Research resource review

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Burt, S. and Burt, T. 2019. *Oxford weather and climate since 1767*. Oxford: Oxford University Press. xv + 513 pp. £35.00 hardback. ISBN: 9780198834632

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A well-kept weather record is a gift from previous to future generations. As the 'climate emergency' gathers pace, we have those data to show where we have come from and just how much has changed. The past two years have certainly witnessed some remarkable weather extremes in the UK. Summer 2018 was the equal warmest since 1884 (Kendon et al., 2019). On 25 July 2019, the highest ever UK temperature of 38.7°C was set. In autumn 2019, rainfall records were broken for large swathes of England and Wales – with South Yorkshire having more than double normal totals. We know that these are exceptional times thanks to the meticulous work of researchers who have pieced together fragments of weather data held in the personal diaries and logs of amateur observers.

Oxford Weather and Climate Since 1767 is a masterclass of scholarship and story-telling. This mighty hardback speaks directly to the heart of anyone who is fascinated by or responsible for weather measurement. Equally, for those who depend on long-term climate series for their policy-making or research, this is an account of the effort (and sometimes bloody-mindedness) needed to safeguard such vital assets from all manner of rationalisations. The tome is a veritable almanac – brimming with statistics, maps, photographs, charts, tables and appendices that interrogate the 250+ year record of the iconic Radcliffe Observatory. As one of the longest daily weather records anywhere on Earth, the authors' account of the data set and the way it came to be, deserves our attention.

The 30 chapters are grouped into six sections. Part 1 (Chapters 1–5) sets the scene with concise summaries of the climatic situation and history of weather observations at Oxford. The unique series is placed in wider national and regional context, along with an appraisal of the extent to which urban development near the site and across Oxford has artificially warmed the series. Precipitation, temperature and sunshine data since 1871 are also interpreted using the Lamb Weather Types and North Atlantic Oscillation index to show how the synoptic situation has driven trends and extreme events (like the hot, dry, sunny summer of 1976). The section closes with a synopsis of other long-period weather observations in the British Isles and across Europe, before reminding us why such records really matter. Without them we are poorly equipped to monitor and/or interpret environmental change, or to benchmark data from successive designs of meteorological instrument.

Part 2 (Chapters 6–19) examines Oxford's weather for individual months then annually. Standard charts and tables are introduced before sequentially detailing each month. Every chapter provides an overview of the essential properties and statistics of the month, followed by sections on temperature, precipitation, sunshine

and rain. Notable extreme events are documented and illustrated with historical imagery of floods, blizzards and low river levels. One of the most striking photographs is of a hardy rowing crew on the water (18 February 1888) just days after the heaviest snowfall on record. The section ends with analyses of annual mean and extreme climate series. Marked rises in maximum, and minimum daily temperatures are shown, most impactfully as the annual mean temperature ‘barcode’ of Ed Hawkins with predominance of cold years (blue stripes) at the start and hot cluster (dark red stripes) at the end. Summary information is given for snowfall days and duration of lying snow, ‘thunder heard’ and barometric pressure.

Part 3 (Chapters 20–23) follows a similar format to the previous chapters but for Oxford weather described by the four seasons. New time series are introduced such as the incidence of fog, the ratio of summer to winter rainfall and the Davis summer index (which covers an extended summer period from May to September). These chapters (along with the monthly summaries) demonstrate the rigour and depth of the analysis that typifies the book. Readers may refer to certain chapters out of curiosity (sadly no outstanding weather statistic to mark my date of birth), or to contextualise extreme events/seasons that will undoubtedly come in future years.

Part 4 is a standalone Chapter 24 on climate change in Oxford. The focus is on detecting rather than attributing changes (which was addressed to a certain extent by the correlation analyses in Chapters 3 and 4). Alongside standard annual temperatures and precipitation series are simple indices to track growing season length, frequency of rain days and running rainfall totals as a proxy for drought. Purists may dislike the fitting of best-fit lines to annual rainfall and the authenticity of some seasonal precipitation trends (including at Oxford) have recently been questioned (Murphy et al., 2109). Any later editions of the book might also benefit from a few supplementary analyses that show just how long detection times can be before statistically significant signals emerge from noisy, local climate series. However, the closing remarks about maintaining long records are well founded. It is always good to be reminded that the whole climate modelling endeavour ultimately rests on high-quality observational data for model building and hypothesis testing.

Part 5 (Chapter 25) is a chronology of the most extreme and occasionally quirky weather observed at Oxford since the Great spring floods of 7 May 1663. This chapter compiles all manner of evidence from diaries, eye-witness accounts, and such like, along with contemporary theories about the causes. There is candour and bemusement amongst the quotations. For example, Thomas Hornsby describes how on 26 January 1776 wine began to freeze in his study – a tough state of affairs for an Oxford don! There are also data from near Oxford showing a brief temperature drop of ~2 °C associated with the near total eclipse on 11 August 1999. The year 2018 offered up a near-record weather statistic in most months; the authors observe ruefully that it was hard to keep up.

Part 6 (Chapters 26–30) ends the book with numerous tables summarizing Oxford weather averages and extremes, followed by a block of Appendices that faithfully document meta information and climate statistics for posterity. The chapters report conventional metrics for daily/monthly maximum/minimum temperatures, rainfall totals, snow depths, sunshine hours, as well as some unusual indices. These include first and last dates above specified thresholds. For example, the latest day with snow lying at 09:00 GMT was 26 April (1981). Tables of periods of absolute and partial drought, notable heatwaves, cold spells and prolonged dullness are given too. In fact, the main body of the book ends with a table of abysmally low sunshine totals for a 60-day run between 16 November 2010 and 14 January 2011 during which just 58.4 hours of sunshine were recorded. Perhaps a more upbeat end would be to look to the future of the Radcliffe Observatory. That the site is in safe hands is beyond doubt. But what new uses might future custodians find for the data, or what clever experiments could be run alongside the existing array of instruments? Such questions warrant a chapter of their own and would have brought the story full circle.

Overall, this book is an extraordinary contribution that honours the immense, collective effort of a long line of weather observers at Oxford. The authors have played their part too. We can only begin to imagine the herculean task of proofing all the statistics in their manuscript! This book will appeal to weather observers (worldwide) who continue the time-consuming and sometime unglamorous task of recording meteorological conditions day after day, year after year. However, there are also important messages for students of engineering, environmental science, geography and historical climatology about the intrinsic value of data gathered by one generation with an eye on the next.

References

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