1. **ABOUT THE DATASET**

**Title:** Storm Ciarán atmospheric pressure data

**Creators:** Giles Harrison1

1. Department of Meteorology, University of Reading, UK

**Rights-holder(s):** University of Reading

**Publication year:** 2024

Description: Storm Ciarán passed over the south of the UK on 2nd November 2023. This caused the atmospheric pressure to be unusually low for November, in the early morning in the south-east of the UK. This archive contains a collection of pressure measurements assembled for the region most affected. Data from roadside measurement sites at southern UK sites form the majority of this archive, at 10min sampling. The archive includes measurements at 1sec resolution obtained from the University of Reading Atmospheric Observatory’s precision barometer data, and from two amateur sites (Selsley and High Littleton) in the south-west. Boiling point of water determinations from Reading are also included.

**Cite as:** Harrison R.G., (2024). Storm Ciarán atmospheric pressure data, University of Reading, Dataset. <https://doi.org/10.17864/1947.001325>

**Related publication:** Harrison, G., Bennett, A., Miller, C. and Bullock, D. (2024) *Storm Ciarán’s effect on the boiling point of water in the southeast of the United Kingdom.* Weather, 79 (10). pp. 312-315. <https://doi.org/10.1002/wea.4611>

1. **TERMS OF USE**

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1. **PROJECT AND FUNDING INFORMATION**

The archive data presented was generated by combining different data sources. (1) The Reading pressure dataset was generated as part of routine measurements made at the Reading University Atmospheric Observatory (<https://research.reading.ac.uk/meteorology/atmospheric-observatory/> , extracted for this submission. (2) The southern UK roadside pressure data was provided by David Bullock of Vaisala, obtained as part of routine measurement network activity. Separate files were generated originally for each location, but of varying formats. They were processed further by Giles Harrison to combine the different sites’ data into the single data file of pressure values provided in this archive. (3) Additional data was obtained from two amateur sites in the south-west, at Selsley (from Giles Harrison) and High Littleton (from Alec Bennett). Laboratory experiments determining the boiling point of water made during the passage of Ciarán in the Department of Meteorology are also included (by Caleb Miller). No external funding was received for this study.

Fig 1 shows the position of the sites, and the pressure minimum obtained during the passage of Storm Ciarán.

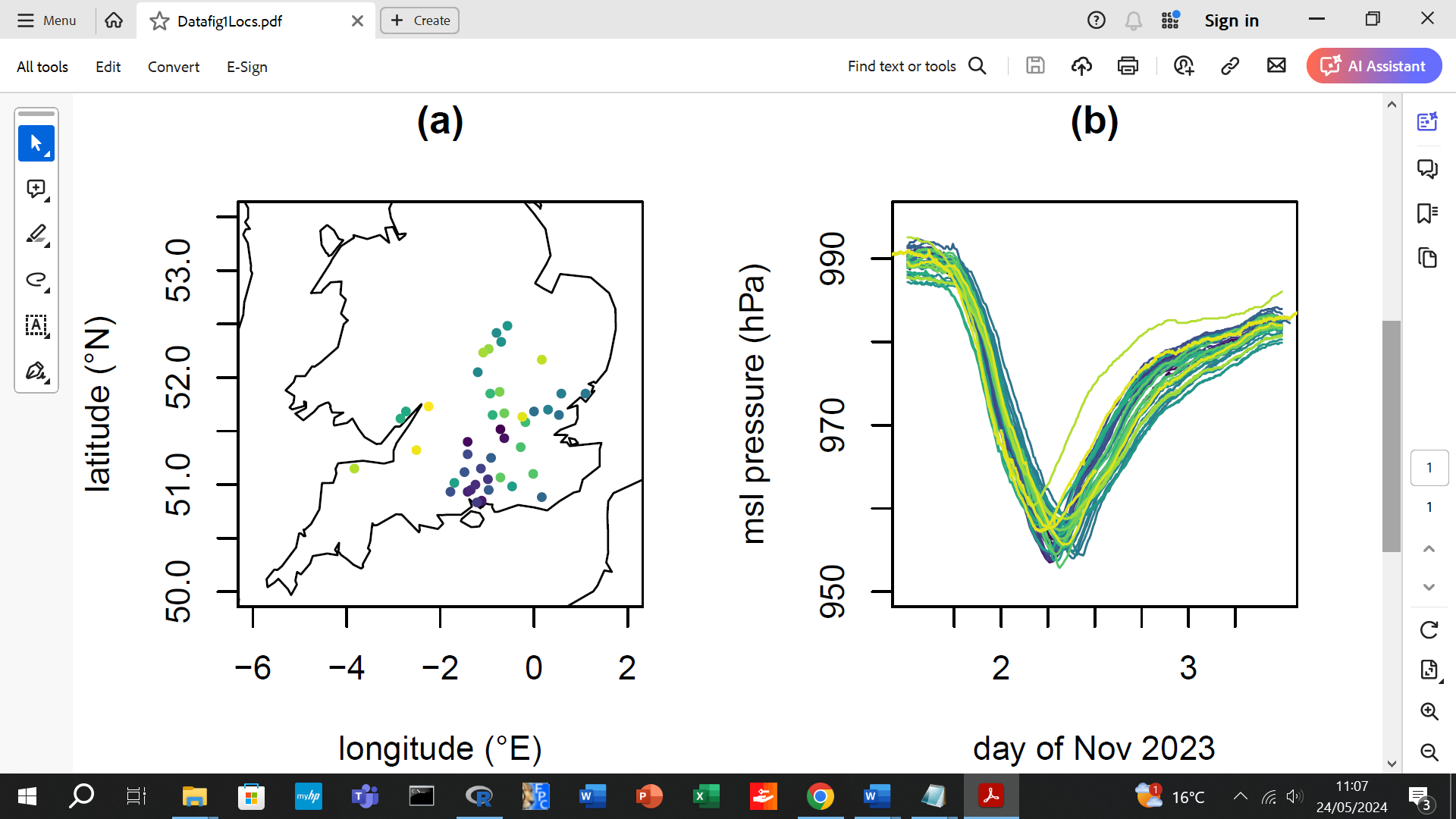


Figure 1. (a) Distribution of sites in this archive. (b) Retrieved pressure data from the same sites, corrected to mean sea level pressure. (The individual station traces are not intended to be fully identifiable, but the colours used in (a) and (b) are consistent for each site).

1. **CONTENTS**

The data set contains three files:

|  |  |  |  |
| --- | --- | --- | --- |
| Filename | duration | contents | Table describing format |
| RSsiteInfo.csv |  | Names, locations and altitudes of roadside sites | 1 |
| RSsiteTimes.csv | 2nd Nov 2023 | Times of samples from the roadside sites | 2 |
| RSsitepressureTS.csv | 2nd Nov 2023 | Processed roadside pressure data from 44 selected sites in UK and Ireland | 3 |
| RGpressureTS.csv | 2nd Nov 2023 00 UTC to 17 UTC | Pressure data (station pressure) from Reading University, at 1 s resolution | 4 |
| SYpressureTS | 2nd Nov 2023 00 UTC to 12 UTC | Pressure data (mean sea level corrected) from Selsley, Gloucestershire, 1 s resolution | 5 |
| HLpressureTS.csv | 1st Nov 2023 to 6th Nov 2023 | Pressure data (mean sea level corrected) from High Littleton, Somerset, 1 min resolution | 6 |
| BoilingPointExperiments.csv | Jan 2020 and 2nd Nov 2023 | Point measurements made in the Instrumentation Laboratory of the University of Reading | 7 |

**Data format**

*Table 1 – Roadside site information*

**RSsiteInfo.csv** is a comma-separated file which lists the roadside sites from which data is available. It includes the locations (longitude and latitude) and the altitude. Each line contains the information specific to one site.

|  |  |  |
| --- | --- | --- |
| Column | Quantity | units |
| 1 | Name of site |  |
| 2 | Longitude West | degrees |
| 3 | Longitude West | minutes |
| 4 | Longitude West | seconds |
| 5 | Latitude North | degrees |
| 6 | Latitude North | minutes |
| 7 | Latitude North | seconds |
| 8 | altitude | metres |

*Table 2 – Sampling time*

**RSsiteTimes.csv** is a comma-separated file which, for each site, provides a line of values with the times when each value of pressure was obtained.

|  |  |  |
| --- | --- | --- |
| Row | Quantity | units |
| 1 | Time of atmospheric pressure measurement (from “A4 Bad Godesburg Way”) | Decimal day of Nov 2023 |
| 2 | Time of atmospheric pressure measurement (from “A4 Halfway”) | Decimal day of Nov 2023 |
| … | Time of atmospheric pressure measurement (site specified in Table 1) | Decimal day of Nov 2023 |
| 44 | Time of atmospheric pressure measurement (from “A411 Barnet Gate”) | Decimal day of Nov 2023 |

*Table 3 – Roadside pressure data*

**RSsitepressureTS.csv** is a comma-separated file containing pressure data from multiple measurement sites in the south of the UK. These sites using WXT530 pressure sensors, uncorrected for sea level. The data was recorded at 10min intervals. Each row contains the run of pressure data from a single site. (This can be processed using the information from Table 1 to identify the site concerned, in combination with the information from Table 2 with the times of each sample.)

|  |  |  |
| --- | --- | --- |
| Row | Quantity | units |
| 1 | Atmospheric station pressure values (from “A4 Bad Godesburg Way”) | hPa |
| 2 | Atmospheric station pressure values (from “A4 Halfway”) | hPa |
| … | Atmospheric station pressure values (site specified in Table 1) | hPa |
| 44 | Atmospheric station pressure values (from “A411 Barnet Gate”) | hPa |

*Table 4 – Pressure data from Reading University Atmospheric Observatory*

The University of Reading Observatory operates a Druck DPI140 precision barometer, sampled digitally at 1s intervals (see also <https://research.reading.ac.uk/meteorology/atmospheric-observatory/barometric-pressure/> ). **RGpressureTS.csv** contains values from the precision barometer. The file is comma-separated, and contains 1s samples from the beginning of 2nd Nov 2023. There are no header lines.

|  |  |  |
| --- | --- | --- |
| Column | quantity | units |
| 1 | Time | UTC hour |
| 2 | Time | UTC minute |
| 3 | Time | UTC second |
| 4 | Decimal hour of day | UTC decimal hour |
| 5 | Station pressure (uncorrected for sea level) | hPa |

*Table 5 – Pressure data from Selsley*

**SYpressureTS.csv** is a comma-separated file which contains pressure data from an amateur measurement site operated by Giles Harrison. This was at Selsley in Gloucestershire, with (GPS-derived) coordinates 51° 43’ 47 Nand2° 14’ 59’ W. (A description of the instrumentation is given in [1]). The BME680 pressure sensor was at 129m altitude and sampled at 1Hz. A correction for the Real Time Clock drift has been applied, and an offset correction following a subsequent comparison with the University of Reading observatory DPI140 barometer. The sea level correction applied follows that in [2].

|  |  |  |
| --- | --- | --- |
| Column | quantity | Units |
| 1 | Decimal day (of November 2023) | UTC decimal day |
| 2 | pressure (corrected to sea level) | hPa |

*Table 6 – Pressure data from High Littleton*

**HLpressureTS.csv** is a comma-separated file which contains pressure data from an amateur measurement site operated by Alec Bennett. It was situated at High Littleton in Somerset, with (GPS-derived) coordinates 51° 19’ 20 Nand2° 30’ 35’ W. The pressure sensor (Kestrel DROP D3, accuracy ±1 hPa) was sampled at 1 min and at 120 m altitude.

|  |  |  |
| --- | --- | --- |
| Column | quantity | Units |
| 1 | Decimal day (of November 2023) | UTC decimal day |
| 2 | pressure (corrected to sea level) | hPa |

*Table 7 – Boiling point data*

Measurements of the boiling point of water were made in the Instrumentation Laboratory of the Department of Meteorology on 2nd November 2023. **BoilingPointExperiments.csv** contains these in a comma-separated file, together with previous measurements made during a period of high atmospheric pressure in January 2020. The 2023 experiments followed the same methodology as for 2020 (described in [3]], using deionised water, a kettle, a Digitron T600 Pt100 thermometer and a DPI141 vibrating drum barometer. The first line of the file is a header line.

|  |  |  |
| --- | --- | --- |
| Column | quantity | Units |
| 1 | Mean atmospheric pressure at site level (from one or more determinations) | hPa |
| 2 | Mean boiling point | °C |
| 3 | Number of experimental determinations | (integer count) |
| 4 | Standard error in the derived boiling point | °C |
| 5 | Date (day of month, month, year) | calendar |
| 6 | Time of experiment (hours and minutes) | UTC |

**References**

[1] R.G. Harrison, (2021). Make your own met measurements: build a digital barometer for about £10. *Weather*, *76*(2). <https://doi.org/10.1002/wea.3857>

[2] WMO. (2021). Measurement of Meteorological Variables. In *WMO No.8 - Guide to Meteorological Instruments and Methods of Observation (CIMO guide)* (Vol. 1). World Meteorological Organisation. <https://library.wmo.int/index.php?lvl=notice_display&id=12407>

[3] Giles Harrison and Graeme Marlton (2020), Pressure on the boiling point, *Weather* 75 (4), 128-129 <http://dx.doi.org/10.1002/wea.3693>