**DURHAM UNIVERSITY OBSERVATORY**

**Daily values of various climate elements**

*Period of record*

This dataset comprises daily values of a range of climate elements, starting in July 1843. Periods of record differ, and missing data are shown as blank cells.

Full details of the instruments used are given in the various Appendices in *Durham Weather and Climate since 1841*. It should be noted that observational and exposure standards for some elements, notably air temperature, differ in the early years of the record from modern standards, and appropriate caution should be exercised when using some of the early records.

Note that these records may differ slightly from previously published data, owing to the inclusion of minor corrections from time-to-time.

*Record format*

Excel (xlsx) record, headed column format as follows: missing entries are left blank. See also notes on each element which follow.

|  |  |
| --- | --- |
| **Date** | Date of record, in d mmm yyyy format (e.g. 23 Jan 1978) for dates on and after 1 Jan 1900. Microsoft does not believe in dates prior to that, so this column is blank prior to 1900. |
| **DD** | Date of month, 1-31 |
| **MM** | Month number, 1 = January to 12 = December |
| **YYYY** | Year, four digits e.g. 1978. DD MM YYYY format dates are available for the whole period of record and are the only date entry prior to 1900. |
| **Tmax °C** | Maximum temperature over the 24 hour period, read at the 2100 GMT observation until 1960 and thereafter at 0900 GMT; for the latter, ‘thrown back’ to the previous day’s date per normal procedure. Period July 1843 to date. |
| **Tmin °C** | Minimum temperature over the 24 hour period, read at the 0900 GMT observation and entered to the date of reading. Period July 1843 to date. |
| **Tmean °C** | Daily mean temperature, the average of the maximum and minimum temperature for that date. Where either or both is missing, the entry is left blank. Period July 1843 to date. |
| **Tgmin °C** | Overnight grass minimum temperature; period probably 2100-0900 GMT 1874 to 1960, thence 24 hour period 0900-0900 GMT, read at the 0900 GMT observation and entered to the date of reading. Period March 1874 to date. Some records are missing where the thermometer became buried in snowfall. |
| **Air frost** | Entry = 1 when the day’s minimum temperature is 0.0 °C or below, otherwise 0. Note that 0.0 °C is used in place of the normal -0.1 °C threshold to ensure that minima originally read as 32 °F to the nearest degree are counted as air frosts. Period of record as for minimum temperatures. |
| **Grd frost** | Entry = 1 when the day’s grass minimum temperature is 0.0 °C or below, otherwise 0. Note that 0.0 °C is used in place of the normal -0.1 °C threshold to ensure that grass minima read as 32 °F to the nearest degree are counted as ground frosts. The one exception is when the grass minimum temperature is missing but the screen minimum temperature is 3 °C or below, roughly the normal difference between the two, when a ground frost is assumed to have occurred. Period of record as for grass minimum temperatures. |
| **Days 25 °C** | Entry = 1 when the day’s maximum temperature is 25.0 °C or greater, otherwise 0. Period of record as for maximum temperatures. |
| **Pptn mm** | Daily precipitation total 0900-0900 GMT, measured at 0900 GMT and thrown back to the previous day’s date per normal procedure. Period January 1868 to date (earlier records appear in the original registers, but they appear unreliable and have not been used.) |
| **Rain day** | Entry = 1 when the day’s precipitation amounts to 0.2 mm or more, otherwise 0. Period of record as for daily precipitation. |
| **Wet day** | Entry = 1 when the day’s precipitation amounts to 1.0 mm or more, otherwise 0. Period of record as for daily precipitation. |
| **Sun h** | Daily sunshine duration, in hours, civil day midnight to midnight. Period June 1880 to December 1999, when the record ceased. Daily values are missing until January 1882, some months missing 1883-1885. |
| **Snow lying 09h** | Entry = 1 when the depth of snow at 0900 GMT was more than zero, otherwise 0. Period of record 1960-1999. |
| **Snow depth 09h cm** | Depth of snow measured at 0900 GMT, in cm. |
| **MSL barom 0900, hPa** | Barometric pressure reduced to mean sea level at 0900 GMT, in hPa (millibars). Period of record July 1843 to December 1960. Missing data have been estimated from reanalysis grids (see Appendix 5 in *Durham Weather and Climate since 1841* for details) |
| **Tdry 0900, °C** | Dry-bulb temperature at 0900 GMT, in °C. Period of record July 1843 to August 1997. |
| **Twet 0900, °C** | Wet-bulb temperature at 0900 GMT, in °C. Period of record October 1846 to August 1997. |
| **Cloud cover 0900, %** | Cloud cover at 0900 GMT, as %. This is derived from eye estimates in tenths of the sky to December 1948, thence in oktas (eighths), converted to a percentage. Period of record April 1847 to August 1997. |
| **Wind dir'n 0900, compass** | Wind direction at 0900 GMT, using compass points. Period of record July 1843 to August 1997 varying between compass points and degrees (see following) |
| **Wind dir'n 0900, degrees** | Wind direction at 0900 GMT, in degrees from north (thus east = 090°, south = 180°, etc) |
| **Wind speed 0900, Bft Force** | Wind speed at 0900 GMT, in Beaufort Force (usually an estimate rather than an instrumental value). Period of record July 1843 to August 1997, varying between Beaufort Force and knots (see following) |
| **Wind speed 0900, knots** | Wind speed at 0900 GMT, in knots (usually an instrumental value) |
| **MSL barom 2100, hPa** | Barometric pressure reduced to mean sea level at 0900 GMT, in hPa (millibars). Missing data have been estimated from reanalysis grids (see Appendix 5 in *Durham Weather and Climate since 1841* for details). *No 2100 obs were taken between February 1855 and June 1858 inclusive.* |
| **Tdry 2100, °C** | Dry-bulb temperature at 2100 GMT, in °C. Period of record July 1843 to December 1960 |
| **Twet 2100, °C** | Wet-bulb temperature at 2100 GMT, in °C. Period of record October 1846 to December 1960, excluding February 1855 to June 1858. |
| **Cloud cover 2100, %** | Cloud cover at 2100 GMT, as %. This is derived from eye estimates in tenths of the sky to December 1948, thence in oktas (eighths), converted to a percentage. Period of record April 1847 to December 1960, excluding February 1855 to June 1858 |
| **Wind dir'n 2100, compass** | Wind direction at 2100 GMT, using compass points. Period of record July 1843 to December 1960 (excluding February 1855 to June 1858), varying between compass points and degrees (see following) |
| **Wind dir'n 2100, degrees** | Wind direction at 2100 GMT, in degrees from north (thus east = 090°, south = 180°, etc) |
| **Wind speed 2100, Bft Force** | Wind speed at 2100 GMT, in Beaufort Force (usually an estimate rather than an instrumental value). Period of record July 1843 to August 1997 (excluding February 1855 to June 1858), varying between Beaufort Force and knots (see following) |
| **Wind speed 2100, knots** | Wind speed at 2100 GMT, in knots (usually an instrumental value) |

*Notes by element*

**HOURS OF OBSERVATION** The morning observation was generally at 9 a.m. local time (0900 GMT after September 1885) and the evening observation at 9 p.m. local time (2100 GMT), but from July 1858 to September 1885 records were made at 1000 and 2200 local time. There were no 9 p.m. observations made between February 1855 and June 1858.

**TEMPERATURE** Daily maximum and minimum temperatures are available from July 1843 to date, with few missing records (maximum temperatures are 98.9% complete, minimum temperatures 99.6%). Until September 1851 the records were from unscreened thermometers exposed on a north wall; between October 1851 and December 1859 the north wall thermometers were exposed in a louvred screen structure. These exposures differ substantially from modern standards, and for this reason records from these years should be used with care. Between January 1860 and October 1899, the thermometers were exposed in a Glaisher stand on the lawned area in front of the observatory building. Corrections have been applied to the Glaisher stand maximum and minimum temperature records (but not the daily 0900/2100 manual thermometer readings) to provide at least approximate statistical equivalents to a Stevenson screen exposure, as set out in Appendix 3 in *Durham Weather and Climate since 1841*. Since November 1899, air temperature records have been made in a Stevenson screen exposed on the on the lawned area in front of the observatory building, the thermometry read manually until October 1999 and thereafter logged by an automatic weather station in the same location.

**PRECIPITATION** Daily precipitation totals are available from January 1868 to date; estimates have been made to cover minor periods of missing data and the record is complete. Earlier records (back to 1843) exist for the site, but have been found to be less reliable and consequently have not been used. A variety of raingauge types, heights and exposures have been used over the years, but since 1868 all have been exposed on or close to the lawned area in front of the observatory building. Full details of the gauges used and their exposures, as far as they are known, are set out in Appendix 4 in *Durham Weather and Climate since 1841*. Since October 1999 the record has been from a 0.2 mm tipping bucket raingauge, logged hourly by the automatic weather station in the same location.

**SUNSHINE** Daily sunshine durations are available from June 1880 to December 1999, with gaps in the record 1883-85; daily values are missing for 1880 and 1881. From the start of the record until December 1999, daily sunshine durations were taken from the record of a Campbell-Stokes sunshine recorder mounted on the south-facing parapet of the observatory building. Daily sunshine records ceased at the site in December 1999, and since then monthly sunshine totals have been estimated to the nearest hour using an adjustment factor applied to a Met Office regional sunshine value. Full details are set out in Appendix 6 in *Durham Weather and Climate since 1841*. (A pyranometer included as part of the automatic weather station gives a crude estimate of daily sunshine, but aside from the limited exposure of the sensor to sunshine, particularly in the summer months, the resulting output is incompatible with the records from the Campbell-Stokes sunshine recorder used throughout the period of record to 1999.)

**SNOW LYING and SNOW DEPTHS** at 0900 GMT are available only for the period January 1960 to September 1999.

If you use this dataset in any publication or published work, please include the following citation:

Burt, Stephen and Burt, Tim, 2022. *Durham Weather and Climate since 1841*. Oxford University Press,   
580 pp.

**Stephen Burt and Tim Burt  
May 2022**