

Radcliffe Meteorological Station

School of Geography and the Environment, University of Oxford

Annual Report 2024

1. Summary

The annual statistics for 2024 at the Radcliffe Meteorological Station are summarised in the table below. The 2024 annual mean temperature was 11.79°C, the 4nd warmest year on record at the Radcliffe Meteorological Station behind 2022, 2023 and 2014. In terms of anomalies, this was 0.69 K greater than the 1991-2020 mean and 2.08 K greater than the 1851-1900 mean.

2024 was also the 6th wettest year since reliable daily rainfall records began in 1827, with 916.2mm of rainfall compared to the standard period average (1991-2020) of 683.9 mm and 929 mm of rainfall in 2023. A remarkable statistic is that 13% of the years rainfall fell during a single 48-hour period from 0900 on the 22nd September to 0900 on the 24th September.

The report progresses as follows: Section 2 details 2024 annual statistics, with an overview of the weather for each month given in Section 3. An update on RMS news and observer changes is given in Section 4, and acknowledgements are made in Section 5 to those who have helped support the work at the RMS throughout the year.



Photo credit: Charlie Knight

2. Annual statistics

	Units	2024 value	1991-2020 average	1991-2020 standard deviation	Difference
Temperature					
Mean air temperature	°C	11.79	11.1	0.5	0.69
Mean daily maximum temperature	°C	15.4	15.0	0.7	0.4
Mean daily minimum temperature	°C	8.0	7.1	0.5	0.9
Highest maximum temperature	°C	30.4	31.0	2.4	-0.6
Lowest maximum temperature	°C	1.7	0.3		1.4
Highest minimum temperature	°C	18.2	18.4		-0.2
Lowest minimum temperature	°C	-5.2	-5.7	1.9	0.5
Air frosts (screen minimum < 0 °C)	days	15.0	33.8		-18.8
Mean minimum grass temperature	°C	5.9	4.0	0.8	1.9
Lowest grass minimum temperature	°C	-7.8	-9.8	1.9	2.0
Ground frosts (grass minimum < 0 °C)	days	45.0	90.7		-45.7
Mean concrete minimum temperature	°C	7.3	5.9	0.8	1.4
Lowest concrete minimum temperature	°C	-7.8	-7.1	1.7	-0.7
Mean soil temperature at 30 cm at 0900 UTC	°C	12.7	11.6	0.4	1.1
Mean soil temperature at 100 cm at 0900 UTC	°C	12.8			
Precipitation					
Total precipitation	mm	916.2	683.9	121.0	232.3
Wettest day	mm	77.1	33.6		43.5
No. of rain days (0.2 mm or more rainfall)	days	162.0	166.9		-4.9
No. of wet days (1.0 mm or more rainfall)	days	114.0	117.9		-3.9
Sunshine duration					
Total bright sunshine	hours	1520.8	1614.2	113.5	-93.4
Mean daily bright sunshine	hours	4.2	4.4		-0.3
Sunniest day	hours	15.0			
Mean wind speed at 0900 UTC (at 10 m)	knots	5.9			
No. of days with fog at 0900 UTC	days	8.0	15.4		-7.4
No. of days with snow lying at 0900 UTC	days	1.0	5.1		-4.1

Anomaly is calculated with respect to the 1991-2020 standard period mean. Yellow denotes anomalies more than 1 standard deviation from the mean, Orange denotes anomalies more than 2 standard deviations from the mean, and red denotes anomalies more than 3 standard deviations from the mean.

3. Monthly summaries

January 2024 was a somewhat typical month by most metrics. Above average rainfall (136%) was complemented by above average bright sunshine hours (123%), resulting in 30 minutes a day extra sunshine vs expected. Temperature parameters were otherwise all in line with 1991-2020 averages.

In contrast to the ordinariness of January, February was a month of records. With 262% of expected rainfall, it was the wettest February on record at RMS, with 124.1mm of rain exceeding the previous record of 119.6mm set in February 1937. The month was also the warmest February in our records, with a mean air temperature of 8.6°C exceeding 8.25°C set in 1990. Not a single air frost (where minimum screen temperature falls below 0 °C) was recorded for month, where >7 would otherwise be expected. A peculiarity of the month's record rainfall is that February 2024 benefited from an extra day, being a leap year, whereas 1937 did not. The rainfall record would not have been broken without the 6.7mm of rain that fell on February 29th.



Photo credit: Paige Norton-Edwards

March 2024 continued the theme of recent months and more generally the 2023/24 winter by being wet and warm. Oxford received 192% of expected rainfall; a total of 82.8mm. This was however significantly less rain than the previous March (2023), which received a (record) 133.9mm. Mean air temperature was one standard deviation above the 1991-2020 average, and the month saw 8 days fewer ground frosts (where grass minimum < 0 °C) than would be expected for the time of year.

April 2024 was by most metrics a return to fairly typical conditions, with the expected monthly hours of sunshine (156.2 hours; 94%) and rainfall (57.2, 117%). A number of temperature observations were above average, but only for a couple was this in excess of one standard deviation above the mean. Mean air temperature was 10.3°C for the month, +0.5°C above the standard period average, while mean daily minimum temperature was 1.2°C above average. Grass and concrete minimum temperatures were also >1 standard deviation above long term averages, while the number of air and ground frosts were under average suggesting a lack of cool and cloud free nights.



Photo credit: Kitty Attwood

Everyone was talking about the weather in May – and particularly complaining that it was cold and wet. So it's interesting to see our temperature observations at the Radcliffe Meteorological station don't agree. In Oxford, May 2024 was the 2nd warmest on record with a mean air temperature of 14.38°C, which was 1.5°C and one standard deviation above the 1991-2020 average. This was true nationally; the UK had its warmest May on record according to the Met Office figures. The warmest May recorded in Oxford was 176 years ago; May 1848 had a mean air temperature of 14.44°C. The month also received above average precipitation, but not significantly so, with 66.6mm (117%). Bright sunshine hours were less than expected for the time of year at 190.2 hours.

In a respite from a wet start to the year, June was dry and sunny - both rainfall and sunshine were a standard deviation below and above their respective means. The month saw just 5 wet days and only 28% of expected rainfall. The station also recorded >250 bright sunshine hours for the month, 127% of expected and averaging 8.3 hours of sunshine a day. The only other statistic significantly different from its June mean was average daily minimum temperature, at 10.2°C against a standard period mean of 11.1°C. All other values were consistent with those expected from a typical June.

Remarkably, this was the first month since December 2022 where mean air temperature was lower than the 1991-2020 average for the respective month.

July 2024 was a fairly typical month in Oxford. Only one metric, mean minimum grass temperature, fell outside of one standard deviation from the standard period mean. Mean air temperature was slightly below the standard period average at 17.5°C, while total rainfall for the month was 67.9mm, 128% of the average July total. The 5th July, with 29.2mm of rainfall, was the wettest day of the month.

Continuing the theme from July, August 2024 was another fairly typical month. Only one metric, lowest grass minimum temperature, fell outside of one standard deviation from the standard period mean. Mean air temperature was slightly higher the standard period average at 18.1°C, while total rainfall for the month was 36mm, 60% of the average August total. Despite the relatively dry conditions, bright sunshine hours were just 7% greater than the standard period mean at 205.4 hours of sunshine.

September 2024 demonstrated the value of the phenomenally long data record at RMS Oxford, which holds monthly precipitation data stretching back to 1767. The month was widely reported in the media to be the wettest on record across much of southern England, but this statement was not true of Oxford. With 193.3 mm of rain, September 2024 was the wettest month of any name in Oxford in 250 years – the only month to receive more rainfall since records began at the station was September 1774 (223.9 mm). This is particularly unusual given that September is typically not a very wet month, averaging just 52 mm of rain. Remarkably, the majority of the month's rain fell on raindays 22 September (77.1 mm 09-09h) and 23 September (41.8 mm 09-09h), which combined is the highest two-day total in the station's history. This two-day total alone also broke the record for the highest 3, 5 and 7-day accumulated rainfall totals. In terms of other recorded metrics, sunshine hours were significantly below that expected and measurable rainfall fell on 6.7 days more than expected. Temperature metrics were largely in line with those expected for the month.



Photo credit: Charlie Knight

Following a record-breaking September, October was a return to rather ordinary conditions. No variable for which we record long term statistics were outside of 1 standard deviation from the 1990-2020 mean. Mean air temperature across the month was 12°C while rainfall was 72.7mm and total bright sunshine hours 100.1, representing 3.2 hours of sunshine a day.

November 2024 was also rather ordinary. The only variables outside of 1 standard deviation from the 1990-2020 mean were the highest maximum temperature (17.4°C on the 24th November) and mean 30cm soil temperatures (9.9°C). Mean air temperature was 7.9°C, equal to the standard period average, while we recorded 74.7mm of rainfall across the month. Sunshine hours were slightly below normal, at 86% of expected. In a record as long as ours, fun statistics can always be found. Snow on the ground was reported on 19th November (2.8cm). This was the earliest winter half year date with snow on the ground at the morning observation, beating 20th November 1988 (1cm) by a day!



The year ended on a rather gloomy note. A 10-day streak of days with no bright sunshine from the 23rd December to the 2nd January contributed to total bright sunshine hours of 20.1 across the month, or just 39 minutes a day, with none at all over the Christmas period. This is just 36% of that expected in an average December. Cloudy conditions were associated with a large number of rain days but this rain was low intensity and did not lead to significant rainfall accumulation which at 45.2mm was just 68% of the expected total. Mean air temperature was 1.8°C higher than the standard period average at 7.2°C. Remarkably, during the month not a single air frost was recorded, where 8.6 would be expected in a typical December.

4. RMS News

In 2024, a team of 10 covered 366 days of weather readings. Our regular observers were supported by a few extra hands, and we thank them for their assistance. Particular thanks to Paige Norton-Edwards for completing the Christmas Day shift and to Emma Simmons for the New Years Day shift.

The Radcliffe Meteorological station was featured in news articles on a number of occasions;

<https://www.ox.ac.uk/news/2024-10-03-oxford-researchers-record-wettest-month-250-years>

<https://www.bbc.co.uk/news/articles/cy4dppm3leo>

<https://www.oxfordmail.co.uk/news/24626797.university-records-wettest-september-oxford-250-years/>

5. Acknowledgements

Everyone at the RMS would like to thank Stephen Burt and Roger Brugge at Reading for the time they have taken during 2024 to provide invaluable support and advice. This includes a fantastic redesign of our daily data tables by Stephen Burt in early 2024.

We would also like to thank everyone in Green Templeton College and in the Department of Engineering Science who has helped or supported the work of the RMS through the year. We thank Angus Bruce at the Met Office for his advice and assistance, and also Freya Morris, Thomas Pilsworth, Chris White and the rest of the Communications team in the School of Geography and the Environment for their support in spreading the work of RMS. Lastly, a continued thanks to chef de mission Professor Richard Washington at the School of Geography and Environment for his supervision, support and advice.

Charlie Knight

On behalf of the RMS observer team

University of Oxford