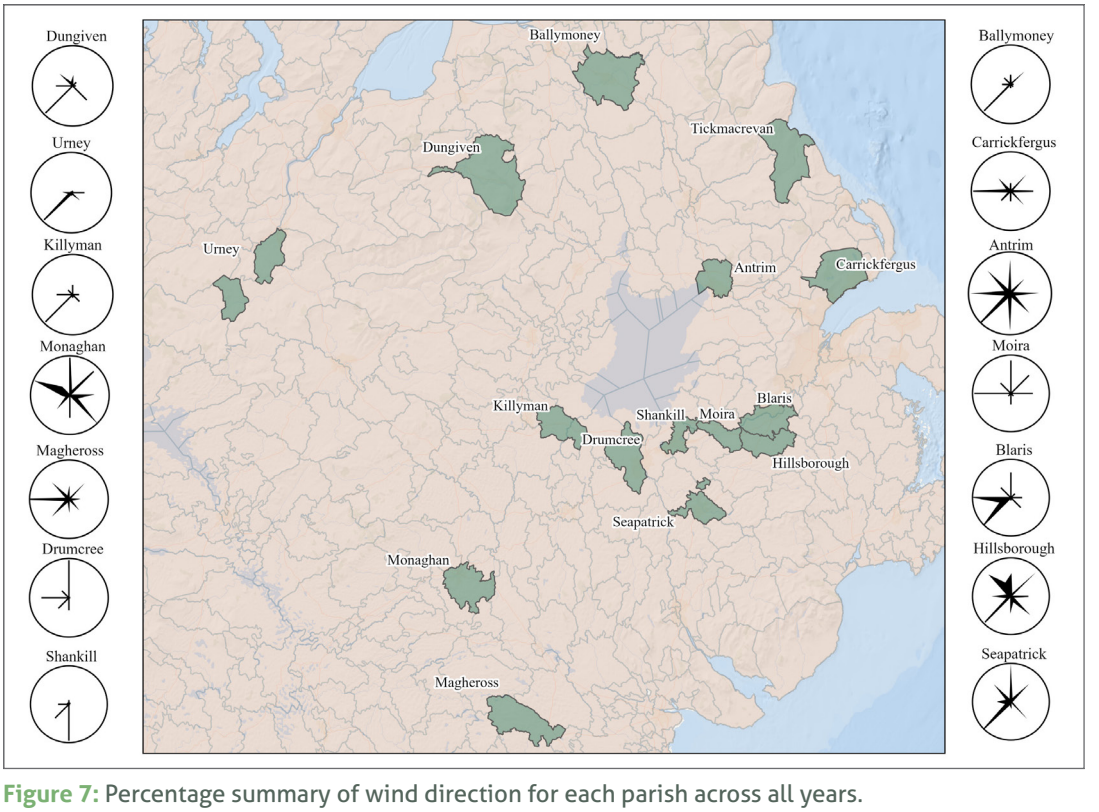


Figure 7: Percentage summary of wind direction for each parish across all years.

[14] Tickmacreven does not include readings.

[15] The only exception to this is Boyle's written account of his recording situation though this is focused on temperature readings (Boyle 1839).

[16] At Mountjoy House – barometric pressure: 1829 onwards; temperature: 1831 onwards; rainfall: 1837 onwards; wind: 1839 onwards; humidity 1841 onwards (according to Andrews 1975).

Weather sentiments

The journals are more substantial in their inclusion of daily qualitative observations of weather conditions, recorded at morning, noon, afternoon, and night, as well as in a more general "Observations" column, depending on the parish and recorder.[17] The former form of recording was the most common across the parishes, though some, Carrickfergus, Magheross, Tickmacrevan, and Urney, included only the "Observations" column. In the following analyses, they will be tackled separately.

Despite its drawbacks, the qualitative information has the potential to offer value as a general overview of localised weather conditions during the periods of observation .[18] There are, however, several challenges in interpreting, visualising and analysing this type of qualitative information. One of the more popular avenues to investigate qualitative information is through sentiment analysis. Scholars have raised concerns though about how sentiment categorisation might be influenced by personal opinion (Pang and Lee 2008; Thelwall *et al.* 2011), something which was highlighted by the OS in the nineteenth century when Portlock (1843: 649–650) cautioned us on the role of human perception: "The great differences in different places and districts cannot be explained solely from localities, and is doubtless, in part, due to the very varying estimates of what is fair and what is wet formed by different people." Therefore, the subjectivity inherent in this form of qualitative information must be recognised by the researcher and interpreted accordingly.

While there is a clear awareness of its limitations, sentiment analysis has been successfully applied to a multitude of genres, and from a modern weather-related perspective, it has proven fruitful (Hearn 2010; Andrejevia 2011; Chopra and Bhatia 2016; Rebora 2023).[19] In this research, it provides additional benefits by offering a way to qualify qualitative information that would otherwise be nearly impossible to interpret. Here, as a practical means of conducting initial exploratory data analysis on the qualitative information, weather-based sentiment analysis enables the grouping of weather conditions based on descriptive language and terminology, ultimately revealing variations in weather, and the related staff experiences of the same, across time and space.

Sentiment analysis typically categorises information into three levels: positive, negative, and neutral conditions of language and text (single words, phrases or sentences). However, given the nature of the information in this context, this traditional approach was deemed inappropriate. Instead, a bespoke classification system was developed and employed, using weather-related terminology ranging from 'low,' 'moderate,' 'high,' and 'extreme' weather, which mirrors but also expands upon more traditional sentiment categories.

[17] Refer to Figure 2 for an example of qualitative recordings.

[18] Mateus (2021) lists the memoir data from Carrickfergus in an inventory of historical meteorological observations which require 'rescue' but does not list the additional meteorological records from other parishes described here, much of which are qualitative.

[19] See Kennedy 2012 for more.

Python was used to extract a list of unique weather-related words from the tabulated journals into text file format. This formed the basis of a sentiment dictionary categorising the weather across each locality, based on the qualitative readings for morning, noon, afternoon, and night.[20] Each unique term was then manually classified by the authors under the four sentiment categories – 'low,' 'moderate,' 'high,' and 'extreme' weather.

Those records classified as 'low' relate to mild, uneventful weather conditions such as 'pleasant', 'fair', 'fine', and 'settled', while those categorised as 'extreme' use terms such as 'intense heat', 'great storm', and 'violent hail'. 'Rain' or 'wet' were classified as 'moderate' weather, as there are no local contemporary records to determine the extent of the precipitation. Similarly, in typical sentiment analysis, both 'rain' and 'wet' could be seen as negative sentiments, but they may have positive implications if there has been a drought previously. Other terms like 'dewy' and 'dull' proved more challenging to associate with a sentiment but were categorised as either 'low' or 'moderate' depending on the context.

Also considered in the sentiment classification are the inclusion of adjectives and adverbs. For instance, a 'hot' day is considered a 'high' sentiment, whereas a 'very hot' day is categorised as 'extreme'. Similarly, 'rain' is classified as 'moderate', 'heavy rain' as 'high', and 'tremendous rain' as 'extreme'. When mixed sentiments were used, such as in the description 'fair and light rain', they were classified as 'moderate' unless a more telling adjective or adverb was also employed.

A final list of 171 unique weather-related terms employed by the OS staff were categorised into the four sentiment levels: 'low' (22), 'moderate' (44), 'high' (45), and 'extreme' (60), this initial classification suggesting that extreme weather is the most prevalent of the four categories.

Assessing the records for each parish, certain terms such as 'fine', 'fair', 'showery', and 'wet' were commonly used by staff, possibly indicating that some terminology was standardised or instructed by Larcom, or other officials, as part of the recording. However, with more extreme weather, there is a clear variation in how it was described. For example, McGann (Ballymoney) uses the term 'tremendous rain', whereas none of the other recorders employ this adjective. Similarly, terms like 'violent' and 'intense' weather were used mainly by McGann, along with different variations of the word 'storm'. It cannot be assumed that other parishes did not experience extreme weather, but rather, the difference more likely lies in the more intense descriptive language used by some recorders. The only other recorder who used similar language is Boyle (Carrickfergus and Antrim), but he did not provide the same level of detailed daily qualitative observations for Carrickfergus, favouring instead temperature and pressure readings, along with use of the general "Observations" column.[21] It is possible that McGann and Boyle, given their relative geographical proximity, might have consulted one another on how to record their observations, as their recording periods for Antrim and Ballymoney overlapped between March and May 1835.

[20] The parishes, Carrickfergus, Magheross, Tickmacrevan and Urney do not include this form of observation and are therefore excluded from this portion of the analysis. The "Observations" column is also excluded at this point and is assessed later.

[21] An analysis of the Observations column is shown later.

'Storm' and its variations were more commonly used by other recorders, including Scott (Blaris) and McIlroy (Hillsborough), though the term was often included in the general "Observations" rather than the multiple daily observations. This again suggests a differentiation in the types of terminology employed by individuals, which appears to depend on the extremity of the weather they observed.

Antrim parish, one of the longer time series in this collection (1835–1838), unsurprisingly holds the largest percentage share of total sentiments recorded in the weather journals, accounting for 45.72% (Table 3). In contrast, Killyman, with only one month of coverage (July 1835), has the smallest total percentage share (1.66%).

Table 3: The total percentage of weather-related sentiments across eleven parishes and all years.

Parish	Low	Moderate	High	Extreme	No Data	Grand Total
Antrim, Antrim	19.55%	12.84%	9.75%	1.71%	1.87%	45.72%
Ballymoney, Antrim	8.92%	3.26%	0.82%	1.20%	5.01%	19.20%
Blaris, Antrim	1.38%	0.42%	0.42%	0.16%	0.89%	3.27%
Drumcree, Armagh	1.22%	0.65%	0.00%	0.00%	0.62%	2.50%
Dungiven, Londonderry	1.22%	0.65%	0.00%	0.00%	0.62%	2.50%
Hillsborough, Down	3.88%	1.06%	0.09%	0.01%	1.68%	6.72%
Killyman, Tyrone	0.76%	0.30%	0.16%	0.03%	0.42%	1.66%
Moira, Down	1.49%	0.33%	0.00%	0.01%	0.61%	2.44%
Monaghan, Monaghan	1.92%	0.79%	0.31%	0.04%	1.04%	4.10%
Seapatrick, Down	5.26%	1.20%	0.67%	0.00%	2.38%	9.51%
Shankill, Armagh	1.37%	0.42%	0.00%	0.00%	0.59%	2.38%
Grand Total	46.95%	21.91%	12.22%	3.18%	15.74%	100.00%

For the purpose of visualisation, Antrim is chosen as the focus to explore the OS weather sentiment in more depth, focusing first on the daily morning, noon, afternoon and night readings. A Python script was written to automate the process of matching the multiple daily observations in the now tabulated weather journals to the categorised unique terms in the sentiment dictionary. The outputs of these sentiment matches were then graphed to visualise the temporal trends in weather sentiment for morning, noon, afternoon and night, and coloured according to the sentiment level. To manage the large datasets, especially for parishes with long collection periods, the data were summarised by percentage occurrence per month over each year of recording. This approach allowed for a more manageable and structured analysis, providing a clearer understanding of how weather conditions varied. By aggregating the data at the monthly level, the script enabled the creation of summary outputs that could be used for further interpretation of

weather patterns, staff experiences, and overall sentiment across the recording period.

The analysis of the Antrim weather journals in this way revealed a particularly interesting pattern in the distribution of weather sentiments, with low conditions (47%) making up the largest proportion of the observations, as shown in Figure 8 (blue). This is particularly striking given that the low sentiment category contains the smallest number of unique weather terms in the sentiment dictionary. This suggests that, while the categories of high and extreme weather contained more diverse terms, low weather conditions were recorded more frequently, likely due to the common use of terms like "fine" and "fair", which were often used to describe less eventful weather.

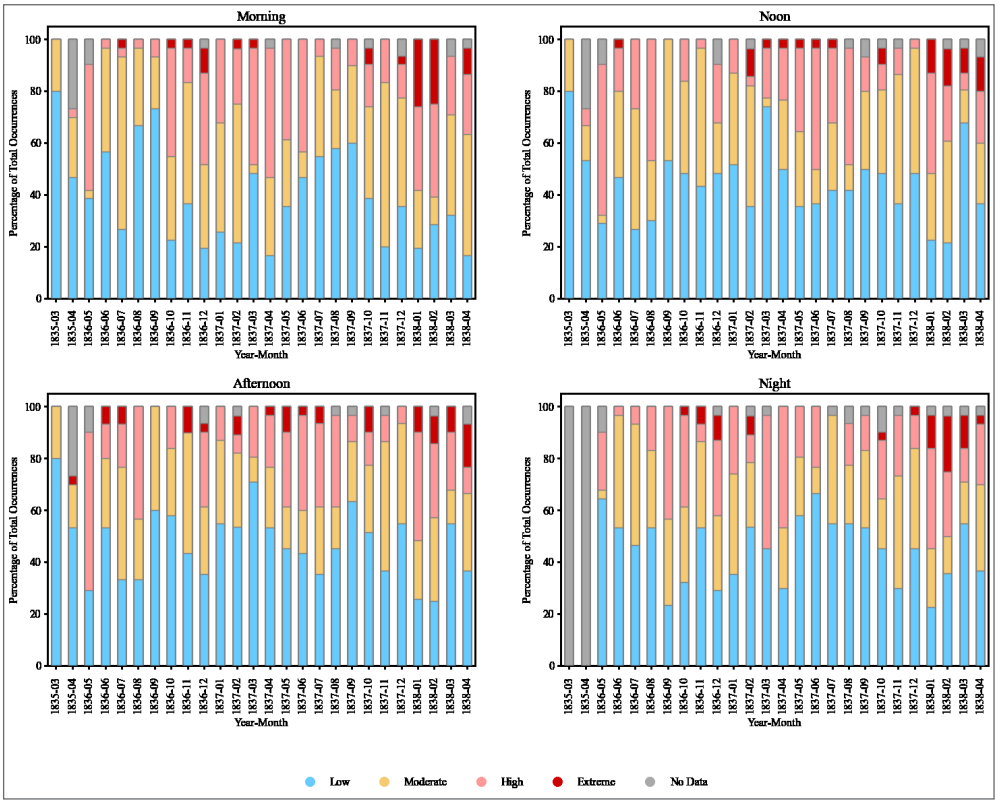


Figure 8: Monthly summary of weather sentiment analysis for Antrim parish detailing percentage total occurrence of morning, noon, afternoon and night sentiments as categorised by the sentiment dictionary (March 1835 – April 1838).

The moderate sentiment category makes up 26% of the total records, and extreme weather is the least recorded (4.56%). This indicates that while extreme weather events may have been relatively rare, when they did occur, staff were more creative in their descriptions, or perhaps those events were beyond the anticipated scope of the standard OS instructions requiring more varied and bespoke terminology.

Figure 9 shows a more consolidated view of the overall percentage of time of day sentiments observed for Antrim parish. The earlier trend of low sentiment (blue) being the most frequently observed is shown clearly, with extreme weather (red) observations being the least common. This pattern generally holds true across all parishes analysed, except in cases where "No data" accounted for a large proportion of the entries. It is true that more blank data for Antrim parish occur during the night reading so the time of day was likely a factor in recording practices.

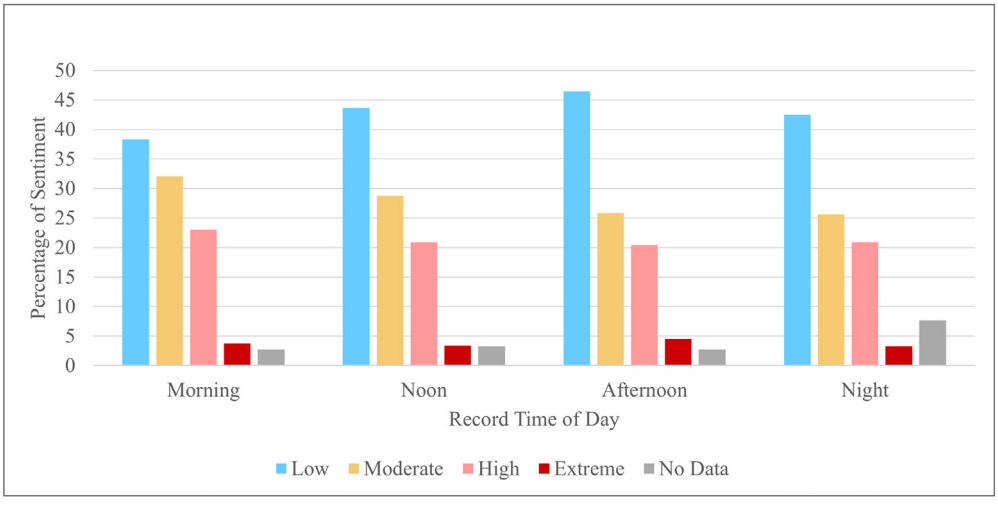


Figure 9: The percentage of sentiment classifications recorded for Antrim parish (morning, noon, afternoon and night) (March 1835 – April 1838).

Interestingly, across similar analyses of all parishes, Ballymoney (not shown here) stands out as an exception, where extreme sentiments were recorded more frequently than those categorised as high. For example, during the period from 16th October 1834 to 24th October 1834, Ballymoney experienced "very stormy" weather and "tremendous rain", which were categorised in the dictionary as extreme sentiments, contributing to the higher percentage of extreme weather observations in that parish.

Expanding the analysis to include the previously excluded parishes which do not include multiple daily observations as shown in Table 3—Carrickfergus, Magheross, Tickmacrevan, and Urney—and applying the same technique instead to the "Observations" column, the sentiment analysis reveals some additional trends.

The parish of Carrickfergus stands out with the highest proportion of observations recorded in the "Observations" column across all parishes, accounting for 45% of the total observations. This is notable, especially as Carrickfergus lacks the more detailed daily qualitative weather readings that other parishes, like Antrim, provide. Some other parishes rank as follows in terms of the "Observations" column contributions: Antrim at 22%, Ballymoney at 8%, and Magheross at 7%, with the other parishes ranging from 0.82% to 3.29% overall.

Across all parishes, however, the largest portion of the data (37%) falls under No data or blank readings. There does not appear to be a pattern in the temporal flow of the blank data across the whole time series suggesting the gaps refer simply to missed recordings, though it is a factor that could be further analysed to ascertain, for instance, if recording breaks were taken when weather was less volatile and therefore might have been deemed less interesting to record. This is followed by moderate weather observations, which appear more frequently than other sentiment categories. This differs from the earlier findings from parishes with detailed daily observations (like Antrim), where low sentiments dominate.

Across both dataset visualisations – the morning, noon, afternoon and night, and the "Observations" column – the data also show that in most cases where staff collected weather information multiple times a day, they tended not to include additional details in the "Observations" column. This may indicate a preference for more formal weather readings in the multiple daily categories, perhaps as instructed, rather than supplementing them with general observations, which might have been considered unnecessary or redundant.

Using qualitative information as a proxy for precipitation

One key weather-related phenomenon of most interest to climate scientists is precipitation, but the OS staff did not collect such data as part of the memoirs, probably due to lack of appropriate equipment. By expanding the use of the sentiment analysis already detailed here to explore precipitation specifically (e.g., rain, snow, hail), we can gain further insights into the nature of the weather descriptions and precipitation levels. In this case, precipitation-related weather terms were extracted from the qualitative recordings across the various daily time readings (morning, noon, afternoon, night) in tandem with the "Observations" column.

To handle the variety of precipitation-related terms, a revised sentiment dictionary was created, which included 756 unique weather references. The increased number of unique references in comparison to the previous sentiment dictionary was caused by cases where the morning, noon, afternoon, and night readings were, in some cases, recorded in one observation entry (such as Carrickfergus parish). The language used in the "Observations" column was also more flexible and narrative in nature, describing weather in broader terms (such as "Rain until 3 pm", "Rain in the evening" or "Very heavy rain until 11:30 a.m., several heavy showers afterwards"), and leading therefore to an increase in the diversity of unique terms used to construct the sentiment dictionary.

The qualitative readings from the morning, noon, afternoon and night together with the "Observations" column were manually categorised in a new sentiment dictionary and the precipitation-related entries were mapped to the same four sentiment categories used earlier: low, moderate, high, and extreme. This process resulted in the creation of a weather sentiment calendar heat map for precipitation-related terms for each location, with the output for Carrickfergus parish shown in Figure 10.

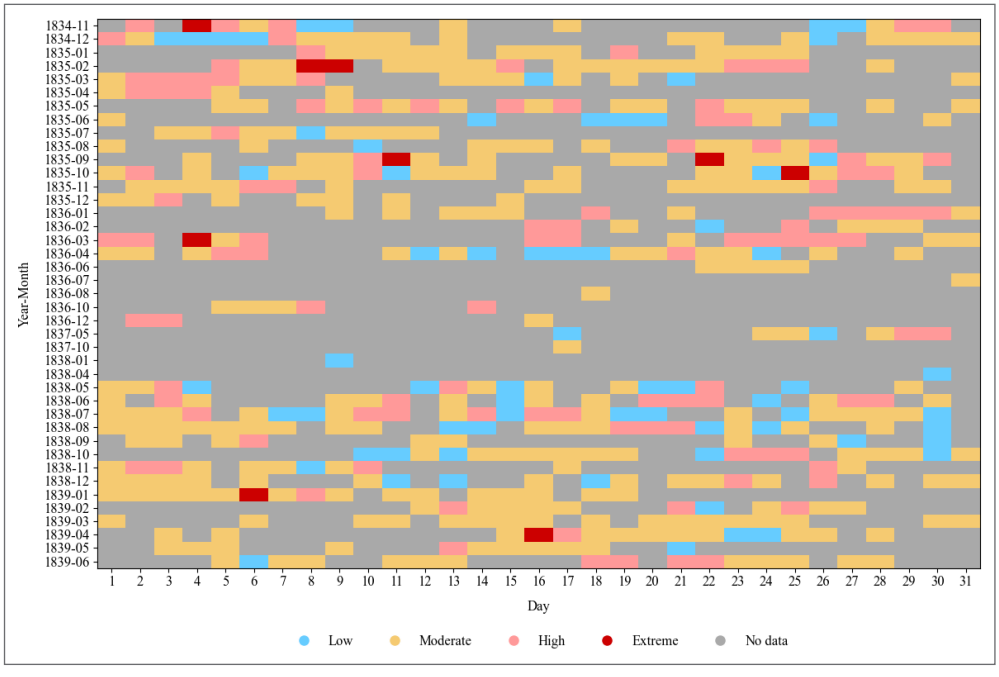


Figure 10: Precipitation related sentiments plotted for Carrickfergus parish (November 1834 – June 1839) showing when precipitation was recorded and its degree of severity.

This visualisation, similar to the temperature and pressure heat maps, provides a picture of localised precipitation trends over time, revealing how different forms of precipitation (and their intensity) varied across the collection period. This visual proxy for precipitation reveals several extreme precipitation events marked in red as per the sentiment categorisation. Notably, the great storm of January 1839 mentioned earlier stands out prominently. The sentiment analysis also highlights a further eight significant precipitation-related events in Carrickfergus, such as violent storms, very severe squalls, very severe gales, and very heavy rain that occurred between November 1834 and June 1839. Again, these events are visualised in red, indicating the match with the extreme category in the sentiment dictionary. Ballymoney, though covering a shorter time series (July 1834 – May 1835), includes the greatest number of extreme events at 18, perhaps unsurprising given McGann's previously mentioned use of descriptive language. There is also correspondence between the few temporally overlapping reports with Antrim and Ballymoney indicating extreme weather on 2nd April 1835, though the same extremity was not witnessed for Carrickfergus which was described as having "heavy showers towards night" and therefore classed as a high sentiment. On the same date, the weather in Dungiven, County Derry/Londonderry, was described as "fine", and in Magheross, County Monaghan, "Pleasant".

Discussion

While the OS memoir weather data are sporadic and limited, they nevertheless provide potentially valuable information for a key period in both Irish climate history and climate studies more broadly. Research on Irish climate reconstruction has emphasised the need to focus more on pre-1850 records, both for preservation and analytical purposes. Extreme episodes of warm and cold winters occurred in 1833–1834 and 1837–1838, respectively (Barriopedro *et al.* 2013), with the latter leading to drought conditions that began in January 1838 and lasted until September 1839 in Ireland (Noone *et al.* 2017). Studies of atmospheric circulation suggest a shift toward drier conditions across Europe from 1826–1875 (Mellado-Cano et al 2020). Exceptionally cool, cold seasons occurred from the 1840s onward (Küttel *et al.* 2010), while the summers from 1835–1839 were among the warmest prior to the twentieth century (Mellado-Cano *et al.* 2020). The OS memoirs (1834–1839) capture information from this crucial point in nineteenth century Ireland and Western Europe and have the potential to add to research for this period. Given their spatial extent, the memoirs also offer researchers the opportunity to explore regional and local expressions and experiences of weather in geographical locations absent from other extant historical records.

Through the innovative application of sentiment analysis, the authors have shown the potential in harnessing qualitative weather-related information of varying kinds from across time and space. Previously somewhat disregarded weather information now has the potential to be assessed alongside contemporary quantitative data and extend historical climate records. This is particularly true of the precipitation information collected by the OS. While the OS weather journals do not include rainfall data and therefore cannot be used to fill quantitative gaps in precipitation history, the qualitative information collected provides a spatial proxy for areas in the north of Ireland where data do not exist, are scarce, or were not collected until much later. The sentiment precipitation mapping approach set out here, therefore serves as a powerful tool for visualising and identifying weather patterns in qualitative records, helping, in this case, to highlight precipitation intensity and timing, and enabling researchers to assess the severity of weather through notable (and less notable) events during the collection period.

This also shows potential to extend to other early qualitative weather diaries and to assess more weather phenomena such as drought and other extreme weather events. For example, the analysis of weather information extracted by Murphy *et al.* (2018) could be expanded to include the contemporary qualitative observations and consequently extend the dataset and current knowledge of early precipitation and other weather types. The authors intend to explore this further via the sentiment analysis of a second source such as that outlined by O'Connor *et al.* (2021), and, to expand this to an assessment of difference in historic qualitative observations elsewhere in the world such as through the historic climate diaries and journals held at the National Oceanic and Atmospheric Administration (NOAA) in the United States of America.

The exploratory techniques employed here to visualise the qualitative data through sentiment analysis do however require refinement as the complexities of working with

qualitative weather information, as highlighted in the nineteenth century by Portlock, remain relevant in this modern interpretation. To develop this approach, we must make decisions on how to classify the information so the final product accounts for both the interpretation of the field collector and the modern researcher. Future research aims to test the subjectivity of assigning sentiments to qualitative weather observations through a more detailed consideration of early observation practices, the positionality of the today's researcher, and the varied descriptive language used by recorders. This could take the form of an existing weather diary where qualitative and quantitative data are both available, such as several of the private weather diaries digitised and held at the UK Meteorological Office Digital Library and Archive. These data could then be used to test if weather categorised using a 'low' sentiment on a particular date also revealed the same picture through the associated quantitative measurement for the same day. Realising and testing the susceptibility of sentiment categorisation to human bias should be discussed at a multi-disciplinary level, including meteorologists, climate scientists, geographers and historians. From this could follow the construction of clear guidance mechanisms for future researchers who wish to build sentiment dictionaries, providing direction for their choices, and enabling the methods to be applied accurately to different journal formats, time frames and spatial extents.

The weather journals also tell us more about the processes and practices of the early OS. For instance, the use of qualitative observations to describe daily weather and prevailing winds, was relatively time-efficient to record and required minimal staff training or equipment. This task could be awarded to any civilian employee with the ability to read and write. The variation in data collection also suggests that more expensive and technical meteorological equipment was generally unavailable to the recorders, either due to cost (the survey had to request additional funds even for core land survey duties), lack of personal interest in weather recording by the OS field staff, or simply the absence of training. In Boyle's introduction to the Carrickfergus register, however we learn a little more. He provides information on the placement of his instruments and mentions the height of the mercury in his thermometer and barometer were "not as continuous as might be wished" (Boyle 1839). The detail provided indicates he had prior knowledge of meteorology or training had been provided, which according to the full set of journals appears not to be the case for other staff. Additionally, the scarcity of weather recording across the memoir counties could indicate shifting priorities within the broader memoir scheme, as well as funding pressures on the larger survey, which required moving staff to other locations and roles. Boyle, for instance, admits to being absent from his home on occasion which might have been due to other work commitments (Boyle 1839) and speaks to the missing observations for the parishes he oversaw.

While there is little biographical detail available for the individuals employed by the OS during this time, especially those who were civilians, the weather information and the broader memoir content can serve as a means of learning about the diligence of individual employees as well as their field collection experiences. In future work, the authors aim to expand this to a tandem analysis with other surviving source materials from the survey

and later evidence of those employed in military careers. For instance, the data reveal that several of the recorders were particularly diligent in their data collection, not only providing extraordinary detail, but doing so in a regimented, militaristic fashion over long periods of time.

Given the clear interest in weather and climate held by some of the survey's leaders, one might question why the OS did not place more emphasis on localised weather data collection and why it was not better standardised and encouraged. At this point, one can only point to cost. As the survey progressed and the memoir scheme was eventually cancelled, there was little incentive for staff to continue weather journaling.

Conclusion

The records included in the OS memoirs have been shown here to provide new insight into the weather in the north of Ireland in the early nineteenth century, as well as the employees who made the observations. It also highlights the importance of looking beyond more commonly accessible quantitative records for weather-related information. By extracting and visualising the quantitative weather registers and qualitative observations recorded by the OS, we can begin to piece together previously unknown weather patterns, explore some of the methodological aspects of weather recording by the surveyors in their locales, and gain a better understanding of the recorders' characters. The application of sentiment analysis to weather-related data and information, in particular, exhibits new possibilities for further research.

The mixed methodology presented here, drawing from a suite of methods and techniques in text analysis and corpus linguistics, Artificial Intelligence, Geographic Information Science and sentiment analysis, alongside more traditional historical and geographical research mechanisms, reminds us to consider, and question, what tools are available outside of ones' own discipline to progress historical, geographical and scientific research.

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