September 2023 Monthly Weather Report

This document provides a summary of the UK's weather and climate statistics for September 2023.

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UK overview

High pressure influenced the UK's weather for the first half of September, bringing fine, sunny, dry conditions and the most significant spell of warmth since June. From 4th to 10th, the UK experienced a significant heatwave with temperatures exceeding 30°C somewhere in the UK for seven consecutive days: a September record. Temperatures in England reached 32°C on 6th, 7th, 9th and 10th, and 33.5°C at Faversham (Kent) on 10th, making this the hottest day of the year. This has only occurred in September on four previous occasions in 2016, 1954, 1949 and 1919. On 8th, 28.0°C at Castlederg (County Tyrone) set a new Northern Ireland September record. However, the heat brought several outbreaks of thunderstorms and intense downpours with rainfall rates of 20 to 30mm per hour, with impacts from flash-flooding. The second half of the month saw an abrupt change to much more unsettled and autumnal weather with westerly weather bringing Atlantic low pressure systems and significant rain. There were some very wet and windy days, notably storm Agnes from 27th to 28th, although fortunately the storm was weakening by the time it reached the UK.

Maximum and minimum temperatures for the month overall were well above average, particularly across the southern half of the UK, with maximum temperature anomalies in some parts of the south-east 3.5 to 4°C above average. The UK monthly mean temperature was 15.2°C, 2.2°C above the 1991-2020 average making this the UK’s equal-warmest September in the series from 1884 (shared with 2006). For England and Wales this was the warmest September on record. The rainfall pattern was variable but rather wet overall with 131% for the UK. Some locations experiencing torrential downpours were particularly wet, for example parts of south and east Devon. Sunshine totals were slightly above average for the UK with 112%.

Reference climatology used for calculating anomalies is the period 1991-2020 unless otherwise stated.

Weather impacts

- **Impacts from thunderstorms and torrential downpours causing surface water flooding.**
- **Localized disruption from wet and windy weather, including storm Agnes.**

A significant proportion of the rain that fell during the month was in the form of thundery downpours, making for a rather uneven rainfall distribution across the country. Surface water flooding caused some problems in Kent on the 1st, while the thundery breakdown to the spell of hot weather in early September caused various impacts. On the 10th, thousands of runners taking part in the Great North Run were stranded after the event due to major disruption to the transport network, with the South Shields Metro station closed while water was cleared from the tracks.

Weather fronts moving south-east across the UK on 11th to 12th brought heavy rain and thunderstorms, with local flooding in Ipswich and Wymondham. Devon and Somerset bore the brunt of impacts from thunderstorms on the 17th to the 18th. In Devon, Exeter Airport was forced to close due to surface water flooding whilst flash flooding also affected Dawlish as local water courses struggled to contain the sudden influx of rainwater. In Somerset, significant surface water flooding occurred along the high street in Minehead. Overall, around 100 properties in south-west England suffered flooding on the 17th, largely due to ingress of excess surface water. Surface water flooding also affected much of Swindon early on the 18th.

The second half of the month saw wind and rain impacts from Atlantic low pressure systems. On the 19th, flooding occurred across parts of North Wales with some fallen trees, while power cuts affected several hundred homes in South Wales. Flooding also disrupted rail transport across parts of the south Pennines and the Inverclyde area on the 20th, while prolonged rainfall in Cumbria also caused some surface water flooding. On the 24th, strong winds associated with a deep Atlantic low centre brought disruption to Northern Ireland, with reports of some power outages and structural damage due to a band of squally and locally intense rainfall.

Storm Agnes affected the UK from 27th to 28th, bringing strong winds and heavy rain, although fortunately the storm was weakening by the time it tracked north-west across the northern half of the UK. A woman was rescued from her car in fast flowing floodwater in Northern Ireland. Irish Sea ferry services were suspended with power outages on the Isles of Scilly and also in Kirkcudbright, south-west Scotland. Some trees were felled and road transport disrupted in south-west Scotland and parts of Cumbria.

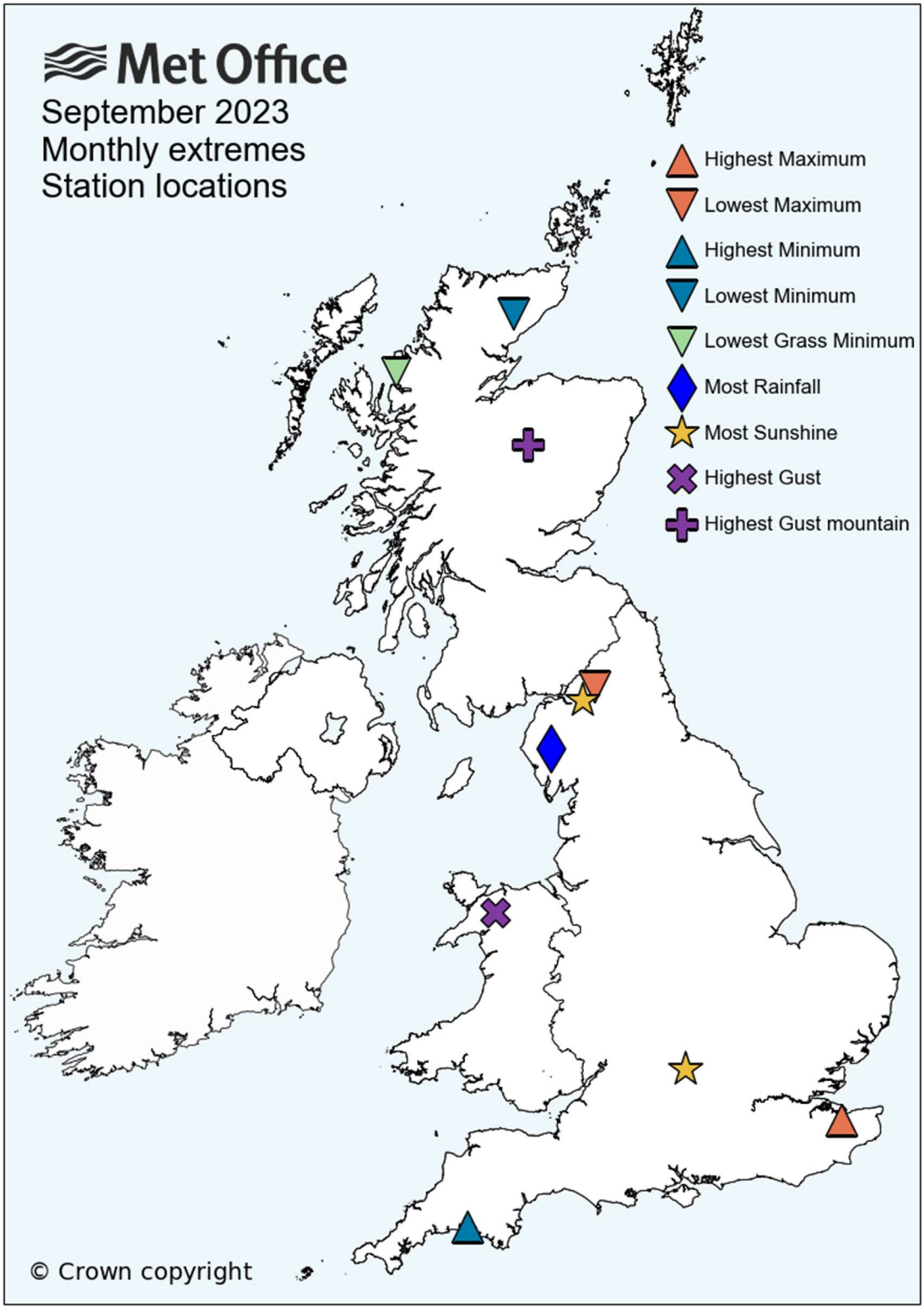
Monthly extremes

The table below lists UK monthly weather extremes recorded at individual weather stations during September 2023 from data available on 04/10/2023. The map shows the location of these stations.

Highest Maximum	**33.5°C** on **10th** at Faversham (Kent, 46mAMSL)
Lowest Maximum	**10.8°C** on **15th** at Spadeadam No 2 (Cumbria, 285mAMSL)
Highest Minimum	**20.5°C** on **5th** at Plymouth, Kinterbury Point (Devon, 0mAMSL)
Lowest Minimum	**-3.5°C** on **13th** at Kinbrace, Hatchery (Sutherland, 103mAMSL)
Lowest Grass Minimum	**-5.0°C** on **17th** at Port Henderson (Ross & Cromarty, 18mAMSL)
Most Rainfall	**117.0mm** on **19th** at Honister Pass (Cumbria, 358mAMSL)
Most Sunshine	**12.9hr** on **5th** at Brampton No 3 (Cumbria, 117mAMSL) also on **4th** at Oxford (Oxfordshire, 63mAMSL)
Highest Gust	**73Kt 84mph** on **27th** at Capel Curig No 3 (Gwynedd, 216mAMSL)
Highest Gust (mountain*)	**89Kt 102mph** on **24th** at Cairngorm Summit (Inverness-shire, 1237mAMSL)
Greatest Snow Depth at 0900 UTC	No non-zero values.

mAMSL refers to station elevation in metres above mean sea level.

*Mountain stations are above 500mAMSL.


Met Office
September 2023
Monthly extremes
Station locations
Highest Maximum
Lowest Maximum
Highest Minimum
Lowest Minimum
Lowest Grass Minimum
Most Rainfall
Most Sunshine
Highest Gust
Highest Gust mountain
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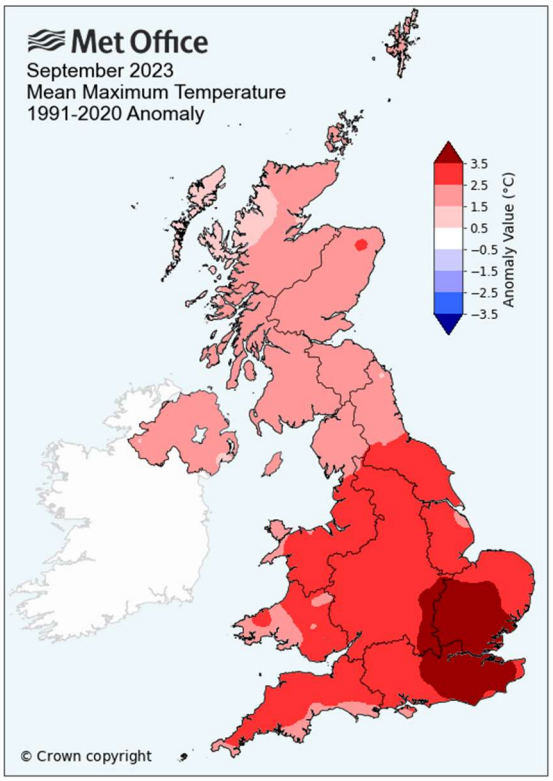
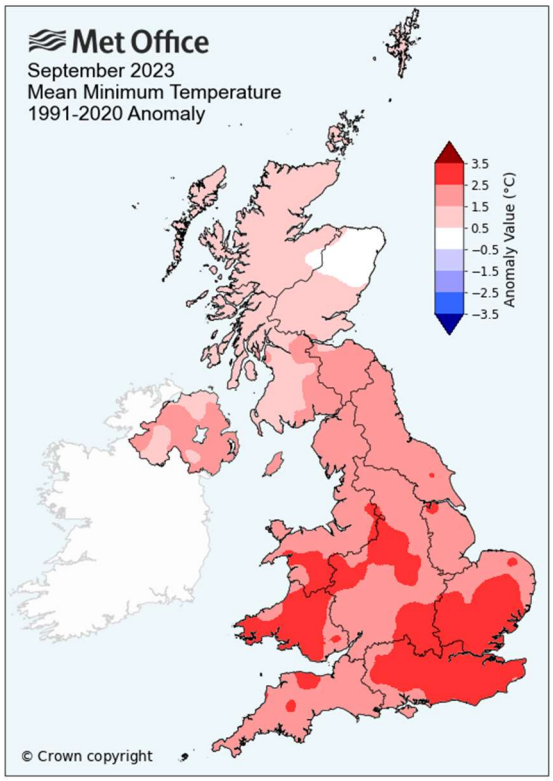
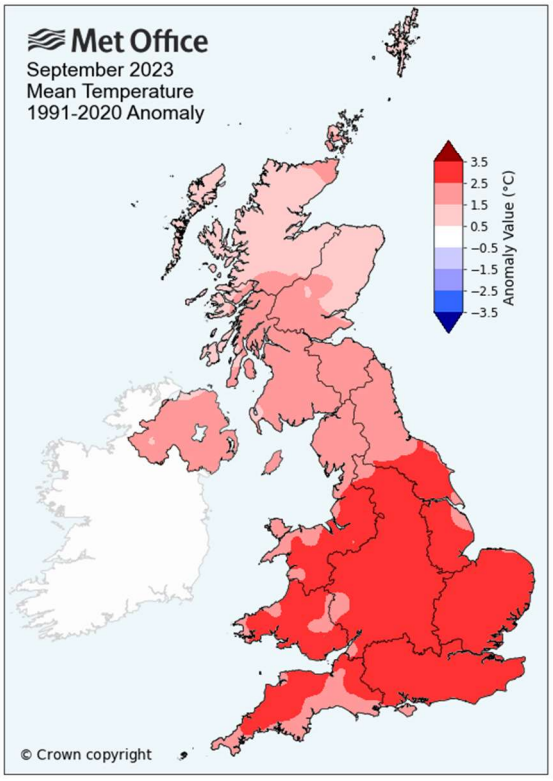
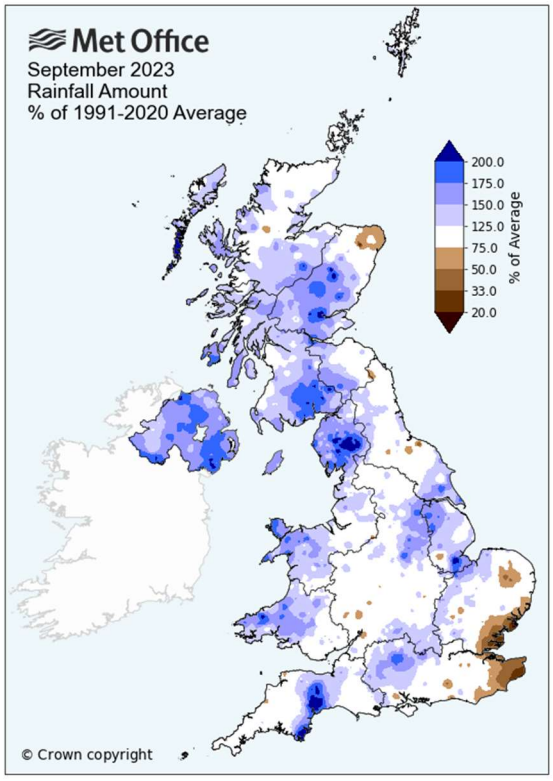
Monthly maps

These maps show monthly average daily maximum, monthly average daily minimum and monthly mean temperature and monthly rainfall for September 2023 as anomalies relative to the September 1991-2020 long term average.

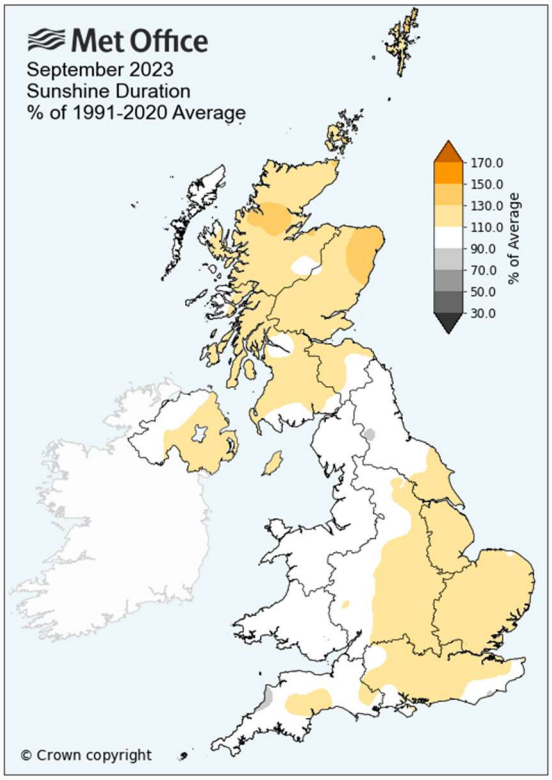


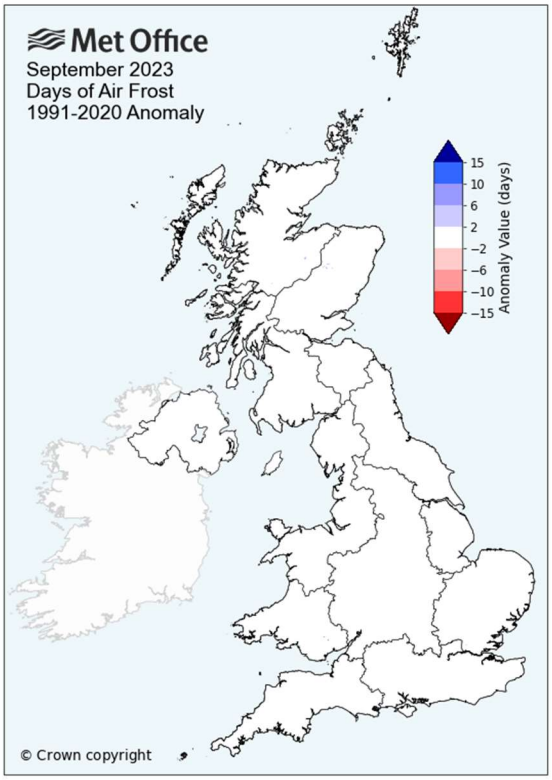


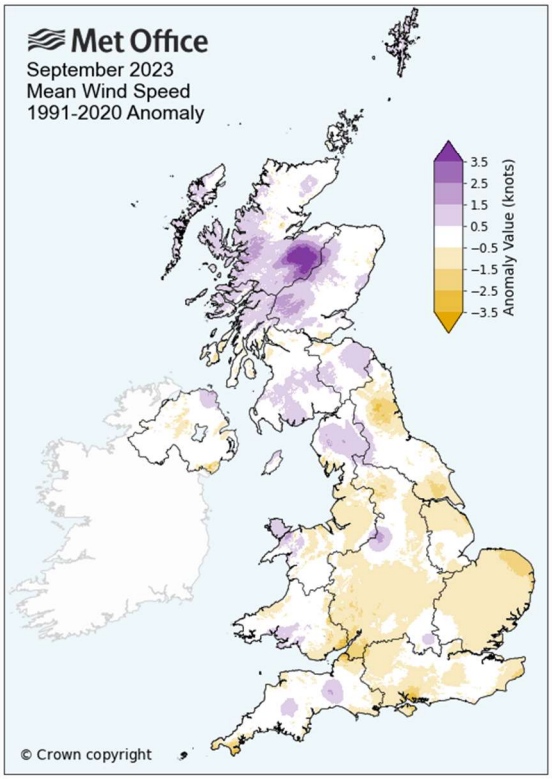


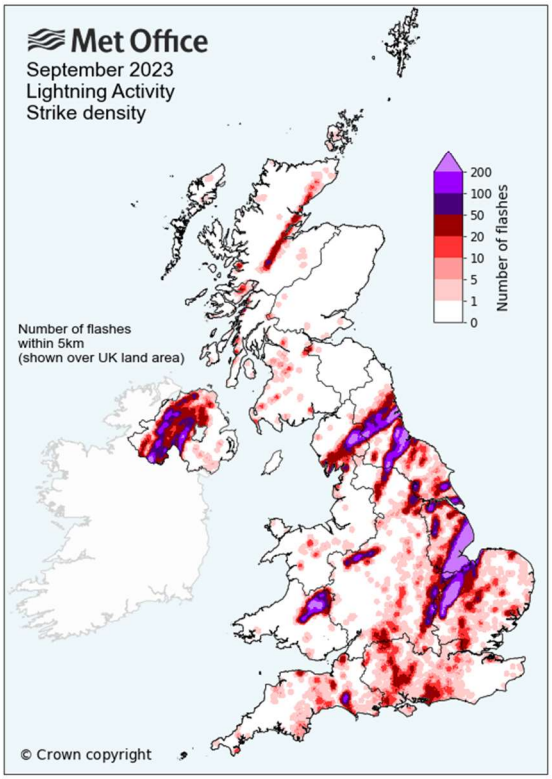


These maps show monthly sunshine, monthly air frost and monthly windspeed for September 2023 as anomalies relative to the September 1991-2020 long term average, plus a map showing lightning activity as the number of strikes within a 5km radius of any land location.









Monthly climate statistics - actuals and anomalies

These tables show the UK and national climate statistics for September 2023 for max, min and mean temperature, rainfall, sunshine and windspeed as actual values and anomalies relative to the September 1991-2020 long term average. The position of the value within the full series (in both ascending and descending order) is shown in the two 'Rank' columns. Central England Temperature (CET) and England & Wales Precipitation (EWP) are also included.

Mean maximum temperature

Region	Maxtemp (°C)	1991-2020 Anomaly (°C)	Rank - warmest	Rank - coldest	Series length (yrs)
UK	19.4	2.5	1	140	140
England	21.2	3.0	1	140	140
Wales	19.4	2.6	2	139	140
Scotland	16.6	1.9	2	139	140
Northern Ireland	18.0	1.7	2	139	140
Central England	21.5	3.3	1	146	146

Mean minimum temperature

Region	Mintemp (°C)	1991-2020 Anomaly (°C)	Rank - warmest	Rank - coldest	Series length (yrs)
UK	11.0	1.9	2	139	140
England	12.1	2.4	2	139	140
Wales	11.8	2.5	1	140	140
Scotland	9.0	1.1	6	135	140
Northern Ireland	10.4	1.6	3	138	140
Central England	12.5	2.4	2	145	146

Mean temperature

Region	Meantemp (°C)	1991-2020 Anomaly (°C)	Rank - warmest	Rank - coldest	Series length (yrs)
UK	15.2	2.2	2	139	140
England	16.7	2.7	1	140	140
Wales	15.6	2.5	1	140	140
Scotland	12.8	1.5	3	138	140
Northern Ireland	14.2	1.6	3	138	140
Central England	17.0	2.8	1	365	365

Rainfall

Region	Rainfall (mm)	% of 1991-2020 Average	Rank - wettest	Rank - driest	Series length (yrs)
UK	119.4	131	32	157	188
England	81.7	119	63	126	188
Wales	155.5	139	36	153	188
Scotland	167.9	136	28	161	188
Northern Ireland	145.1	166	16	173	188
EWP (England and Wales)	91.0	120	97	162	258

Sunshine

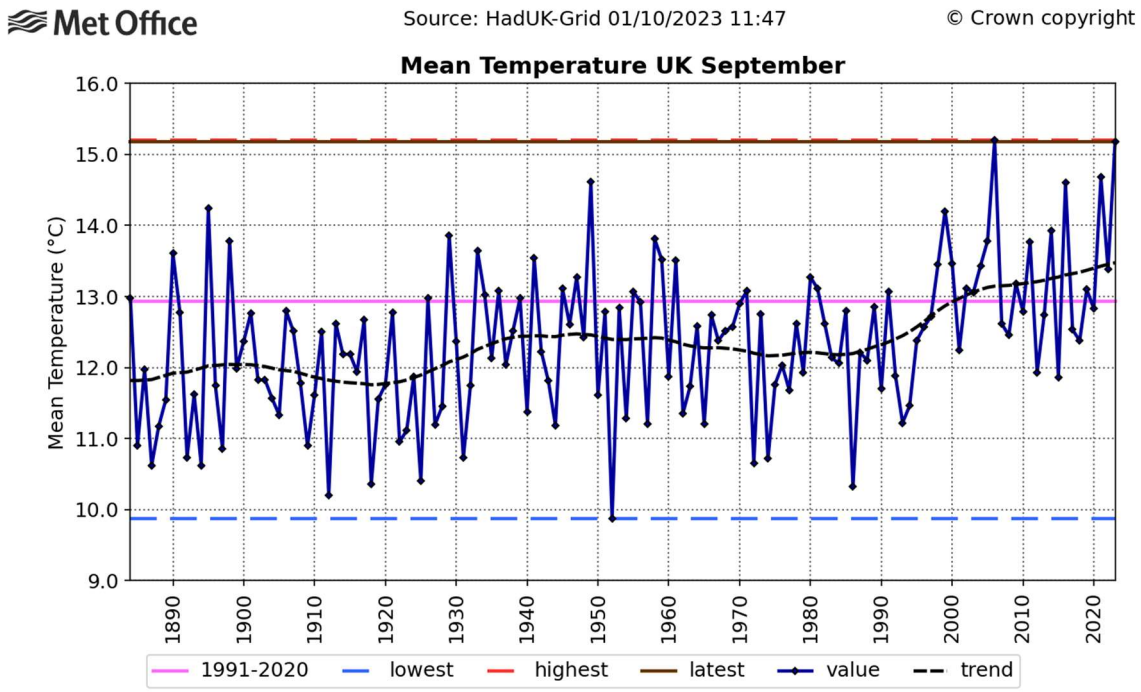
Region	Sunshine (hours)	% of 1991-2020 Average	Rank - sunniest	Rank - dullest	Series length (yrs)
UK	142.4	112	20	95	114
England	156.7	111	25	90	114
Wales	129.2	100	46	69	114
Scotland	124.8	117	9	106	114
Northern Ireland	125.8	111	20	95	114

Windspeed

Region	Windspeed (knots)	1991-2020 Anomaly (knots)	Rank - windiest	Rank - calmest	Series length (yrs)
UK	8.3	-0.1	37	19	55
England	6.9	-0.5	44	12	55
Wales	8.5	-0.1	34	22	55
Scotland	10.6	0.6	24	32	55
Northern Ireland	7.7	-0.1	38	18	55

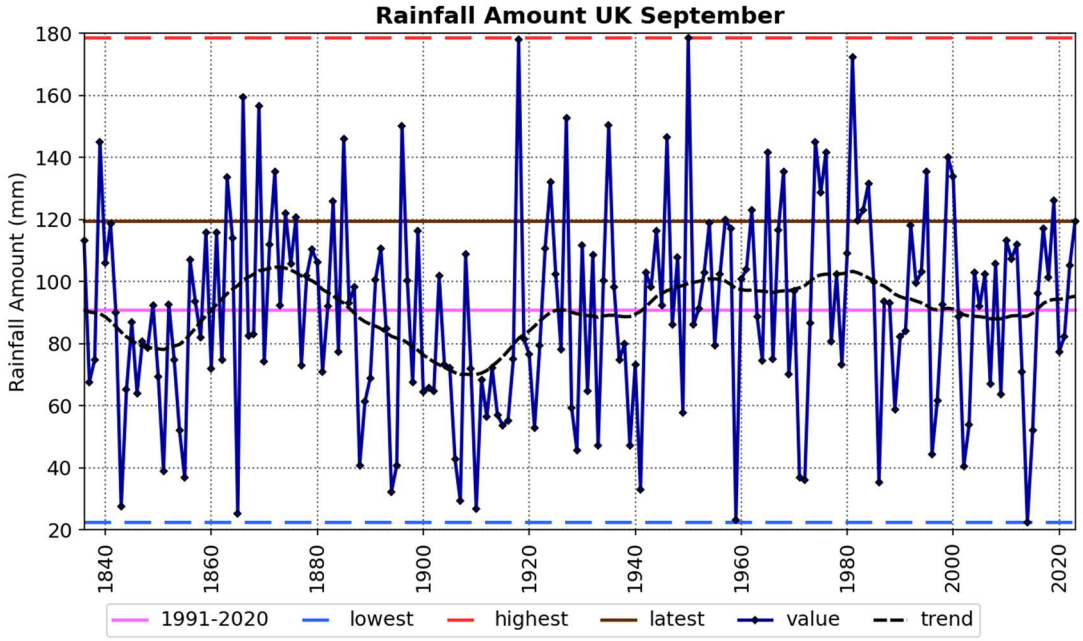
Monthly time-series

These charts show time-series for the UK for September for monthly mean temperature (from 1884), monthly rainfall (from 1836) and monthly sunshine (from 1919). The brown line shows the latest (2023) value. The hatched black line is a smoothing filter which shows the long-term trend. The tables below show statistics for the latest year, latest 10 years 2014-2023, the most recent 30-year climate reference period 1991-2020 and the 30-year baseline climate reference period 1961-1990.



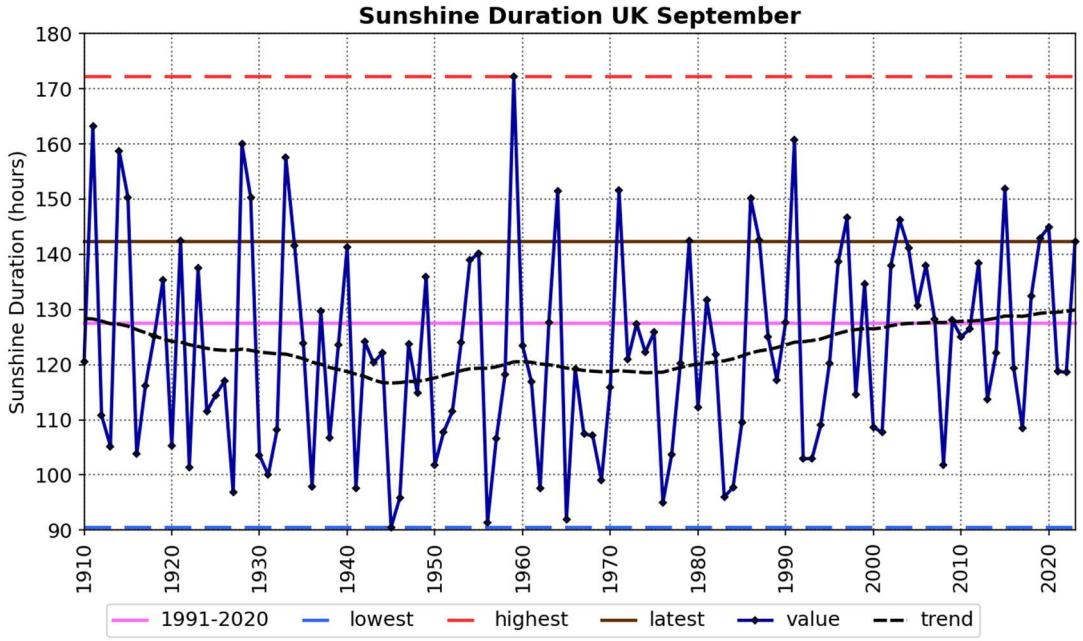
Period	1961-1990	1991-2020	2014-2023	2023
Meantemp (°C)	12.2	12.9	13.4	15.2

Met Office Source: HadUK-Grid 01/10/2023 11:47 © Crown copyright



Period	1961-1990	1991-2020	2014-2023	2023
Rainfall (mm)	99.2	90.9	90.0	119.4

Met Office Source: HadUK-Grid 01/10/2023 11:47 © Crown copyright

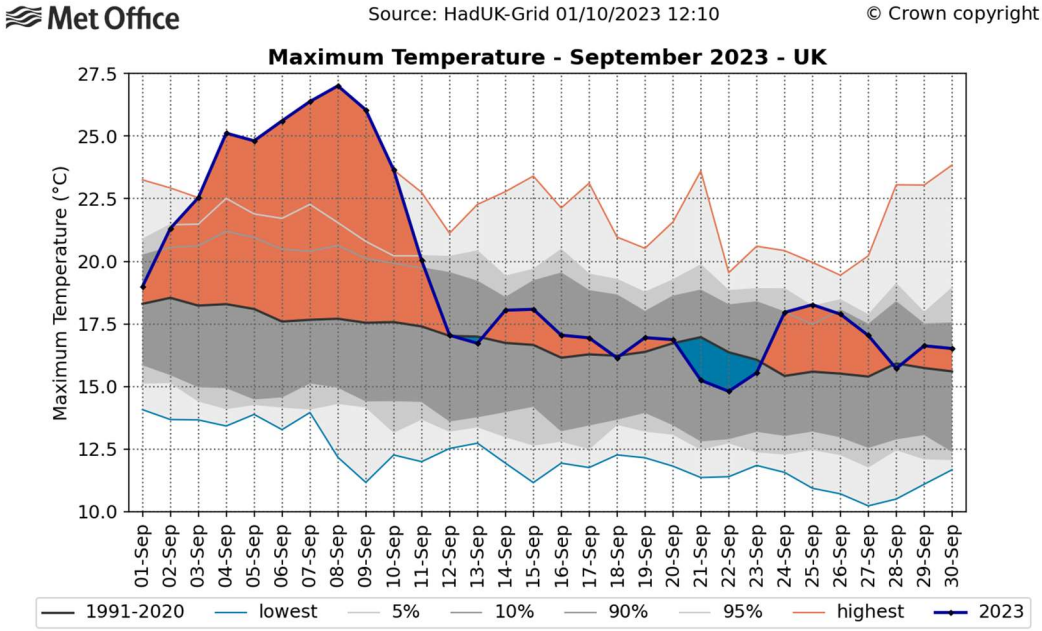


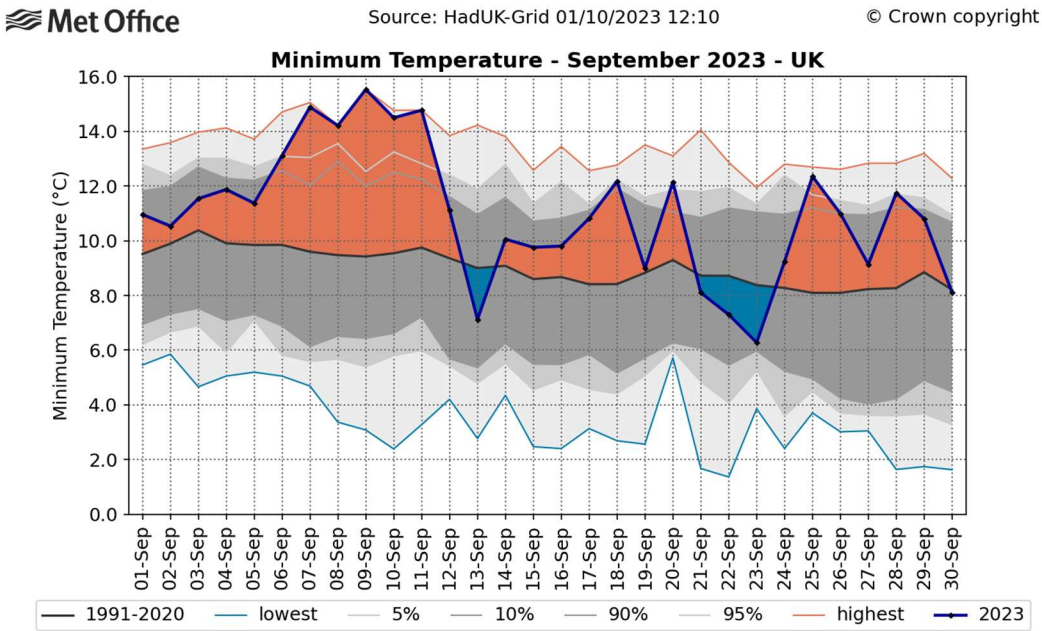
Period	1961-1990	1991-2020	2014-2023	2023
Sunshine (hours)	119.2	127.5	130.2	142.4

Daily time-series

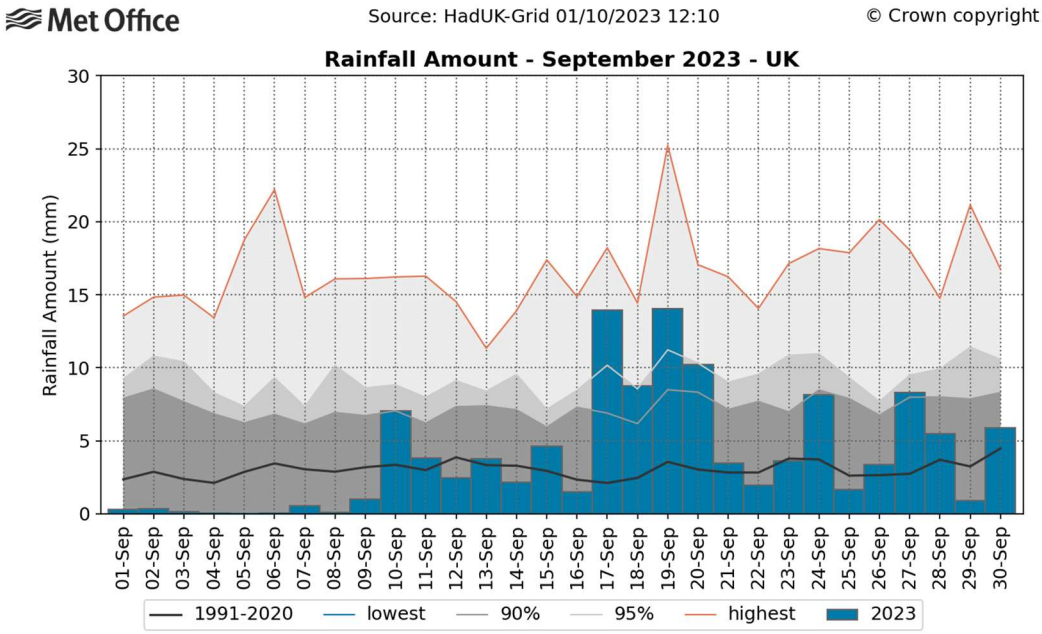
These charts show time-series of UK area-average daily maximum and daily minimum temperature and daily rainfall for each day of September 2023. The areas shaded in grey show the highest and lowest values in the daily temperature series (from 1960) and daily rainfall series (from 1891) together with percentiles and the 1991-2020 long term averages for each day. The rainfall accumulation chart shows the daily rainfall series as an accumulation through the month.

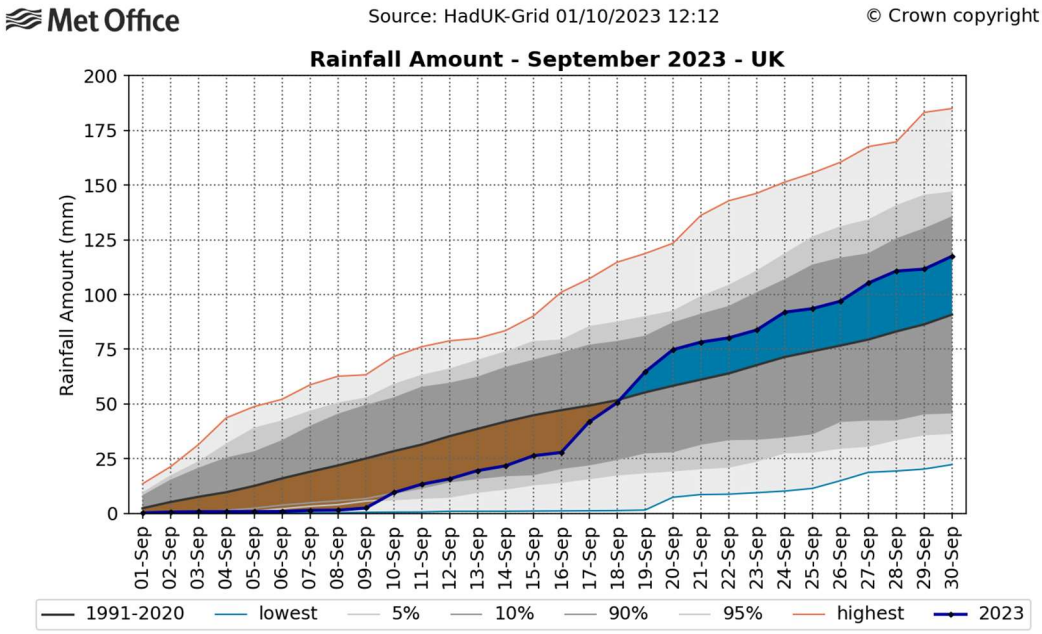
Daily maximum and daily minimum temperature





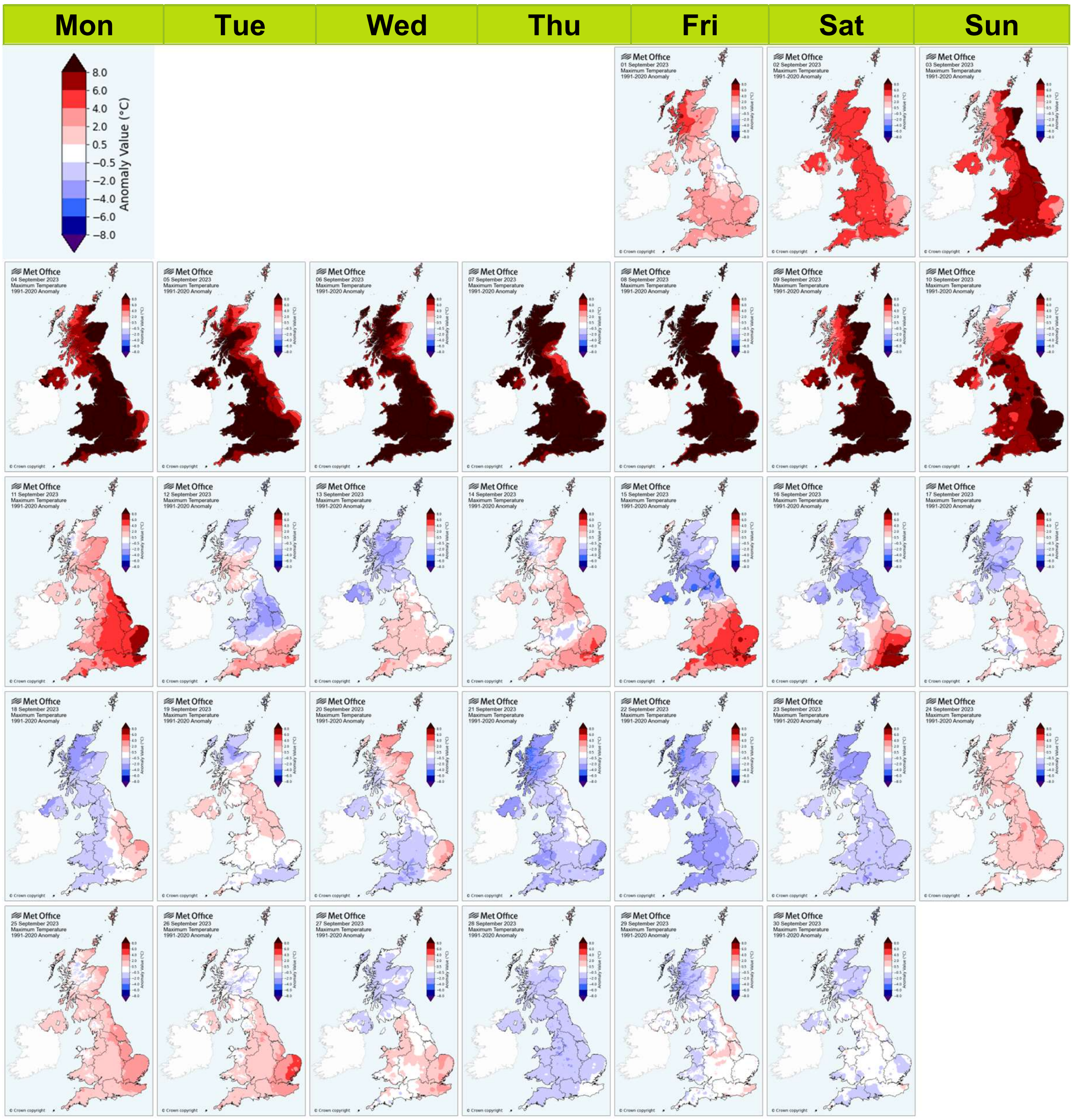
Daily rainfall and rainfall accumulation





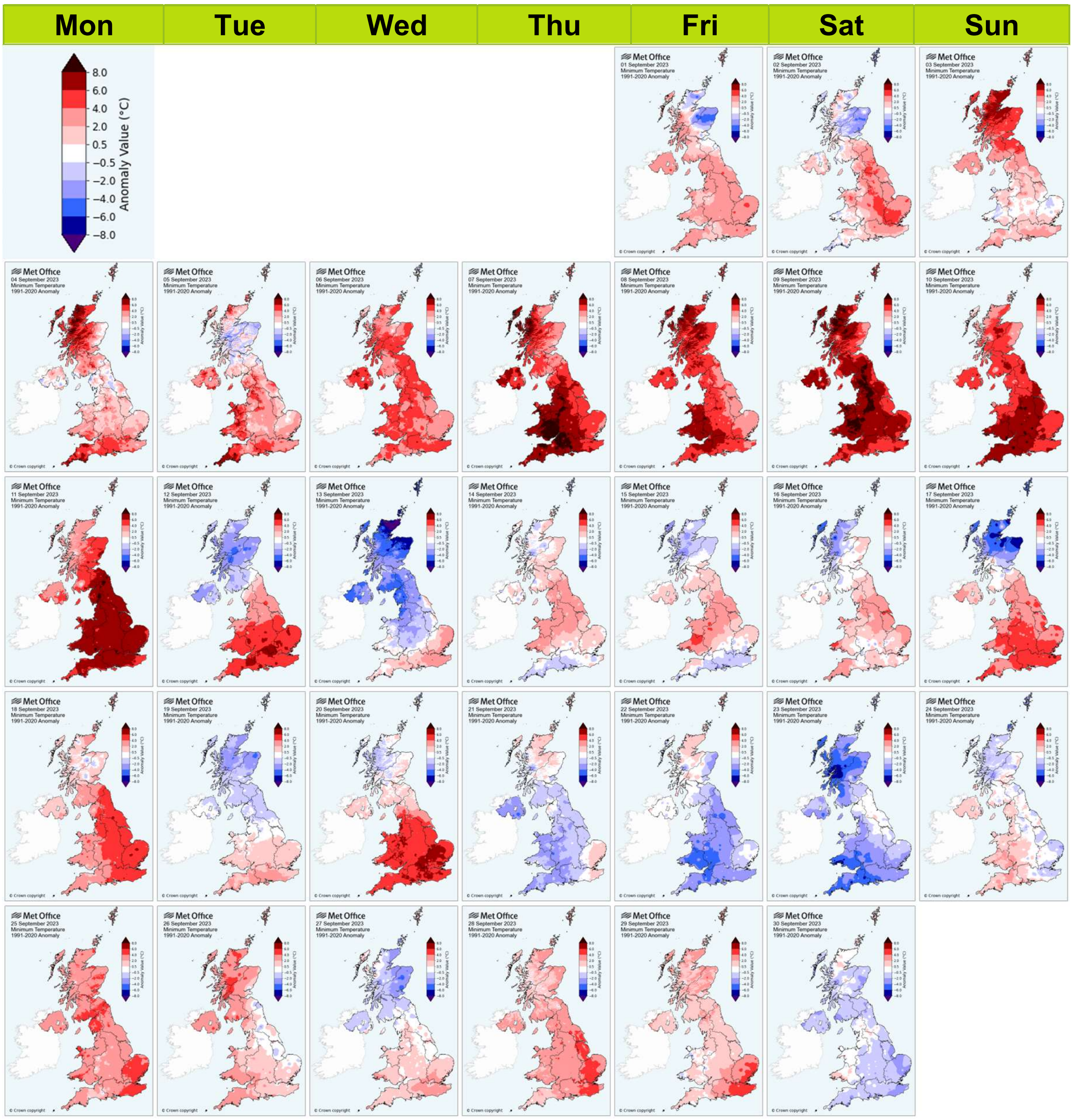
Daily maximum temperature maps - calendar view

These maps show daily maximum temperatures for each day of September 2023 as anomalies relative to the September 1991-2020 long term average. The daily maximum temperature is the maximum from 0900UTC on the day in question to 0900UTC the following day. Normally, the maximum occurs in the early afternoon.



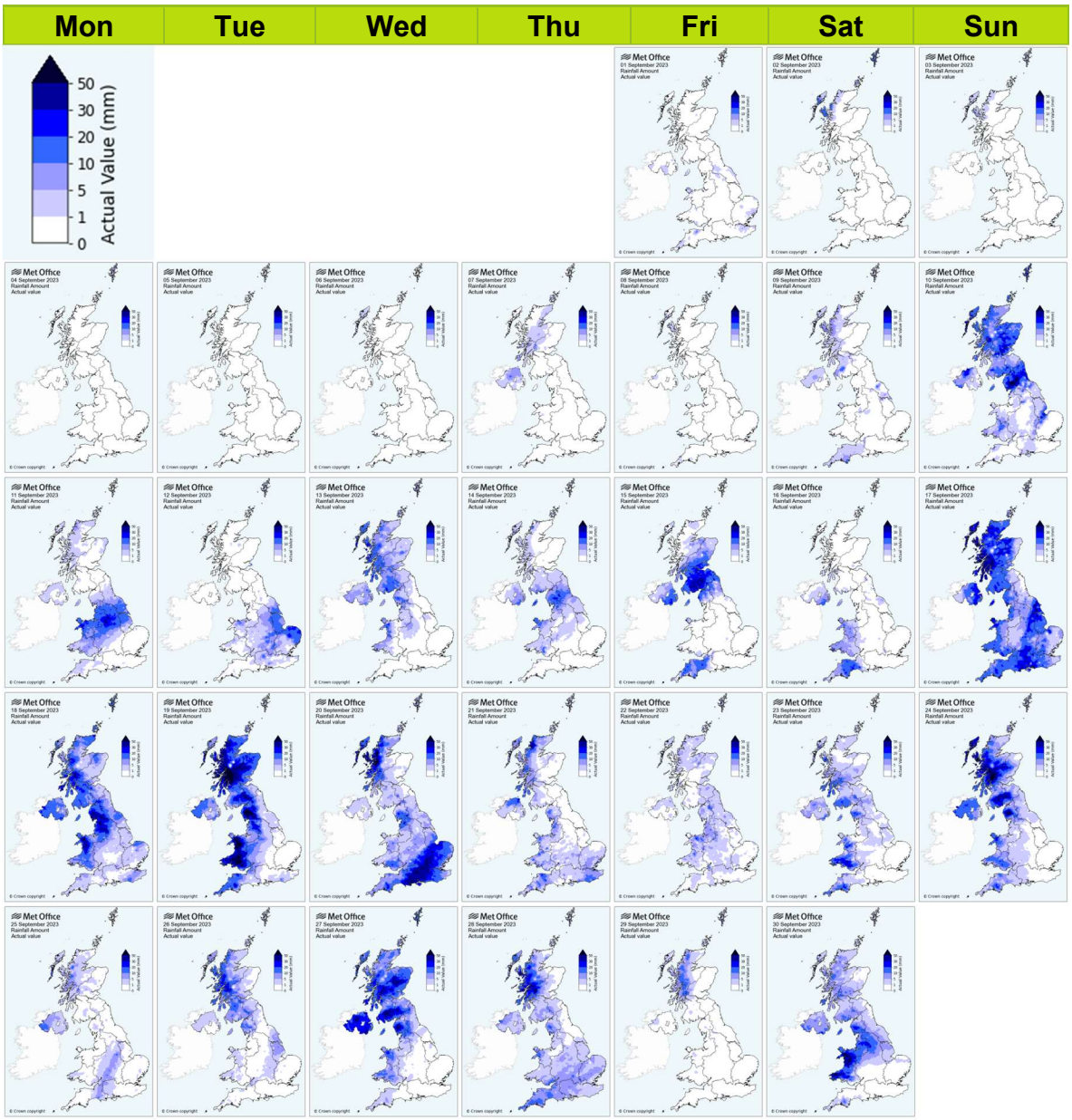
Daily minimum temperature maps - calendar view

These maps show daily minimum temperatures for each day of September 2023 as anomalies relative to the September 1991-2020 long term average. The daily minimum temperature is the minimum from 0900UTC the previous day to 0900UTC on the day in question. Normally, the minimum occurs in the early morning.



Daily rainfall maps - calendar view

These maps show daily rainfall for each day of September 2023 as daily totals. The daily rainfall is the total from 0900UTC on the day in question to 0900UTC the following day.

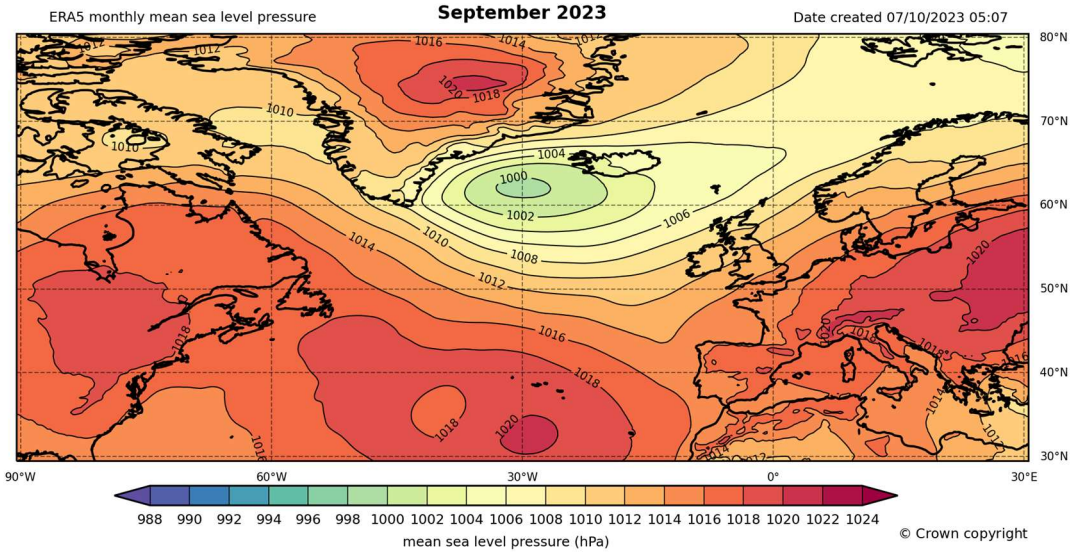


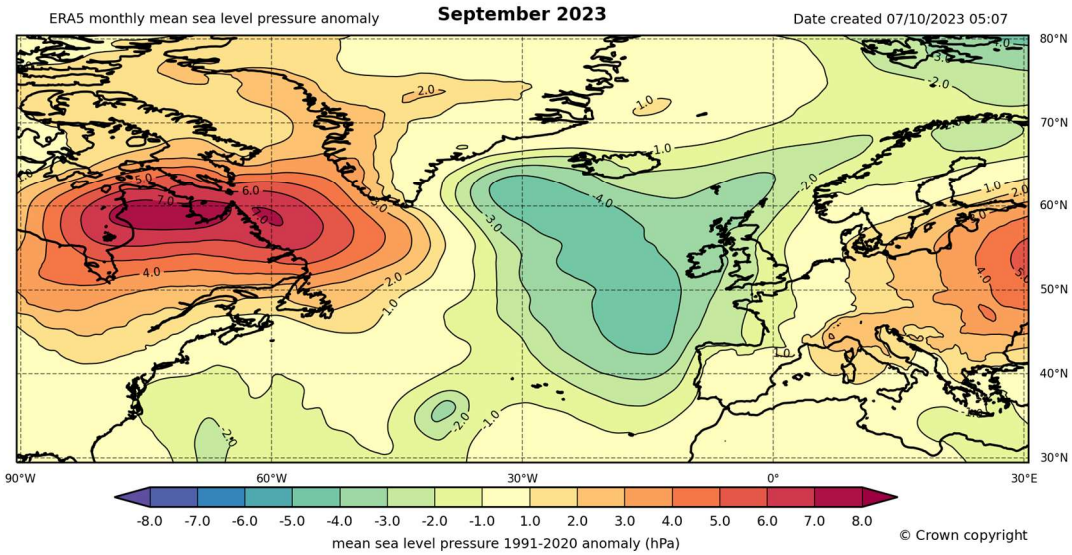
Monthly atmospheric circulation

Mean sea level pressure

These charts show the monthly mean sea level pressure for September 2023 for the UK and north Atlantic, based on the ERA5 reanalysis (Hersbach et al, 2019), both as actual values and as an anomaly relative to the September long term average. These charts provide an indication of the weather characteristics of the month overall i.e. whether the weather type has been generally settled (high pressure) or unsettled (low pressure) during the month.

Fine, settled weather for the first half of September transitioned to an unsettled westerly Atlantic influence for the second half. Overall, the UK was in north-west (low) to south-east (high) pressure gradient from Iceland to the near continent, with a weak low pressure anomaly to the west of the UK.

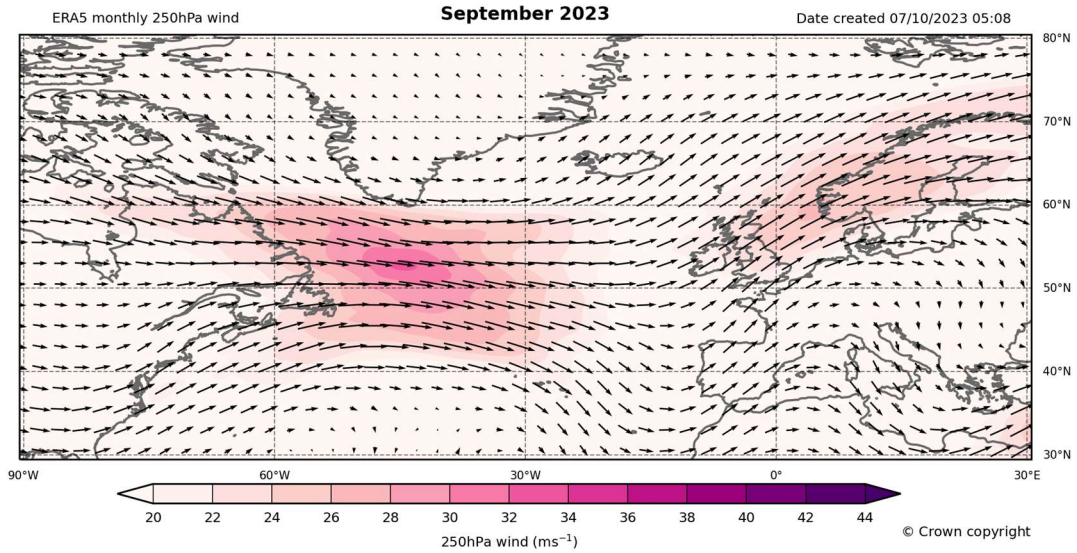


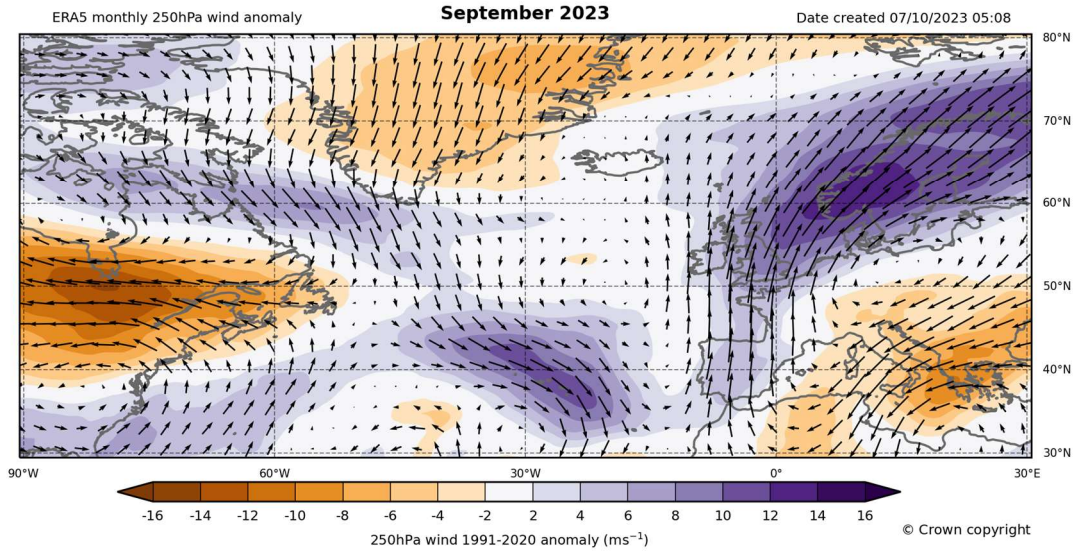


250hPa wind speed and direction

These charts show the monthly 250hPa wind speed and direction for September 2023 for the UK and north Atlantic, based on the ERA5 reanalysis (Hersbach et al, 2019), both as actual values and as an anomaly relative to the September long term average. This provides an indication of the mean strength and position of the jet stream compared to normal. The wind anomaly map shows shaded (scalar) wind speed anomalies with arrows as (vector) wind anomalies.

With a low pressure anomaly to the west, the jetstream was in a more southerly direction than normal, making this a notably warm month, particularly across the southern half of the UK.





Weather diary

- **Record breaking heat early then wet, windy and cooler**

  From the 1st to the 9th, with a continental high pressure firmly in charge of the UK weather and winds predominantly from the south or southeast, maximum temperature records across all nations were broken. While most parts saw the mercury exceed the mid-20s Celsius, the Midlands and southeast recorded maximums of 32°C plus. A small scale feature crossed Northern Ireland on the 7th bringing 10 to 20mm of rainfall in places.

  The 10th was met by a thundery breakdown with locally heavy downpours bringing the first significant rainfall for some parts of the UK. Totals exceeded 30mm for a number of places with the Cumbrian hills experiencing 24-hour totals over 60mm. High pressure maintained an influence from the 12th to the 17th, but with a much cooler airstream, and some places in the north of Scotland recorded their first frosts of the year with temperatures falling to -3.5°C in Sutherland.

  There then followed a series of vigourous Atlantic depressions that crossed the UK bringing a spell of wet and windy weather to all parts. The 27th saw the arrival of Storm Agnes which affected all regions but particularly western districts with winds gusting between 60 and 70mph, and rainfall totals exceeding 30mm.

  A ridge of high pressure on the 29th and 30th brought a brief, noticeably cooler but much needed respite to the unsettled weather.

Notes

The Met Office National Meteorological Library and Archive holds a near-continuous record of monthly weather reports from 1884, and this report forms a continuation of that series. The purpose of each report is to provide an overview of the weather conditions across the UK for that month. The emphasis is mainly based on observations from the surface network of weather stations. Climate series based on from data from these stations are used to provide long term context.

This summary was produced on 11/10/2023 09:23. The statistics are a provisional assessment of the observational data available at the time of production. Ongoing data receipt and quality assurance processes may result in subsequent updates to the statistics presented.

If you have any questions or feedback about this product, spot any data errors or omissions, or wish to obtain further data, please contact the Met Office.

For historical monthly weather reports please visit the Library and Archive.

- The land-surface observations presented in this report are from the Met Office official weather station network which includes both automatic weather stations and manual climate stations operated by volunteer observers. Rainfall data are from the official registered rain-gauge network which includes rain-gauges operated by a number of key partners including the Environment Agency, Scottish Environmental Protection Agency and Northern Ireland Water.
- The observations are carefully managed such that they conform to current best-practice observational standards as defined by the World Meteorological Organization (WMO). The observations also pass through a range of quality assurance procedures at the Met Office before application for climate monitoring.
- Daily and monthly maps, monthly statistics and monthly time-series are primarily based on the HadUK-Grid dataset of 1km resolution UK gridded climate data (Hollis et al, 2019). Monthly statistics from the monthly Central England temperature series 1659 (Manley, 1974) and England and Wales precipitation series from 1766 (Wigley et al, 1984) provide long term context.
- The monthly lightning activity map is based on data from the Met Office ATDnet (Arrival Time Difference Network) system. This is an automatic lightning location network comprising around ten lightning outstation sensors located across Europe.
- The monthly maps of mean sea level pressure and 250hPa wind speed and direction are based on the ERA5 reanalysis (Hersbach et al, 2019). ERA5 is the fifth generation ECMWF reanalysis for the global climate and weather for the past 4 to 7 decades. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics.

Hersbach, H., Bell, B., Berrisford, P., Biavati, G., Horányi, A., Muñoz Sabater, J., Nicolas, J., Peubey, C., Radu, R., Rozum, I., Schepers, D., Simmons, A., Soci, C., Dee, D., Thépaut, J-N. (2019): ERA5 monthly averaged data on single levels from 1959 to present. Copernicus Climate Change Service (C3S) Climate Data Store (CDS). https://doi.org/10.24381/cds.f17050d7

Hollis, D, McCarthy, MP, Kendon, M, Legg, T, Simpson, I. HadUK-Grid - A new UK dataset of gridded climate observations. Geosci Data J. 2019; 6: 151-159. https://doi.org/10.1002/gdj3.78

Manley, G. (1974), Central England temperatures: Monthly means 1659 to 1973. Q.J.R. Meteorol. Soc., 100: 389-405. https://doi.org/10.1002/qj.49710042511

Wigley, T.M.L., Lough, J.M. and Jones, P.D. (1984), Spatial patterns of precipitation in England and Wales and a revised, homogeneous England and Wales precipitation series. J. Climatol., 4: 1-25. https://doi.org/10.1002/joc.3370040102