

Radcliffe Meteorological Station

School of Geography and the Environment, University of Oxford

Annual Report 2022

Summary

2022 was a record-breaking year at the Radcliffe Meteorological Station across multiple metrics. The annual statistics for the station for 2022 are shown in the table below. 2022 was an extremely warm year for the RMS Oxford station, with not only the highest air temperature recorded in the station's 208-year history (38.1°C in July), but also the warmest yearly mean temperature on record (12.14°C) and the warmest temperature on record in 5 other station metrics.

2022 was drier than usual, with the number of days with rain over 1mm was more than one standard deviation lower than the long-term mean. While the total yearly precipitation was lower than the long-term average, it was not more than a standard deviation away from the record-long mean. However, the number of sunshine hours was up significantly, over 2 standard deviations higher than the long-term mean. The number of fog days and days with ground frost were also noticeably lower this year, with both metrics one standard deviation lower than the long-term average. The occurrence of snow and air frost, as well as average wind speed and the 3 absolute minimum temperature values, were all similar to their long-term means.

Annual Statistics

Metric	2022 Annual Value	Date Recorded	Anomaly Against Long Term Mean	Rank in record/number of years in record
Mean air temperature (°C)	12.14		2.0	1 st (208)
Absolute maximum air temperature (°C)	38.1	19/07	8.2	1 st (140)
Lowest maximum air temperature (°C)	-1.2	13/12		
Mean maximum air temperature (°C)	16.5		2.5	1 st (208)
Absolute minimum air temperature (°C)	-7.4	15/12	0.1	Joint 60 th coldest (142)
Mean minimum air temperature (°C)	7.7		1.4	Joint 1 st (142)
Absolute minimum grass temperature (°C)	-8.9	15/12	-1.4	
Mean minimum grass temperature (°C)	4.7		-1.6	Joint 5 th (142)
Absolute minimum concrete temperature (°C)	-8.1	15/12	-1.1	
Mean minimum concrete temperature (°C)	6.7		0.8	Joint 3 rd (36)
Mean soil temperature at 30 cm (°C)	12.5		1.6	1 st (98)
Mean soil temperature at 100 cm (°C)	12.6			
Highest daily rainfall (mm)	20.6	16/03		
Total rainfall (mm)	551.7		-94.9	Joint 202 nd (256)
Total bright sunshine (hours)	1880.7		365.6	2 nd (142)
Mean daily bright sunshine (hours)	5.2			
Mean wind speed (knots)	8.7		-0.1	Joint 72 nd (142)
No. of rain days (0.2 mm or more rainfall)	140.0		-30.1	126 th (142)

No. of wet days (1.0 mm or more rainfall)	104.0			
No. of days with minimum temperature less than 0°C	30.0		-14.9	Joint 120 th (142)
No. of days with ground temperature less than 0°C	69.0		-32.2	134 th (142)
No. of days with fog at 0900 GMT	7.0		-12.5	Joint 88 th (95)
No. of days with snow lying at 0900 GMT	7.0		-2.3	Joint 42 nd (142)

Anomaly is calculated with respect to the long-term mean. Yellow denotes anomalies more than 1 standard deviation away from the long term mean. Orange denotes anomalies more than 2 standard deviations away from the long term mean, while red denotes anomalies more than 3 standard deviations away from the long term mean.

Monthly Statistics



View from the top of Engineering in January 2022. Photo credit: Anlin Chen.

With only 20.0 mm of total rainfall received, January 2022 was the driest January in Oxford since 2006, whilst the number of rain days (9.0) was the joint 7th lowest value recorded for the month in the 141-year record. This marked a stark contrast to January 2021 (115.3 mm) which was the 5th wettest in the Oxford record; indeed, this difference (95.3 mm) is the 3rd largest between consecutive Januarys, behind only 1995-1996 (131.4 mm and 34.4 mm) and 1948-1949 (127.3 mm and 22.9 mm). The month was also brighter and calmer than normal, with the values for total sunshine (85.1 hours) and mean wind speed (6.8 knots) the 6th highest and joint 4th lowest recorded for January respectively. The temperature was fairly average for the time of

year, with the exception of a maximum of 13.9°C observed on the 1st, making it the joint warmest New Year's Day in the Oxford record.

February saw three named storms impact on the weather of the UK, with total rainfall (62.7 mm) and mean wind speed (14.7 knots) above average for the time of year in Oxford. Indeed, the latter of these two values made it the 3rd windiest February in the RMS record, and is the joint 6th highest reading for any month since 1881. Despite this, total sunshine hours (98.5) were one standard deviation above the long-term mean, with the 9.8 hours recorded on the 27th making it the 2nd sunniest February day on record (behind the 10.3 hours recorded on 27/02/2019). Temperatures were unseasonably warm; a mean air temperature of 7.3°C the joint 6th highest registered for the month, whilst there were no instances of air frost (only the 4th time this has occurred in February).

March 2022 was unseasonably mild, with a mean air temperature of 8.0°C making it the 5th warmest March in Oxford in the 21st century, and several other temperature metrics registering values in excess of one standard deviation above the long-term average. A spell of fine weather between the 17th – 26th ensured the total sunshine hours for the month (154.3) were \approx 35% above the long-term mean, whilst the number of rain days (11.0) were low for the time of year. The fact that the total rainfall recorded was around average for March owed largely to the 20.6 mm received on the 16th, an amount which accounted for over half of the monthly total (40.9 mm).

April was an unseasonably dry month in Oxford, with the monthly rainfall total (13.8 mm) only 32% of the long-term mean value. Almost three quarters of the total rainfall was received in the first week of April; the month finishing with a prolonged dry spell (no rainfall was recorded from the 17th – 30th). Accordingly, the number of rain days (7.0) was also one standard deviation below the long-term mean, whilst the total sunshine recorded (181.7 hours) was above average for the time of year, with the 21st (13.0 hours) registering as the sunniest April day in Oxford since 2015. Although relatively warm (mean air temperature of 9.6°C), the morning of the 3rd registered a minimum grass temperature of -7.3°C, the lowest reading for this metric in the month of April since 1997.

With a mean air temperature of 13.9°C, May 2022 was the joint 5th warmest May in the Oxford record. Indeed, all but one of the temperature metrics were at least one standard deviation above the long-term average, whilst the values for absolute (5.3°C) and mean (9.7°C) minimum air temperature are the 2nd highest recorded



The Radcliffe Observatory and Green Templeton College grounds in April 2022.
Photo credit: Anlin Chen.

for the month of May. This was also the first time since 2015 that there were no instances of ground frost during May. Temperature aside, it was a fairly average month for the time of year; total rainfall (42.1 mm) and mean wind speed (8.2 knots) were not unseasonably low, whilst the total number of sunshine hours recorded (202.1 hours) were just above the long-term mean.

June 2022 was relatively warm and bright in Oxford, with the values for mean air temperature (16.1°C) and total bright sunshine (256.8 hours) both over one standard deviation above the long-term average. The maximum temperature of 31.7°C recorded on the 17th of the month made it the joint-11th warmest June day in the RMS record. Total rainfall (51.2 mm) was around average for the time of year, although over one-third of that figure was received on the 4th of the month (19.2 mm), the highest daily value registered in Oxford since the 16th March.

July 2022 was an unprecedented month at the RMS, with the Oxford temperature record, previously set in 2019 (36.5°C on 25/07/19), broken on the 18th (36.7°C) and then again on the 19th (38.1°C). The mean air temperature for the month (19.5°C) was also two standard deviations above the long-term average, making it the 5th warmest July in the RMS record. It was also an exceptionally dry month in Oxford, with the values for total rainfall (7.1mm) and number of rain days (6.0) both ranking as the joint 7th lowest for the month of July in the RMS record.

August 2022 was an exceptionally hot month at the RMS, with a record-breaking mean air temperature of 20.0°C, which was 3.8°C above the long-term mean and 0.1°C above the previous record, 19.9°C, set in 1997 and 1995. The absolute maximum temperature, 33.4°C, occurred on August 12th, ranking as the 7th hottest August day since 1815. August 2022 had the 2nd highest mean maximum air temperature (26.5°C), 3rd highest mean minimum air temperature (14.4°C), and 3rd highest mean minimum concrete temperature (14.1°C). Its mean 30cm soil temperature was 21.3°C, breaking the previous 1995 record by 0.3°C. The total rainfall ranked the 5th lowest for August in the history of RMS and the number of rain days (0.2mm or more) was tied as the 2nd lowest. With 246.5 hours of sunshine, it also had the 6th longest August sunshine time on record. Overall, it was a very dry, sunny, and hot August, like many places in England this year, featuring multiple record-breaking measurements.



Anlin Chen being interviewed on RMS Oxford's record-breaking temperatures in July 2022. Photo credit: Anlin Chen

Following a record-breaking July and August, September 2022 was a rather ordinary month. The mean air temperature was 15.1°C, which was just over 1 standard deviation above the long-term mean and ranked 25th in the RMS record. The mean minimum grass temperature was 8.7°C, ranking the 15th highest in the record. The mean 30cm soil temperature at 17.3°C was the 5th highest in record. The total rainfall was less than historical average and a cloud cover of 7 or 8 oktas was observed for half of the month (15 days). All the variables where the differences exceeded one standard deviation of long-term mean were some measures of mean rather than absolute values. It appears that September 2022 on average was warmer than usual, but it



A colourful 2022 autumn at the RMS Oxford site. Photo credit: Anlin Chen

had few exceptional days with extreme values compared to historical data. Overall, September 2022 was moderately warmer and slightly drier and cloudier than Septembers at RMS in the past.

October 2022 was considerably warmer than average, with 8 of our 10 temperature measurements at least 1 standard deviation away from their respective October long-term means. The mean air temperature (13.5°C) is the joint 4th warmest October in the RMS record, while the mean maximum air temperature (17.8) is the second highest recorded for October, only beaten by 19.1°C in 1921. Total sunshine recorded in October was 160.2 hours, which is a new record for this station, again beating a measurement taken in 1921.

Despite feeling like a wet month, November 2022 was only the 28th wettest November recorded at RMS Oxford, with a total of 108.6mm. Similar to the previous month, November 2022 was unusually warm, again with 9 of the 10 temperature measurements over one standard deviation away from their long-term means. The absolute minimum air temperature (3.6°C on 29th November) is a new record for the station for November, over 1°C greater than the previous record (2.4°C) from 2009. The mean minimum air temperature (7.6°C) is only 0.6°C cooler than the warmest November value for this measurement (8.4°C recorded in 1994).

December 2022 was slightly colder than usual at RMS Oxford, although only the minimum concrete temperatures were over a standard deviation colder than their long-term means. With 7 days of snow lying on the ground during this month, between 12th to 18th December, this is the joint 7th snowiest December recorded by RMS Oxford and the December with most snow days since 2010.



The Radcliffe Meteorological Stations wishing Oxford a merry Christmas. Photo credit: Anlin Chen

RMS News

During 2022, there has been one notable change within the RMS observing team. Lead observer Matt Clements left the team in August as he returned home to write up his DPhil. Matt has been an observer since June 2021 and led the team for 12 months. We are grateful for his time and commitment to RMS Oxford, and wish him the very best for the future. The lead observer role has passed to Sophie Harbord, a DPhil student in the climate lab in the School of Geography and the Environment who has been on the RMS Oxford team for a year.

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Sophie Harbord
Meteorological Observer
University of Oxford