



THE UK'S WEATHER IN 2022

Paul Homewood

The Global Warming Policy Foundation

Briefing 65

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About the author

Paul Homewood had a career as an accountant in industry. He has been writing on climate and energy issues since 2011 and has written several papers for GWPF. This is his fourth annual review of the UK climate for GWPF.



Executive summary

According to the Met Office, the UK climate 'is continuing to change',¹ whilst weather is becoming more extreme.² But what does the actual evidence tell us? Using official data up to 2022, from the Met Office and other sources, this paper examines UK climate trends, and assesses the truth of these claims. The results are as follows:

- Although 2022 was the warmest on record in the UK, there has been no increase in long term averages since the early 2000s.
- The annual temperature in 2022 was well within the bounds of natural variability, and was largely due to long spells of sunny weather in spring and summer.
- The summer of 2022 was only the fourth hottest, according to the Central England Temperature Record, and not as hot as 1976, 1826 and 2018.
- Annual rainfall last year was only slightly below average.
- The number of days with extreme temperatures is not increasing, as fewer cold days are offsetting more hot ones.
- Long-term averages in rainfall in England and Wales, which have been rising since the 1970s, are similar to the 1870s and 1920s.
- While winters have become slightly wetter, there is little change in the other seasons. In particular, summers are not getting drier, as projections from climate simulations have suggested.
- Rainfall is not becoming more extreme, whether on an annual, monthly or daily basis.
- Sea levels have been rising at approximately 1.7 mm per year around the UK, after taking account of vertical land movement. There has been no acceleration in the rate of rise on multi-decadal scales.
- Wind storms have been declining in frequency and intensity since the 1990s.

In short, although it is slightly warmer than it used to be, the UK climate has changed very little. Long-term trends are dwarfed by the natural variability of weather. Nor is there any evidence that weather has become more extreme, or will become so in future.



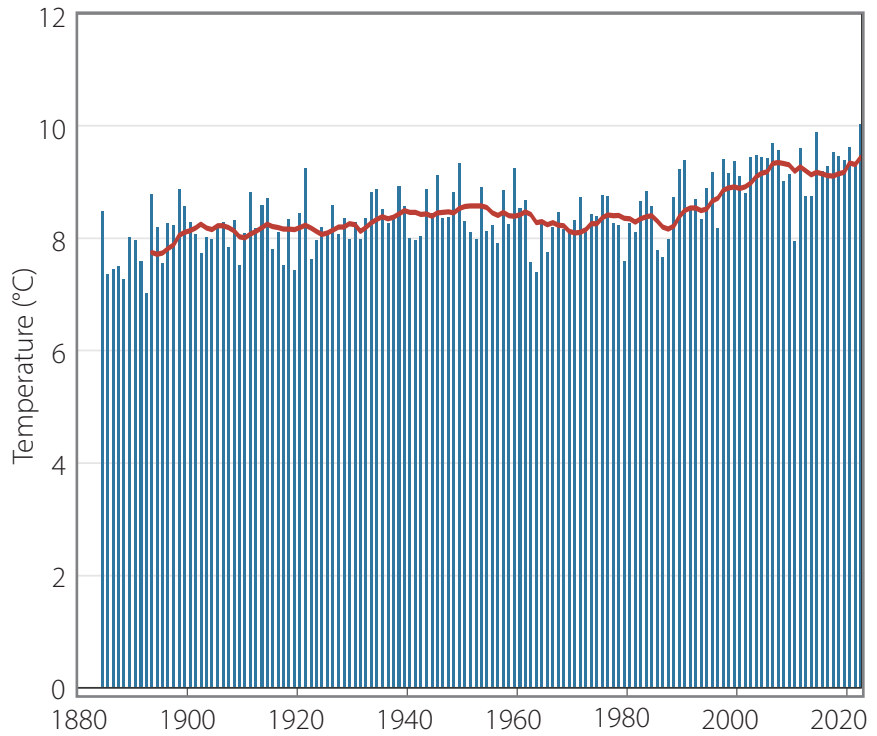
1. A review of 2022

The annual mean temperature in the UK was a record high of 10.0°C in 2022 (Figure 1). However, it was only 0.1°C warmer than 2014, effectively just a rounding error. Despite this, the 10-year running average is still no higher than it was between 1998 and 2007, at 9.4°C. This indicates that there has been no long-term increase in average UK temperatures for more than two decades, following a sharp rise during the 1980s and 90s.

Figure 1: UK temperatures: annual means and running 10-year averages, 1884–2022.

Source: Met Office.⁴

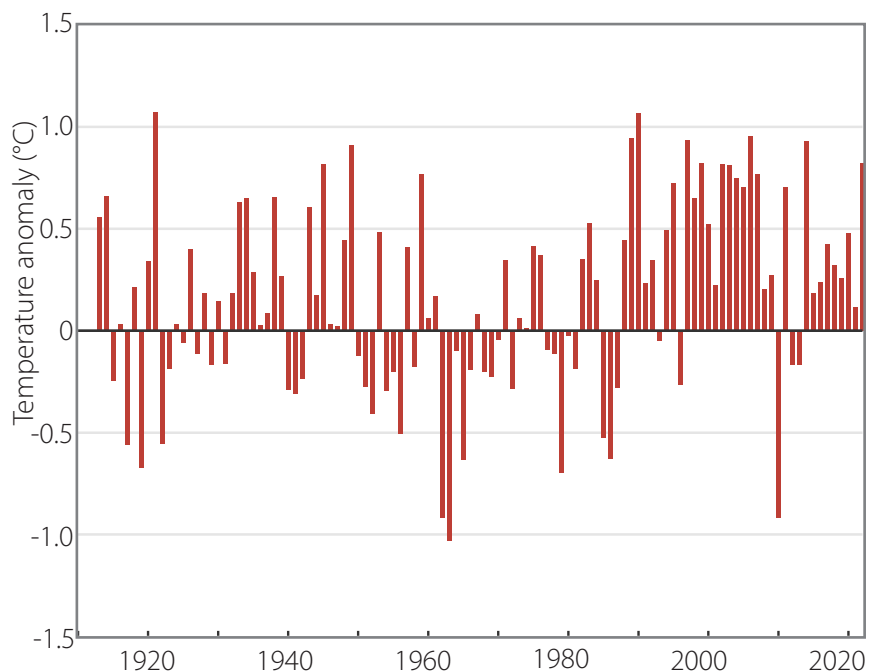
■ Annual
— 10-year running mean



Annual temperatures in 2022 were well within the bounds of natural variability, being 0.82°C above the 30-year average (Figure 2). In comparison, 2010, for instance, was 0.92°C below, whilst several other years have had bigger anomalies than 2022.

Figure 2: UK annual mean temperature anomaly, 1913–2022.

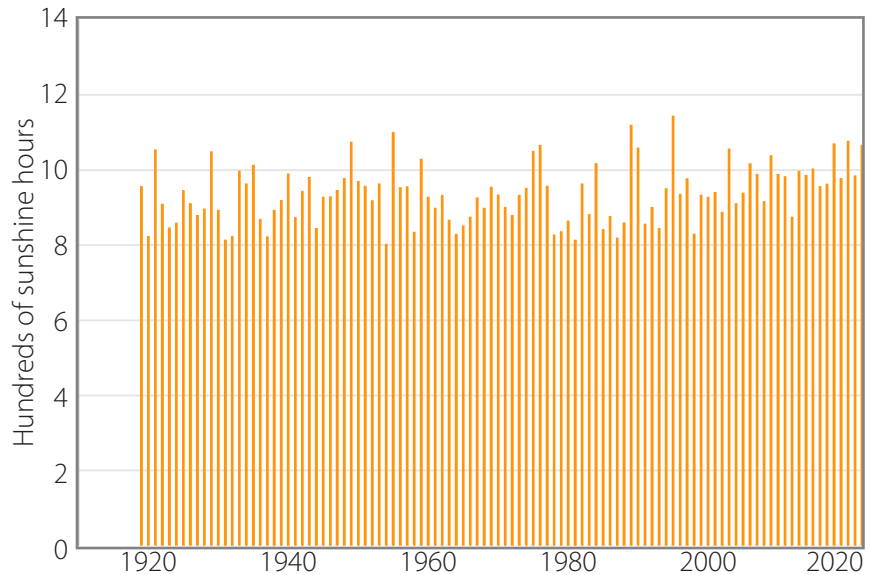
Anomaly against average of previous 30 years. Source: Met Office.⁴



So just how exceptional was 2022? Central to the mildness of the year was the prevalence of sunny weather throughout spring and summer. Sunshine hours were the seventh highest for the period since records began in 1919 (Figure 3). Inevitably, sunny weather at that time of year brings high temperatures. However, there is no evident long-term trend in sunshine hours that would suggest this is part of a pattern of climate change.

Figure 3: UK sunshine hours, 1919–2022.

Source: Met Office.⁴



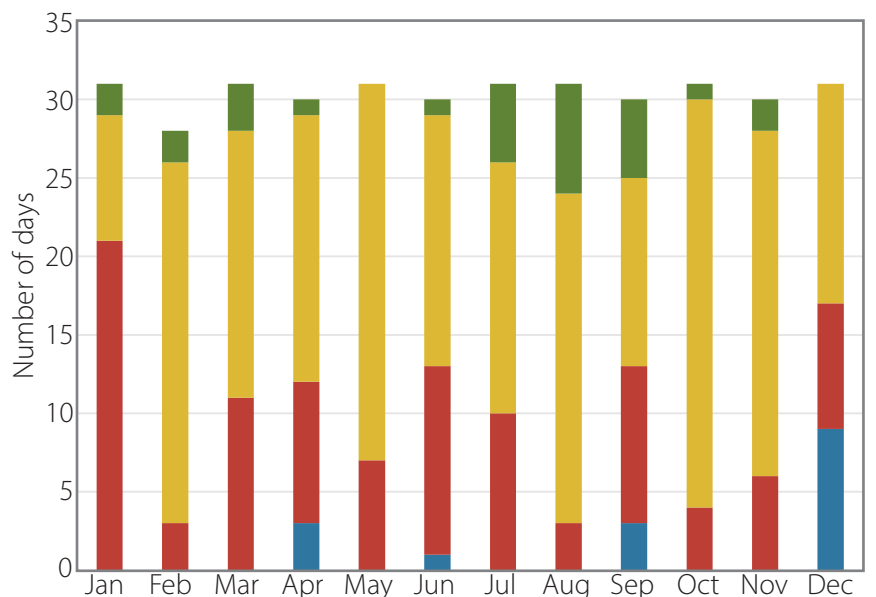
Analysis of daily temperatures from the Central England Temperature Record (CET) shows that the number of days above the 95th percentile only slightly exceeded the average for the year as a whole. However, the number of days above the median but below the 95th percentile heavily outweighed the number below the median but above the 5th percentile: 215 versus 104.

Any temperatures within these two bands must be regarded as 'normal', so in simple terms the high average temperatures in 2022 should be seen merely as the result of natural variability. The weather patterns during the year dictated the temperatures that followed.

Figure 4: Central England daily temperature percentile distribution in 2022.

Based on daily temperatures between 1991 and 2020.⁵

- >95th percentile
- <95th percentile
- <50th percentile
- <5th percentile



This conclusion is reinforced by the fact that no month set a record high temperature, or indeed anything near one (Table 1).

Table 1: CET monthly mean temperature rankings in 2022.

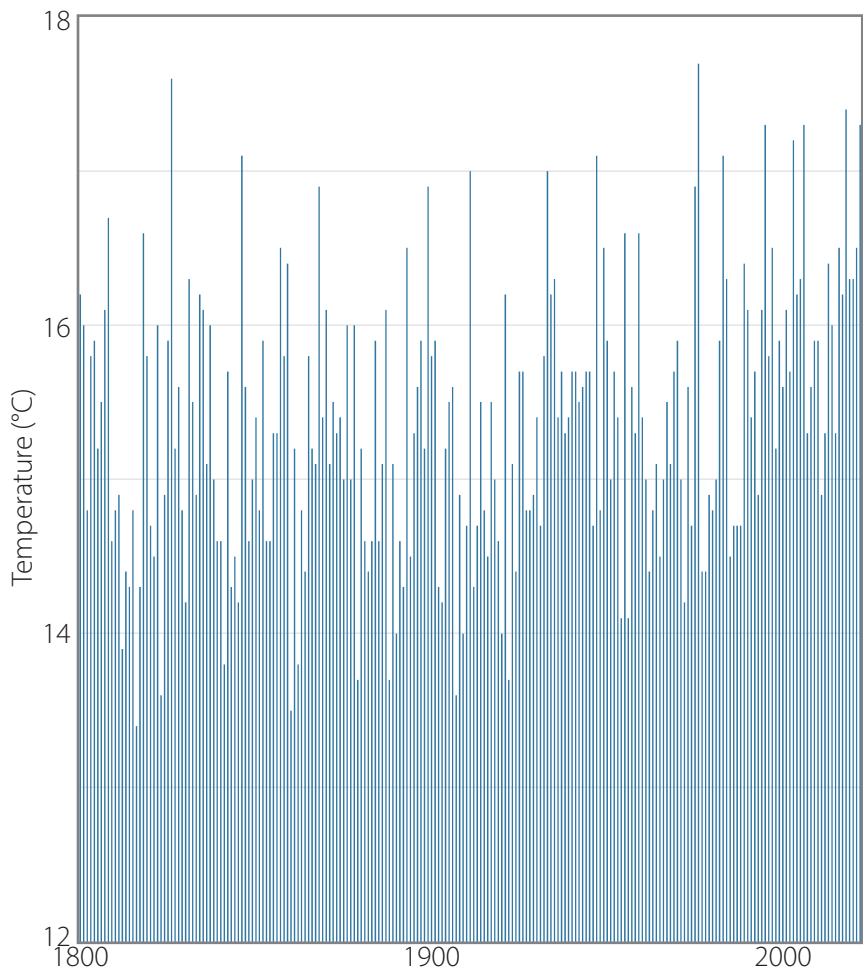
Source: HadCET.⁵

Month	Rank
January	91
February	9
March	11
April	62
May	22
June	107
July	21
August	3
September	56
October	5
November	8
December	117

The highlight of the year was obviously the hot summer. However, according to the Central England Temperature record, it was only tied in fourth place in a ranking of hottest summers (Figure 5), being 0.4°C cooler than 1976, and also cooler than 1826, and 2018.

Figure 5: Summer mean temperatures, 1800–2022.⁵

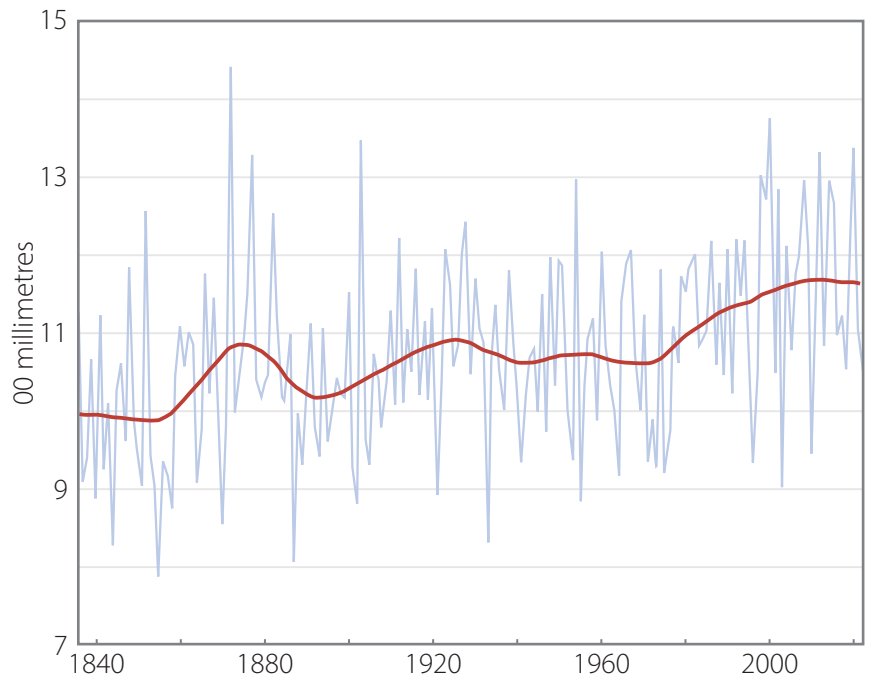
Source: HadCET.⁵



Despite a dry summer – the tenth driest in the UK since 1836 – the year as a whole was only 20 mm below the series average, 1836 to 2022, and was therefore ranked only 89th driest, close the median (Figure 6).

Figure 6: UK rainfall, 1836–2022.

Source: Met Office.⁴

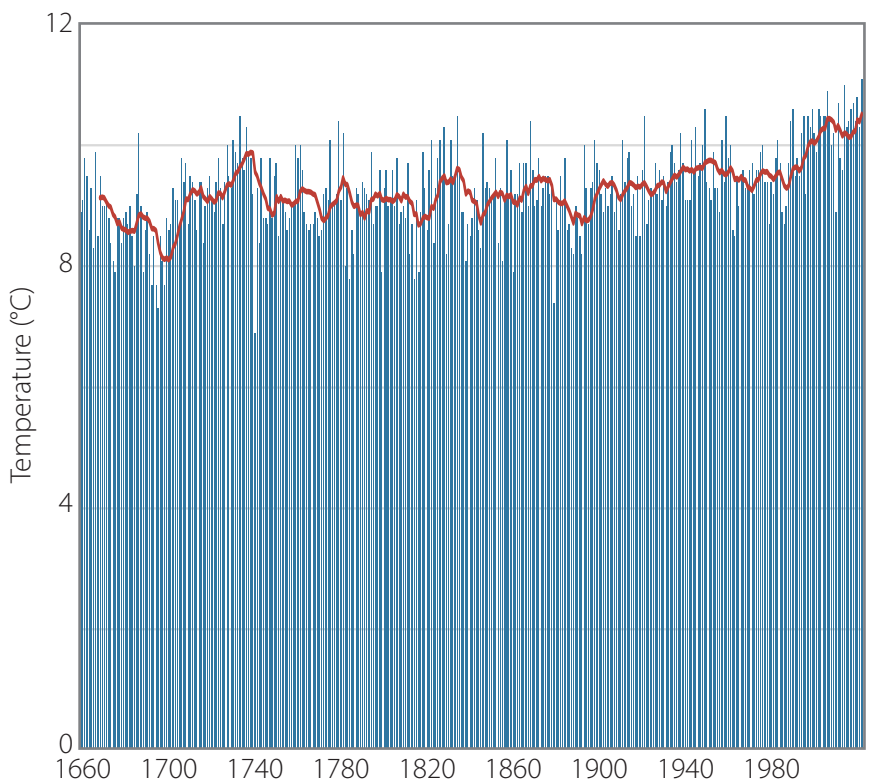


2. Temperature trends

As already noted, there has been no long-term increase in average UK temperatures for the last two decades. This is confirmed by the Central England Temperature Record. Figure 7 shows the rise in average temperatures during the 1990s, but this was not unprecedented; there was a similar rise during the 1730s. There have also been instances of falls in temperatures of similar scale.

Figure 7: Central England Temperature Record, 1659–2022.

Red line is the ten-year running average. Source: HadCET.⁵

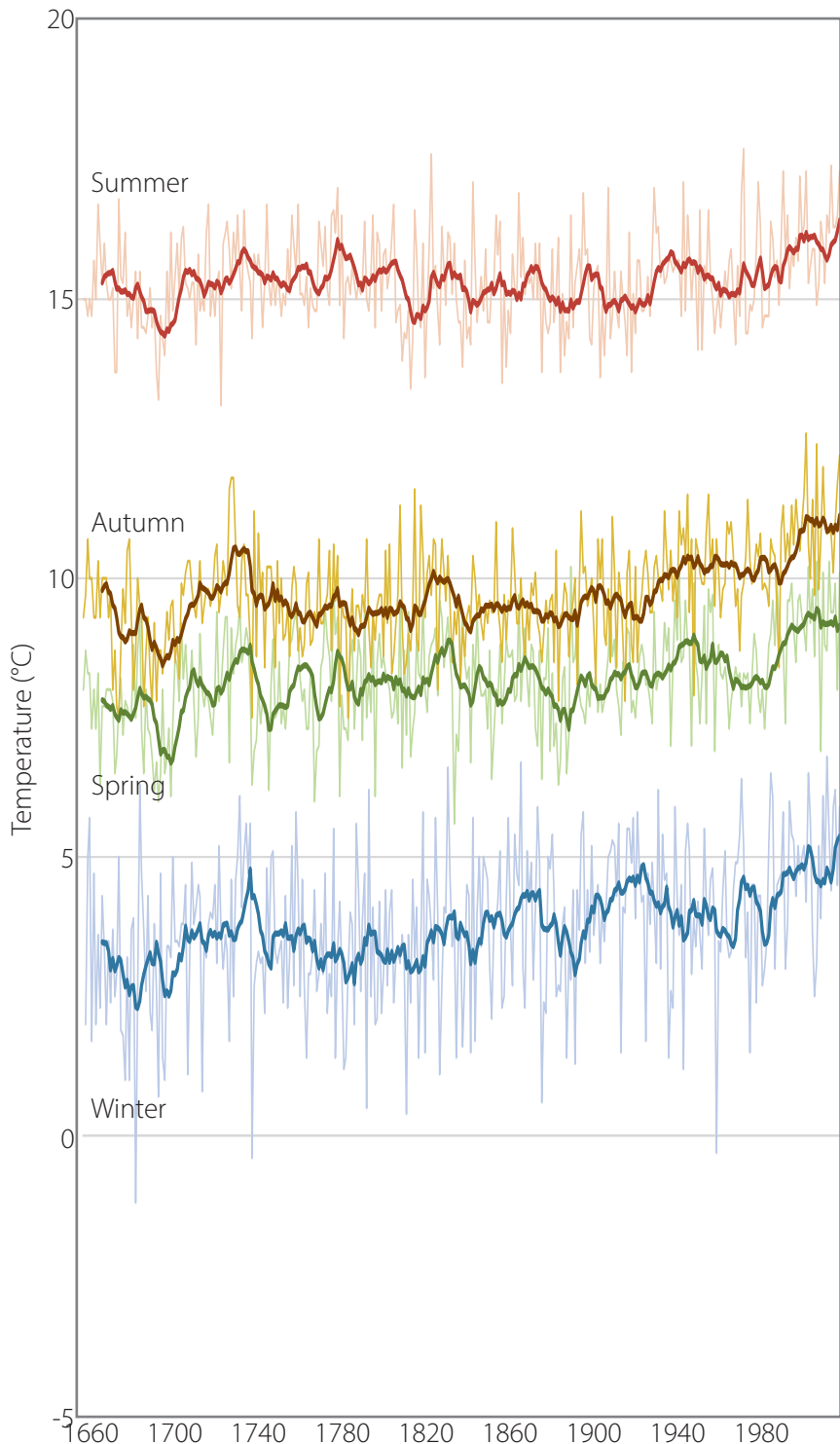


All four seasons exhibit the same pattern, with rising temperatures during the 1990s (Figure 8). For winter, spring and autumn, that increase has levelled off. The hot summers of 2018 and 2022 have led to a slightly higher long-term average. It is noticeable, however, that summer temperatures appear to have hit a ceiling and there is no indication that any summer in the foreseeable future will be hotter than 1976.

It is also worth pointing out that average winter temperatures are only 0.5°C warmer than during the 1920s. The principal cause of the rise in average winter temperatures has been the relative absence recently of exceptionally cold winters, rather than a general increase in winter temperatures.

Figure 8: Seasonal temperatures, 1659–2022.

Bold lines are 10-year running averages. Source: HadCET.⁵



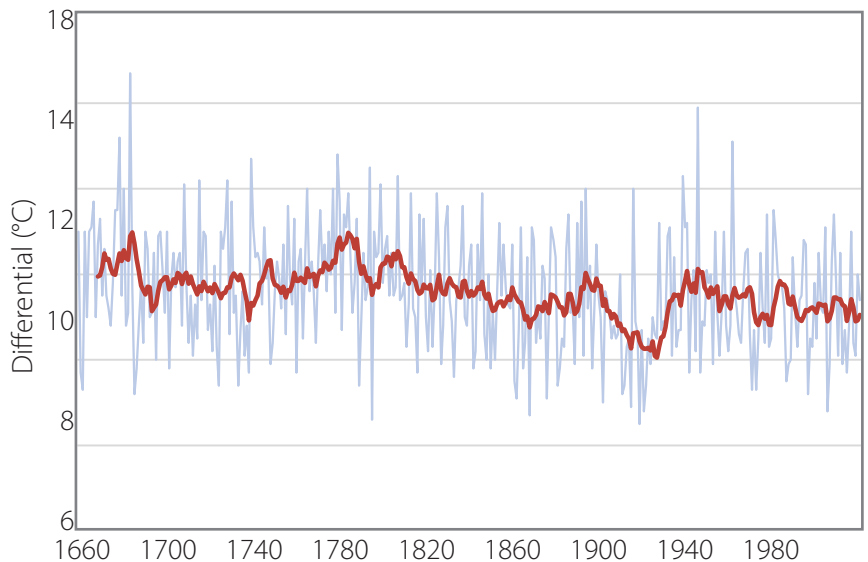
This is borne out by the fact that even the mildest winters in recent years have not been unprecedented. The warmest winter was in 1868–69, and 1833–34 and 1988–89 also appear in the top four, along with 2015–16.⁶ The winter of 2021–22 ranked as the 16th warmest since 1659, but the winters of 1685–86, 1733–34, 1795–96, 1833–34 and 1868–69 were all warmer. This indicates that mild winters are a meteorological phenomenon, rather than a climatic one.

It must also be noted that average spring temperatures are barely (0.2°C) higher now than in the 1940s. Most of the recent increase in spring temperatures has simply offset the large fall in temperatures that began in the 1950s and culminated in the 1980s.

Although summers have become warmer, extremes of temperature in the UK have reduced over time, as winters have grown milder. The difference between average winter and summer temperatures has thus shrunk (Figure 9).

Figure 9: CET winter/summer temperature differentials, 1659–2022.

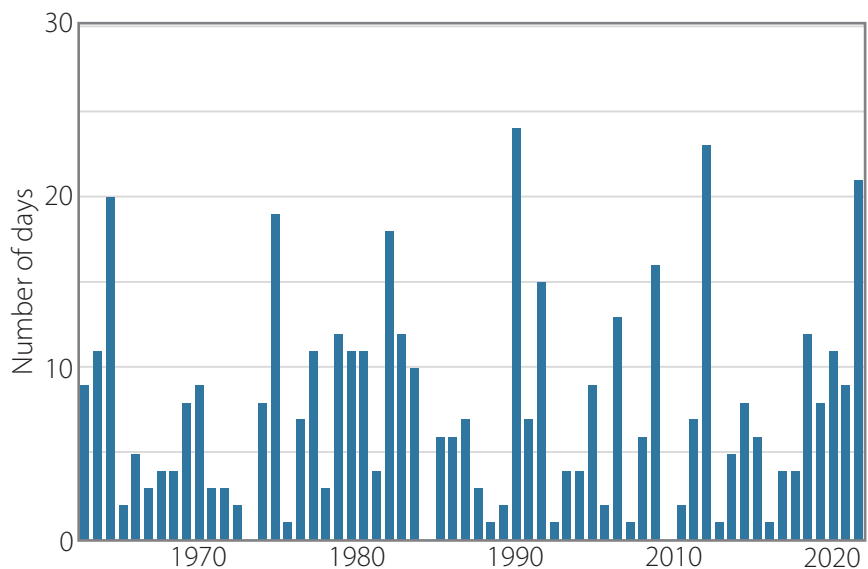
Red line is ten-year running average. Source: HadCET.⁵



Analysis of extreme temperature days also shows no increasing trends:

Figure 10: CET daily mean extreme temperatures, 1961–2022.

Number of days each year when mean temperatures were in the top and bottom first percentiles. Source: HadCET.⁶

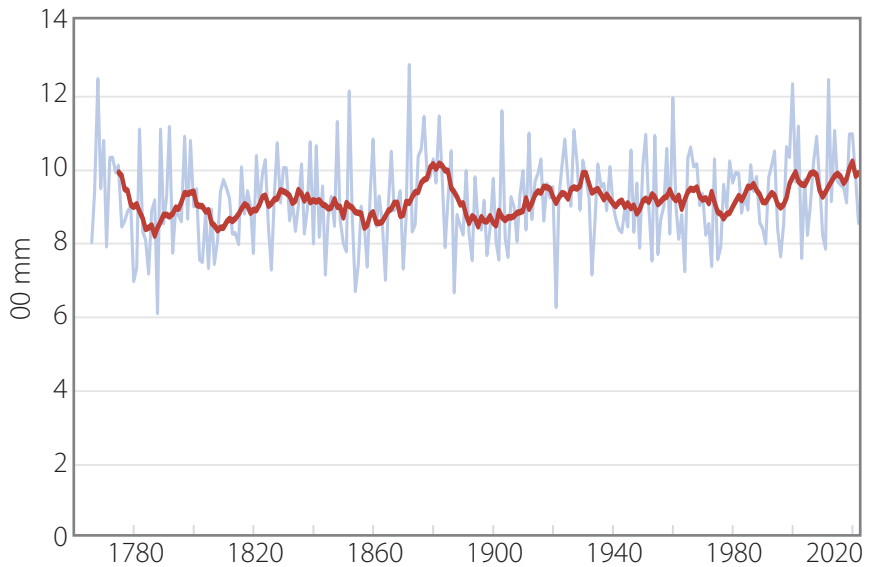


3. Precipitation trends

Annual rainfall in England and Wales has been gradually trending upwards since the 1990s (Figure 11), but the long-term average is lower than during the 1870s, and similar to the 1920s.

Figure 11: England and Wales rainfall trends.

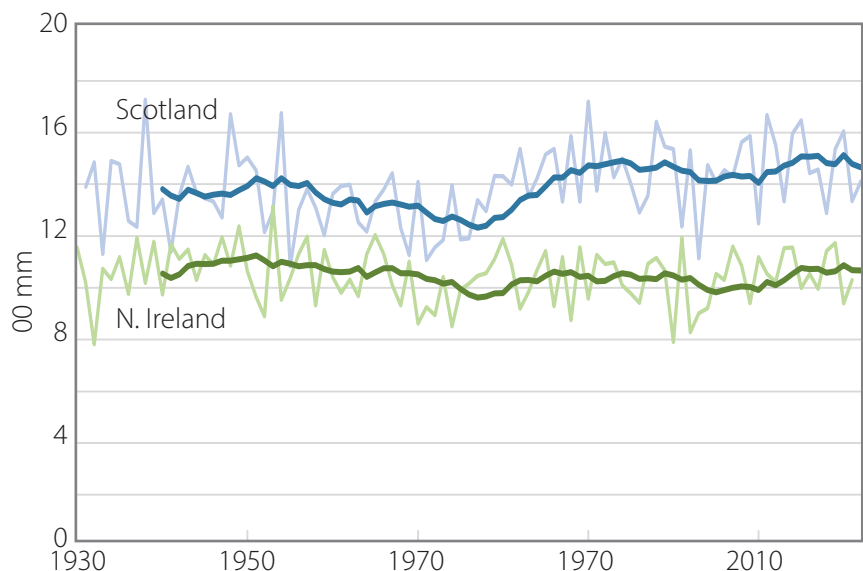
Red line is ten-year running average. Source: Met Office.⁷



In Scotland, there was a substantial increase in rainfall between the 1970s and 1990s, but there has been little long-term change since then (Figure 12). Current long-term averages are only slightly higher than in the 1940s. By contrast, there has been little trend in rainfall in Northern Ireland since 1931 (Figure 12).

Figure 12: Rainfall trends in Scotland and Northern Ireland.

Bold lines are ten-year running average. Source: Met Office.⁷



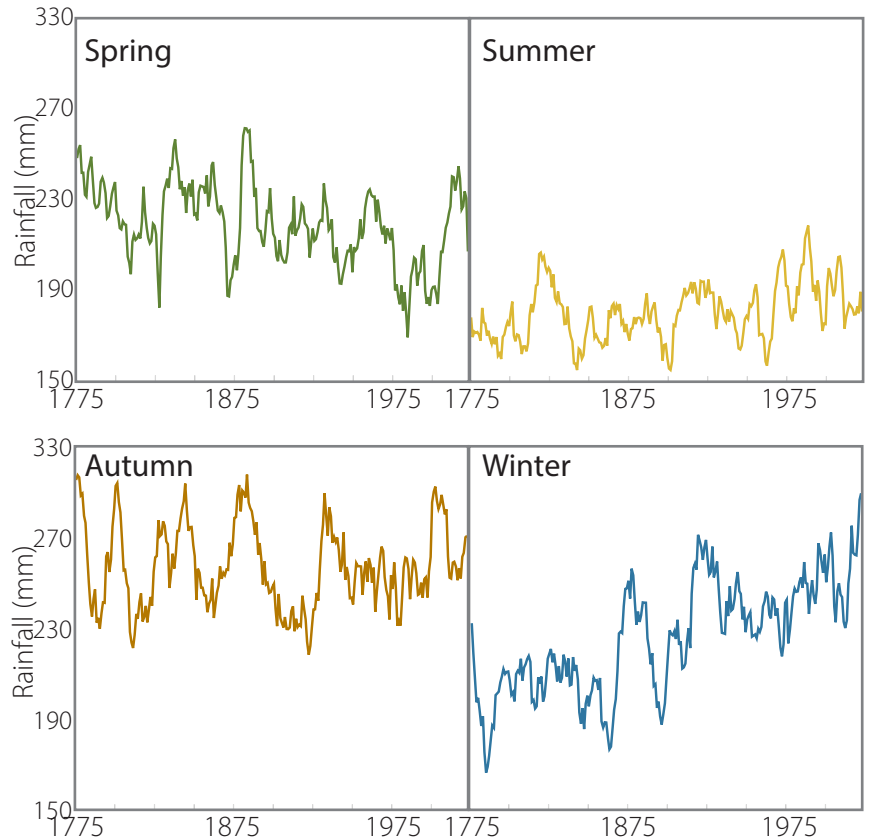
Seasonal analysis of England and Wales rainfall (Figure 13) shows:

- Winter rainfall has been slowly rising, but the long-term average is only slightly higher than the 1910s and 1920s.
- There are no long-term trends in spring.
- Similarly there are no long-term trends in summer rainfall, and the latest 10-year average is close to the full 1766–2022 average.
- Autumn rainfall trends have changed little over the years.

What is remarkable about all seasons is just how little rainfall patterns have changed in the last 250 years.

Figure 13: England & Wales precipitation, seasonal trends, 1775–2022.

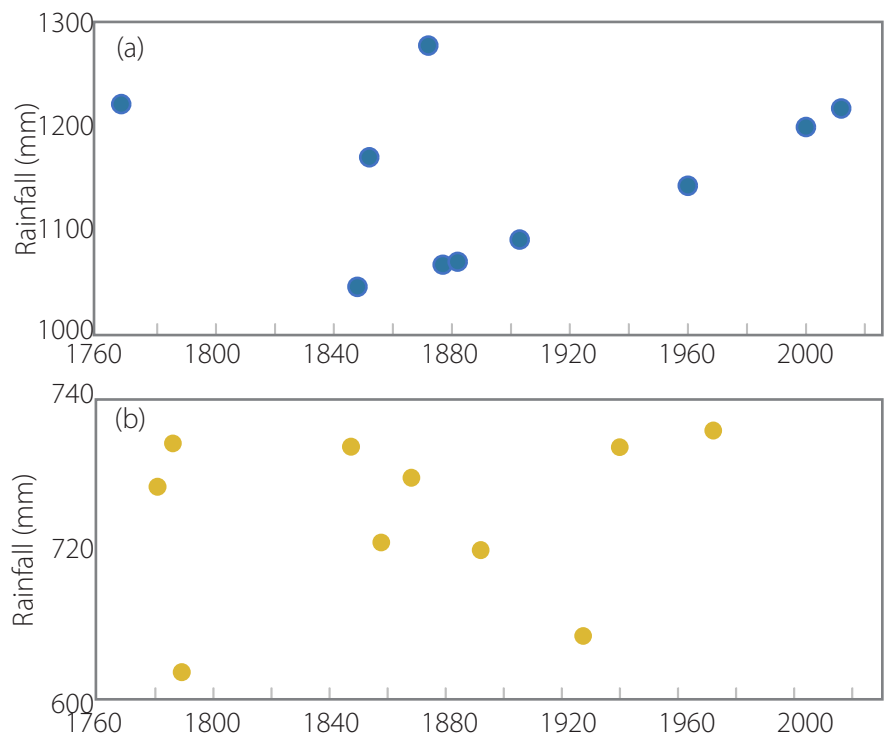
10-year moving averages. Source: Met Office.⁷



In England and Wales, most of the wettest years occurred in the years up to and including 1960 (Figure 14a). The only two exceptions are 2000 and 2012. The situation regarding the top ten driest years is even starker (Figure 14b), with the most recent year being 1964:

Figure 14: Extreme rainfall years, 1760–2022.

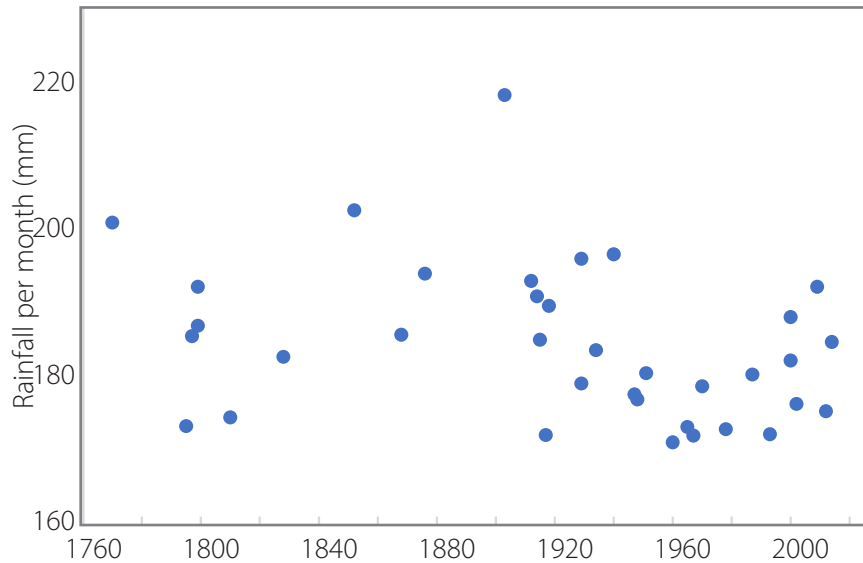
(a) top 10 wettest years and (b) top 10 driest years. Source: England & Wales precipitation series.⁷



There has not been a month in the England & Wales series with rainfall over 170 mm since 2014 (Figure 15); there have been 36 in the full record since 1766. The wettest month was October 1903, and the wettest month since 2000, November 2009, only ranked the ninth wettest.

Figure 15: Extreme rainfall: months with more than 170 mm of rain, 1766–2022.

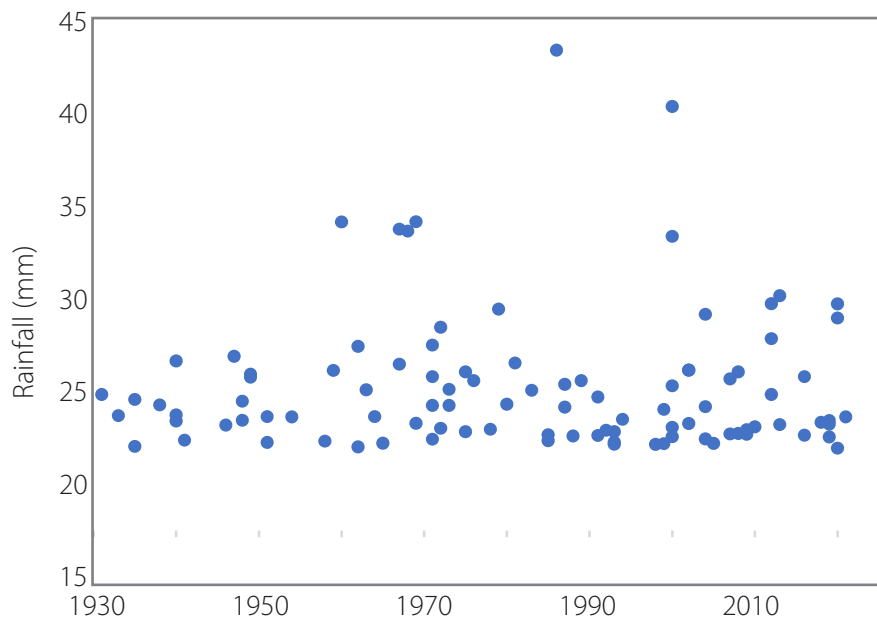
Source: England & Wales precipitation series.⁷



No day in 2022 saw more than 20 mm of rainfall (Figure 16). The record wettest day in England and Wales was in August 1986, and four of the six wettest days all occurred in the 1960s. The data for annual, monthly and daily precipitation clearly does not support the contention that rainfall is becoming more extreme in England and Wales.

Figure 16: Extreme rainfall: days with more than 20 mm of rain, 1931–2022.

Source: England & Wales precipitation series.⁷

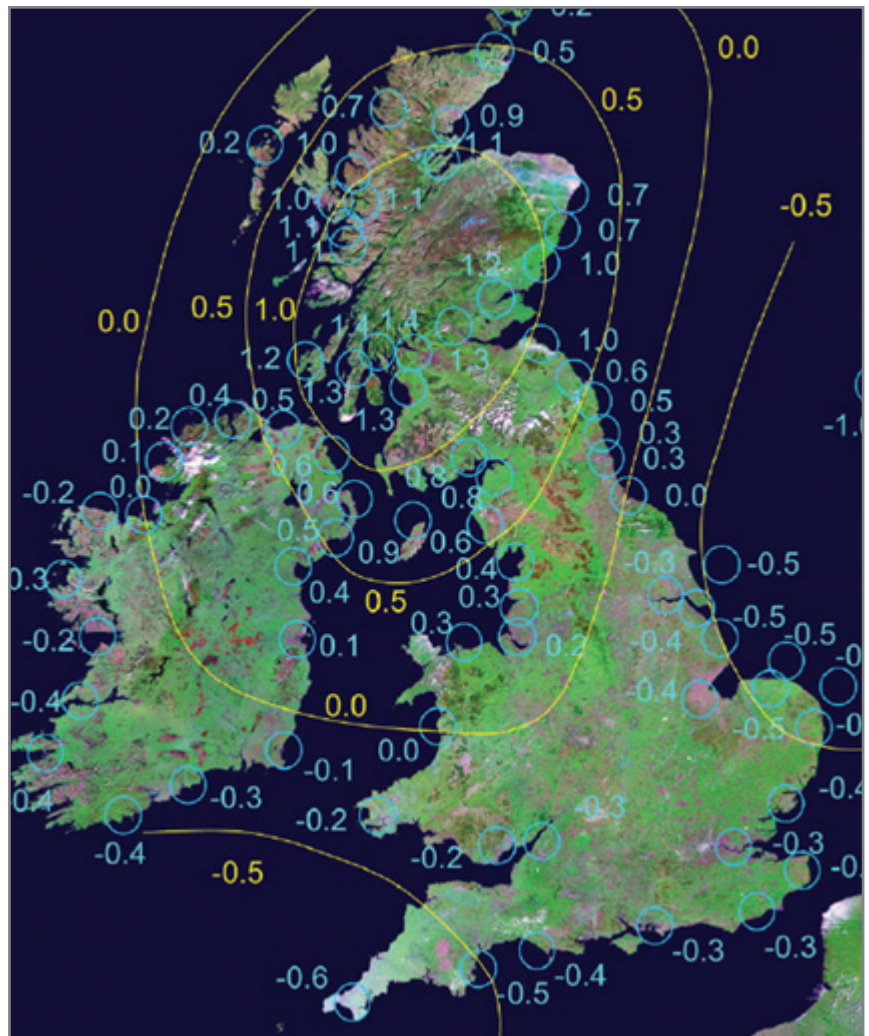


4. Sea-level rise

Any analysis of sea-level trends needs to first consider vertical land movement. Generally speaking, the land mass of Scotland and Northern Ireland is rising, while the rest of the UK is sinking, by maybe as much as 1 mm per year in the extreme south west, as a result of isostasy.

Figure 17: Sea-level rise.

Current rate of relative land- and sea-level change in the British Isles in mm, showing relative land uplift as positive and relative subsidence as negative. Source: Shennan et al.⁸



There are only two tide-gauge stations in the UK with long-term, relatively uninterrupted, and high quality data – Newlyn in Cornwall and North Shields in Northumberland. According to the Met Office, the land at Newlyn is sinking at about 0.6 mm per year, and it is rising by 0.1 mm per year at North Shields (Figures 18a and b). Tide gauges at the two sites show that sea levels have been rising at 1.84 mm and 1.90 mm per year respectively since the early 20th century, or 1.78 mm and 1.91 mm after correcting for vertical land movement. Note, however, that Newlyn’s record begins slightly later than North Shields’, so direct comparisons cannot be made.

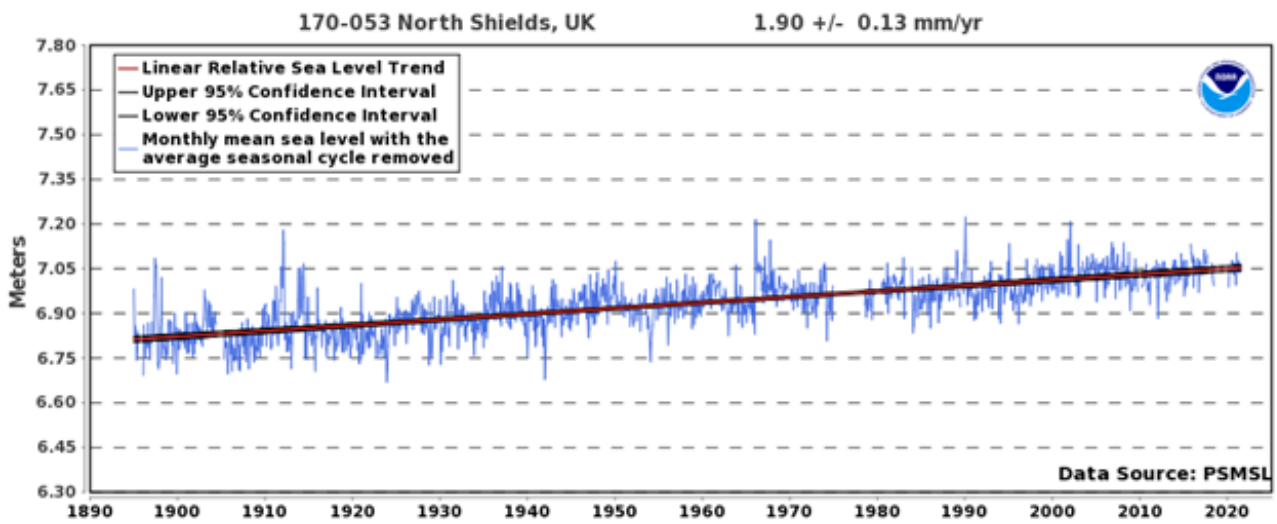
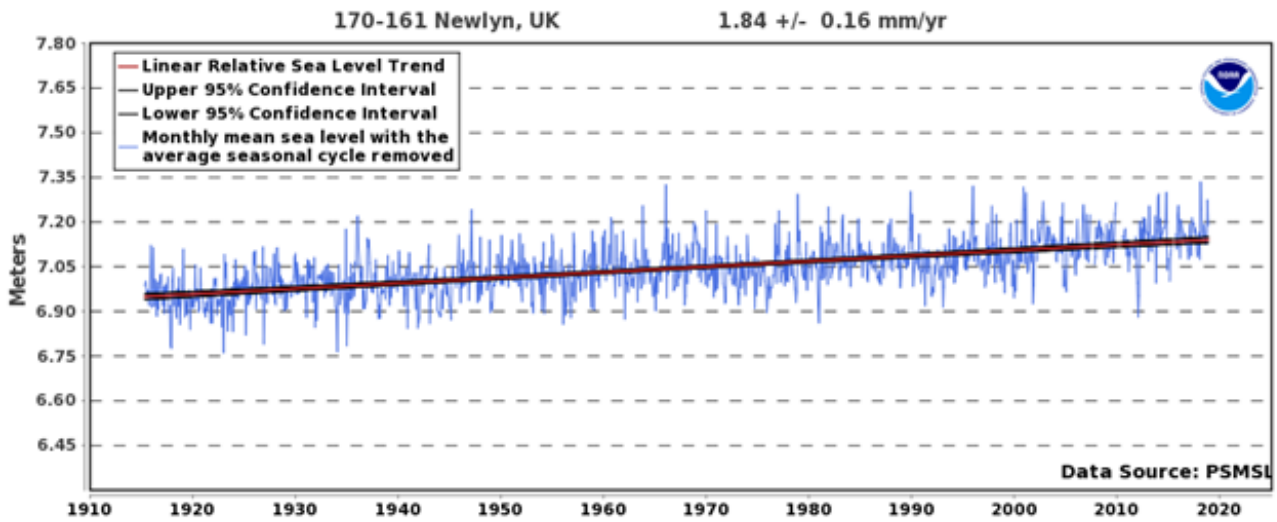


Figure 18: Sea-level rise.

Current rate of relative land- and sea-level change in the British Isles in mm , showing relative land uplift as positive and relative subsidence as negative.⁹

At both sites, sea levels have been close to the linear trend since 2010, a strong indication that sea-level rise has not been accelerating over the period of the record. This is confirmed by analysis of the rolling 50-year trends (Figure 19), which show that the rate of rise was higher in the first half of the 20th century than today. After that period, there was a decline in the rate of rise, reaching a minimum in the 50-year period of 1950 to 2000. This minimum coincides with the long period of Northern Hemisphere cooling after the war, particularly in the 1960s and 1970s, and is associated with the cold phase of the Atlantic Multidecadal Oscillation.³

Since that minimum, sea levels around the UK have been rising more quickly again, but there is no evidence of a multi-decadal or centennial acceleration.

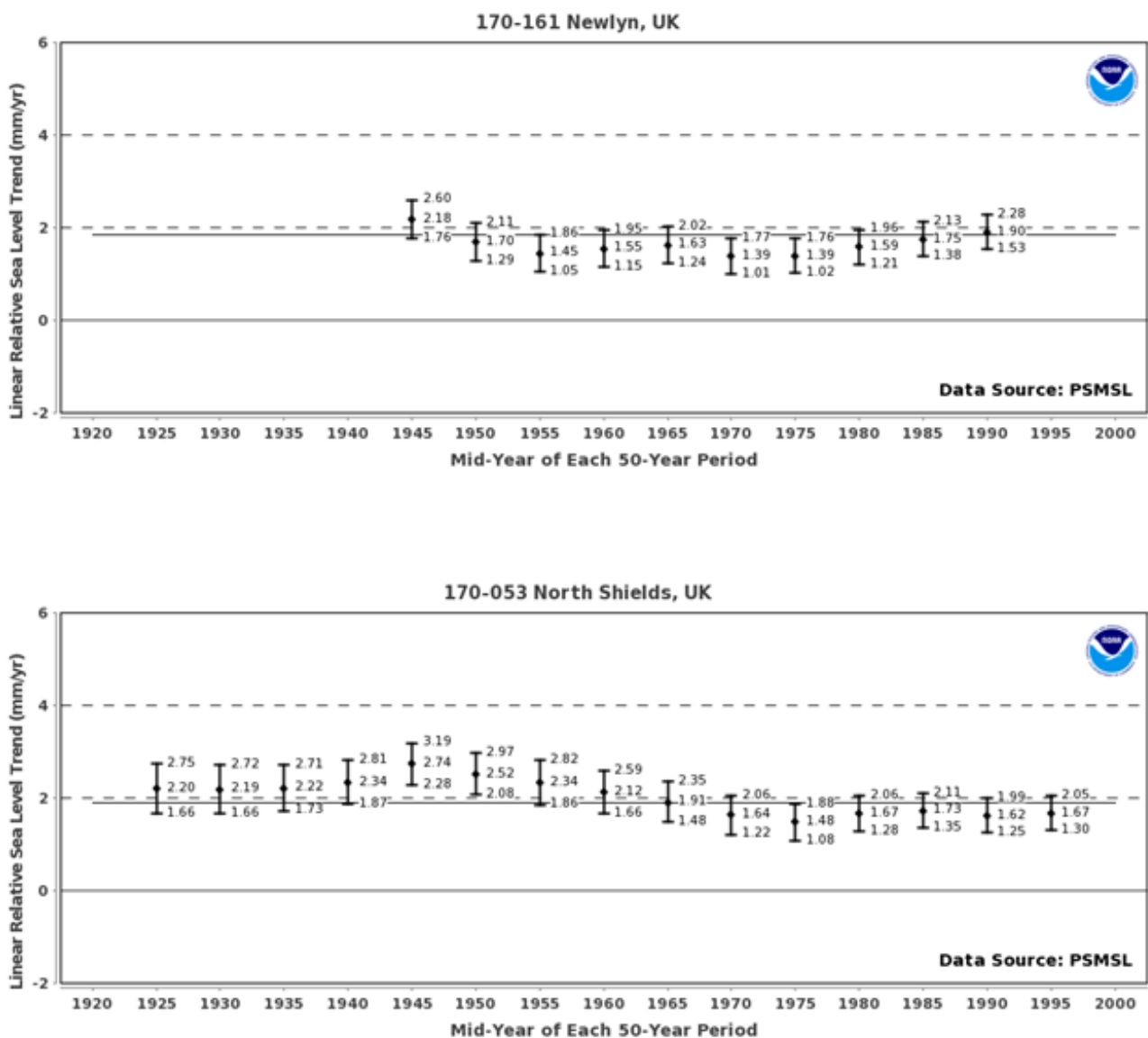


Figure 19: Sea-level rise – decadal means.

Current rate of relative land- and sea-level change in the British Isles in mm, showing relative land uplift as positive and relative subsidence as negative. Source: PSMSL.⁹

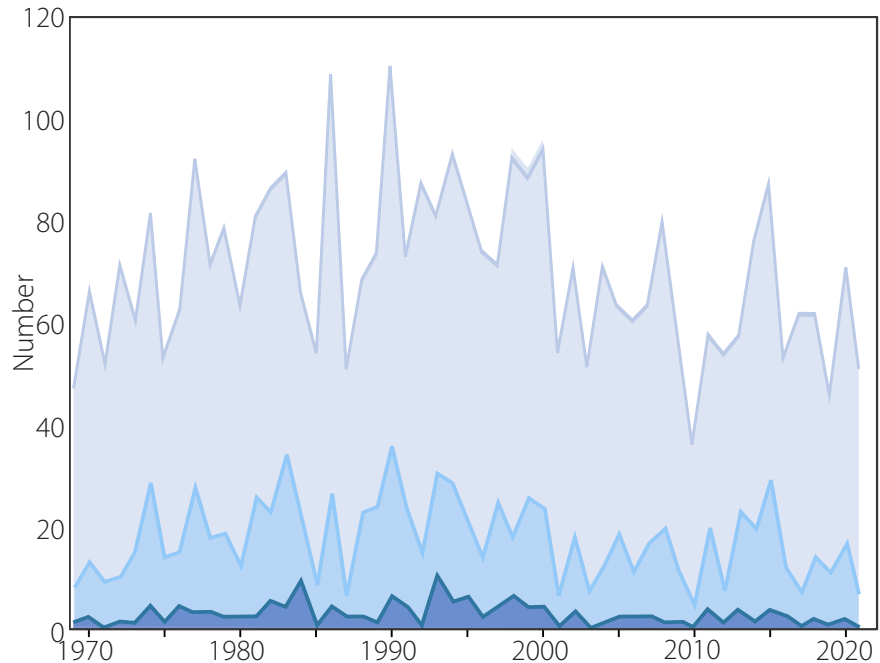
5. Storms

Since the naming of storms began in 2015, they have gained more attention in the media and amongst the public, with the consequent misapprehension that they are becoming more common. In reality, wind storms have been declining in both frequency and intensity since the 1990s, as Figure 20 shows:

Figure 20: Wind speeds, 1969–2022.

Number of days each year on which gusts exceeding given speeds are recorded by at least 20 or more UK stations, from 1969 to 2022. Stations more than 500 m above sea level are excluded. Source: Met Office, State of the UK Climate, 2022.¹

>40 Kt
>50 Kt
>60 Kt



Notes

1. Met Office State of the Climate 2022. <https://www.metoffice.gov.uk/research/climate/maps-and-data/about/state-of-climate>.
2. Met Office. <https://www.metoffice.gov.uk/research/climate/understanding-climate/uk-and-global-extreme-events-heavy-rainfall-and-floods>.
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5. CET. https://www.metoffice.gov.uk/hadobs/hadcet/data/meantemp_daily_totals.txt
6. CET Seasonal. https://www.metoffice.gov.uk/hadobs/hadcet/legacy/data/ssn_HadCET_mean_sort.txt.
7. .
8. England & Wales Rainfall Series. <https://www.metoffice.gov.uk/hadobs/hadukp/>.
9. Late Holocene relative land- and sea-level changes: Providing information for stakeholders – Shennan et al. <https://www.geosociety.org/gsatoday/archive/19/9/abstract/i1052-5173-19-9-52.htm>.
10. NOAA - https://www.tidesandcurrents.noaa.gov/sltrends/sltrends_global.html.

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