

## 2023: New Zealand’s second warmest year on record

<b>Temperature</b>	2023 was New Zealand’s 2 <sup>nd</sup> warmest year on record, based on NIWA’s seven station series which began in 1909. Annual temperatures were above average (+0.51°C to +1.20°C above the annual average) or well above average (>1.20°C above the annual average) for much of Aotearoa New Zealand. Small pockets of near average temperatures (within -0.50°C to +0.50°C of average) were observed around Northland, Auckland, Bay of Plenty, Gisborne, Hawke’s Bay, eastern Wairarapa, southern Marlborough, Canterbury high country, and Otago.
<b>Rainfall</b>	Rainfall was well above normal (>149% of annual normal) for parts of Northland, Auckland, Coromandel, Gisborne, and Hawke’s Bay, while above normal rainfall (120-149% of annual normal) was observed through these same areas, as well as much of eastern Wairarapa, the eastern Tararua District, and Bay of Plenty. Near normal rainfall (80-119% of annual normal) was observed for the rest of the country, except for small and isolated areas of below normal rainfall (50-79% of annual normal) in the Central Plateau, West Coast, South Canterbury, and eastern Otago. Despite the number of extreme rainfall events during the year, 2023 was only New Zealand’s 21 <sup>st</sup> wettest year on record <sup>1</sup> .
<b>Soil moisture</b>	<p>During January and February, soil moisture levels were considerably higher than normal across the majority of the North Island as well as parts of Canterbury and Marlborough, with below normal or near normal soil moisture levels elsewhere. During mid-February, meteorological drought emerged in pockets of eastern Otago, with very dry to extremely dry conditions occurring across the rest of Otago, much of Southland, South Canterbury, Banks Peninsula, northern West Coast, and inland Tasman.</p> <p>This pattern of above normal soil moisture for the North Island lingered into autumn, while the wettest soils in the South Island shifted towards Mid and South Canterbury and Otago. By the end of winter, soil moisture levels had returned to near normal for much of the country, although lingering pockets of above normal soil moisture were still present in parts of Canterbury and Otago. During spring, soil moisture levels became above normal for parts of the North Island, although some pockets of below normal soil moisture also developed across both islands.</p> <p>At the end of December, above normal soil moisture was widespread throughout the central North Island, parts of Northland and Auckland, as well as the western Tasman and upper West Coast. Below normal soil moisture was observed in parts of Northland, East Cape, Wellington, the upper South Island, and across parts of South Canterbury, Otago, and Southland.</p>
<b>Sunshine</b>	The Mackenzie Basin experienced New Zealand’s highest annual sunshine total during 2023 (2658 hours recorded at Lake Tekapo/Takapō).

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<sup>1</sup> Based on an analysis of areal-averaged rainfall anomalies from NIWA’s Virtual Climate Station Network dating back to 1961.

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# 2023: NZ's second-warmest year on record

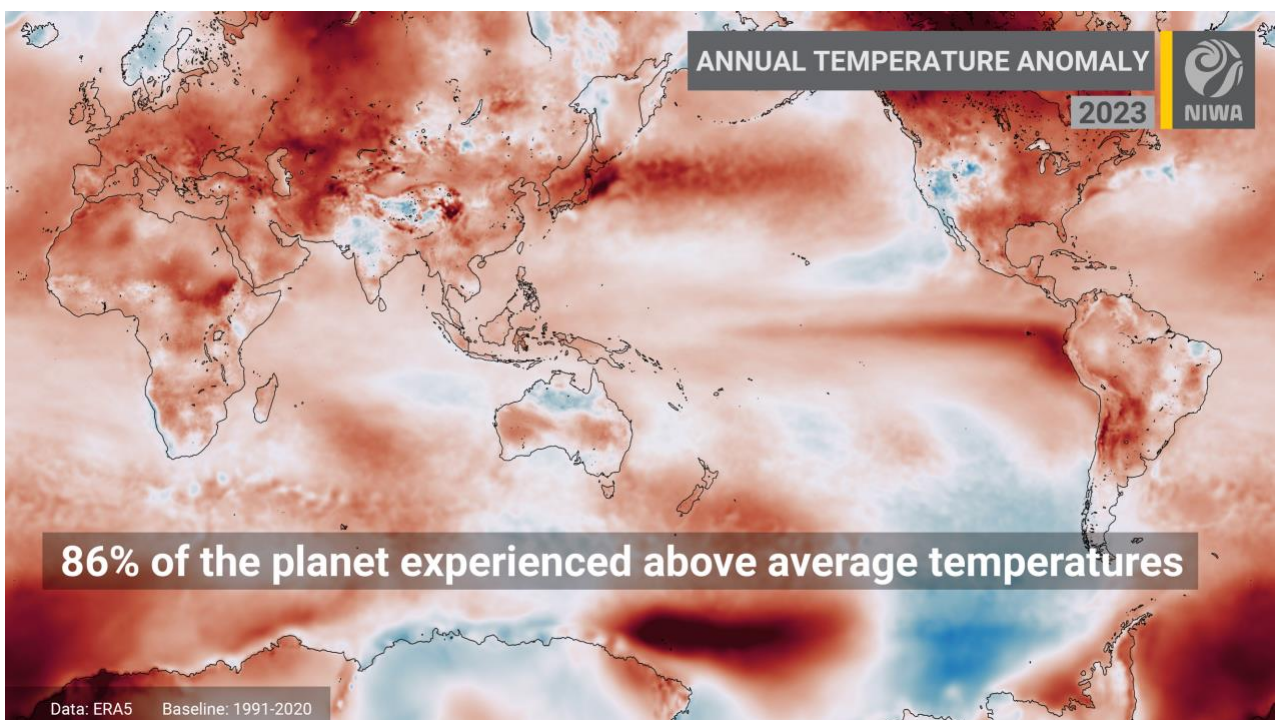
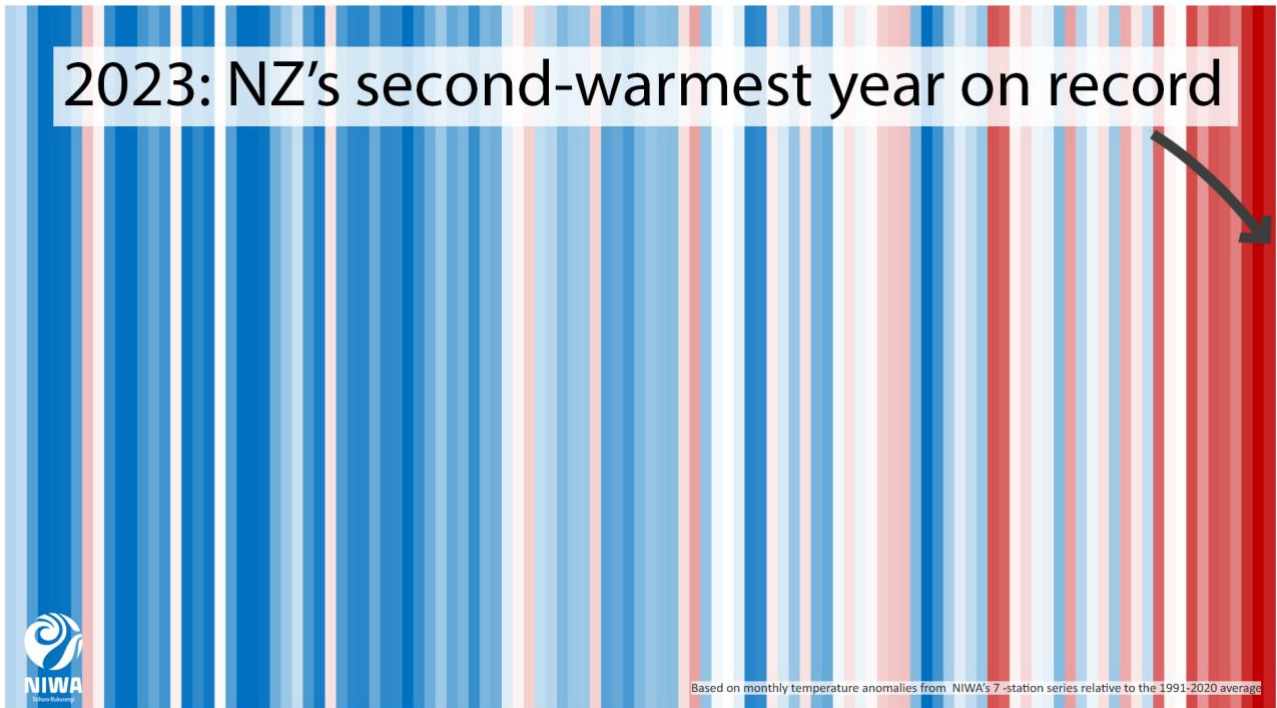


Figure 1: (a, top) Coloured stripes showing a time series of the national temperature anomaly calculated from NIWA's Seven Station Series, relative to the 1991-2020 baseline. Red colours indicate temperatures above the 1991-2020 baseline while blue colours indicate temperatures below the baseline. (b, bottom) Global temperatures as a difference from the 1991-2020 baseline in 2023. Red (blue) indicates warmer (cooler) than average temperatures. Data from ERA5 (accessed January 2024).

## Overview

2023 was Aotearoa New Zealand's 2<sup>nd</sup> warmest year on record, just shy of the record set in 2022 (Figure 1a). The nationwide average temperature for 2023 calculated from NIWA's seven station series was 13.61°C, being 0.87°C above the 1991-2020 annual average. Both minimum and maximum temperatures were the 2<sup>nd</sup> warmest on record. New Zealand's three warmest years on record have all occurred in the last three years. Globally, 2023 was the warmest year on record, with 86% of the planet's surface area experiencing above

average temperatures (Figure 1b). The clear warming trend observed both locally and globally is consistent with human-caused climate change.

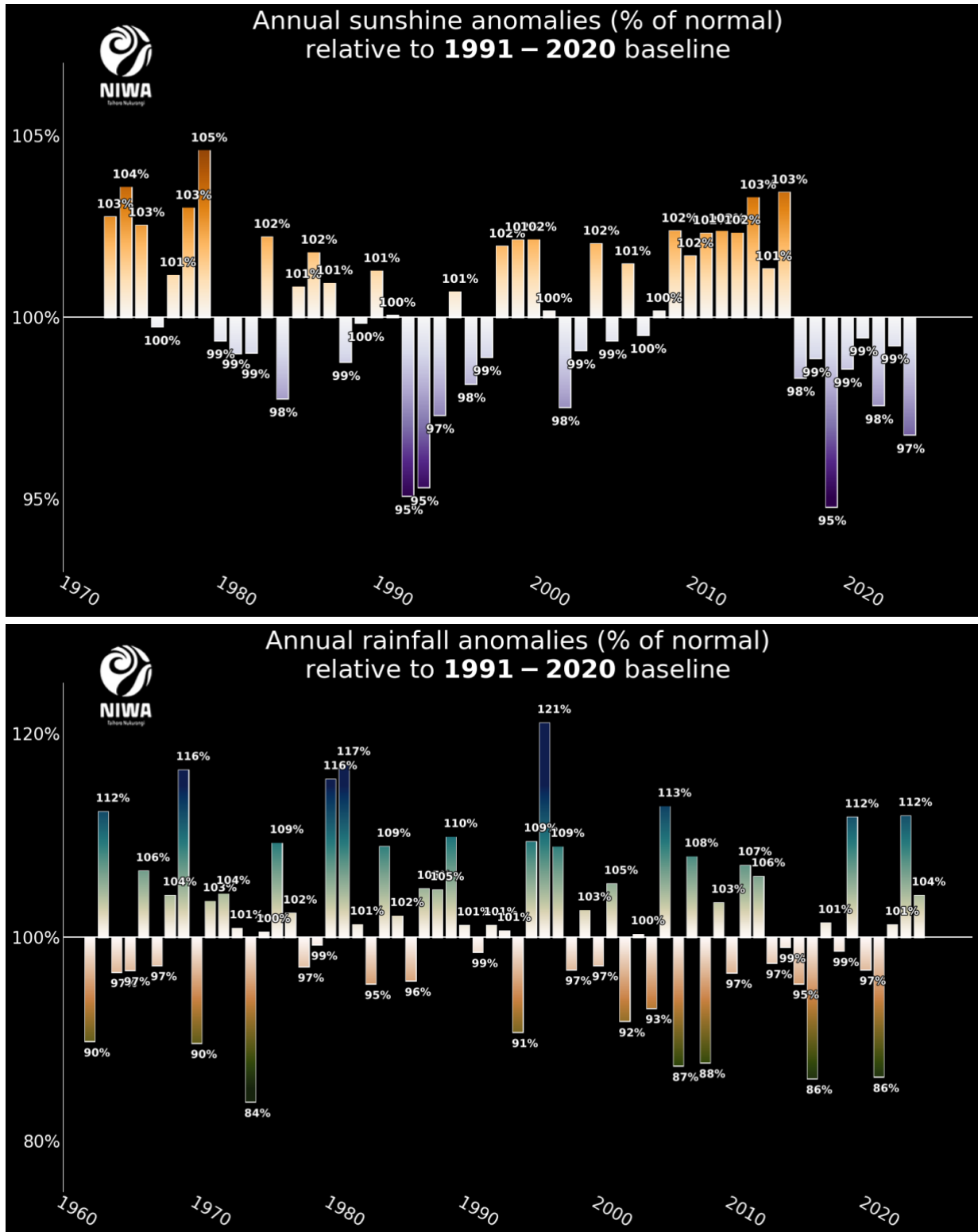


Figure 2: (a, top) Annual sunshine hours as a percentage of the 1991-2020 normal based on data from NIWA's VCSN. VCSN solar radiation data began in 1972. (b, bottom) Annual rainfall anomalies a percentage of the 1991-2020 normal based on data from NIWA's VCSN. VCSN rainfall data began in 1961.

Data from NIWA's seven station series shows eight months of 2023 had temperatures that were well above average (>1.2°C above the monthly average) or above average (+0.5°C to +1.2°C above the monthly average). May and September were both the warmest on record, at an astounding 1.1°C and 2.0°C above their 1991-2020 monthly averages, respectively. Meanwhile, August was relatively cool, recording a mean

temperature of  $-0.55^{\circ}\text{C}$  below the 1991-2020 monthly average, the first month to have below average national temperatures ( $-0.5^{\circ}\text{C}$  to  $-1.2^{\circ}\text{C}$  below the monthly average) since May 2017.

2023 was also the 4<sup>th</sup> cloudiest year on record (Figure 2a) and the 21<sup>st</sup> wettest year (Figure 2b), based on an analysis of NIWA's Virtual Climate Station Network (VCSN), with records dating back to 1972 (for solar radiation) and 1961 (for rainfall). It was the cloudiest year nationwide since 2018. The nationwide solar radiation anomaly was 97% of normal, while the nationwide rainfall anomaly was 104% of normal compared to the 1991-2020 long-term normal.

Several climate drivers came together to produce an exceptional year of weather in New Zealand. One major climate driver of 2023 was the transition from a La Niña to an El Niño. La Niña is characterised by cooler than average ocean temperatures in the central and eastern equatorial Pacific, while El Niño is the opposite. Both La Niña and El Niño influence atmospheric circulation patterns in the Pacific Ocean, which have flow-on effects to regional climate across the globe through what are known as teleconnections<sup>2</sup>.

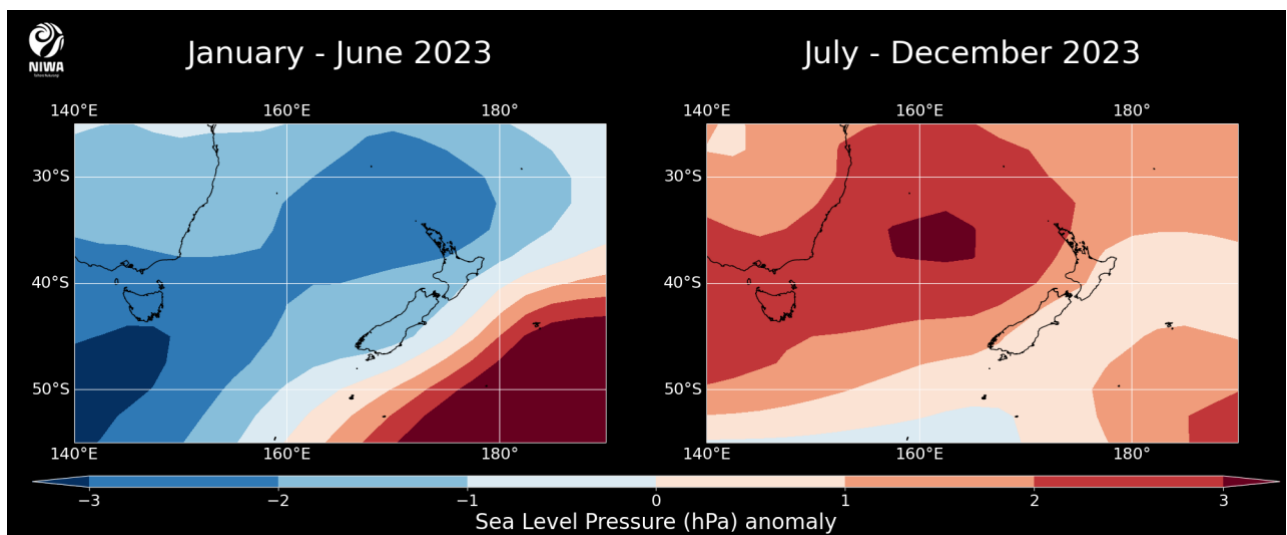


Figure 3: (a, left) Sea level pressure anomalies during the first six months of the year (January – June 2023). Blue shows lower than normal pressure, and red shows higher than normal pressures. (b, right) Sea level pressures during the last six months of the year (July – December 2023). Anomalies are the difference from the 1991-2020 baseline period. Data from NCEP reanalysis (accessed January 2024).

For New Zealand, La Niña tends to be associated with higher-than-normal air pressure near and to the east of the country with lower pressures to the north. This contributes to more sub-tropical, north-easterly winds than normal, increasing air temperatures, sea temperatures, and humidity. This air flow was common in the first half of the year (Figure 3a). Meanwhile, El Niño tends to be associated with lower-than-normal air pressure to the south and southeast of the country and higher-than-normal air pressure to the north. This can lead to an increased north-to-south pressure gradient<sup>3</sup>, intensifying spring-time westerly winds and fronts as they move across the country. This air flow occurred more consistently during the second half of the year (Figure 3b), as the ocean-atmosphere transitioned to El Niño. However, one atypical element of the building El Niño was a persistent blocking high pressure system to the south-east of New Zealand, a holdover from La Niña. This high pressure system, shaded in dark red at the bottom right of Figure 3a and 3b, slowed the typical progression of weather patterns from west-to-east across the country and led to more northerly winds than what is usually associated with a classical El Niño circulation regime. This also contributed to additional heavy rainfall events in the north and east of the North Island, which are typically less common during El Niño.

<sup>2</sup> Climate patterns related to one another across long distances

<sup>3</sup> Difference in air pressure over distance



At the end of the year, SSTs in the west-central equatorial Pacific where El Niño is measured reached 2.01°C above average, qualifying as a very strong oceanic El Niño. However, widespread above average SSTs in the Pacific and on a global scale contributed to weather patterns not typically associated with El Niño events. The clear difference between the 2023 El Niño event and the 1997 and 1982 events is illustrated in Figure 4, where there is an absence of the cold pool of SST to the south and east of New Zealand in 2023 and warmer than average SSTs for most of the globe.

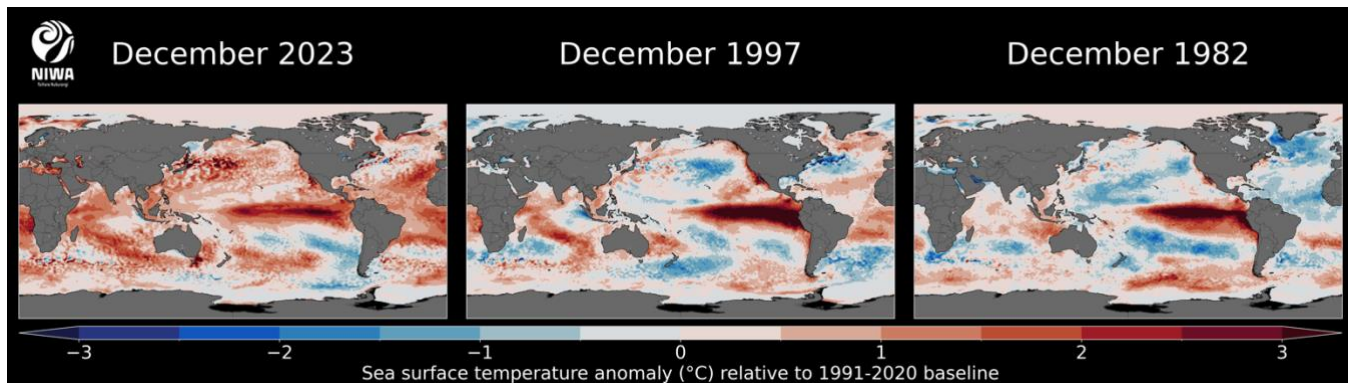


Figure 4: Sea surface temperatures as a difference from the 1991-2020 baseline in December 2023, 1997, and 1982. Red (blue) indicates warmer (cooler) than average seas. Data from ERA5 (accessed January 2024).

Other notable differences were that the West Pacific Warm Pool, a large area characterised by permanent surface temperature >28°C and considered the “heat engine” of the globe, was significantly warmer than average in the beginning of the year. While this is typically the case during La Niña episodes, sea water at depth in the western equatorial Pacific was more than 4°C above average. This feature was likely a meaningful source of heat and moisture for many of New Zealand’s major rain events during 2023. Even as New Zealand’s climate transitioned to El Niño during spring, this area of very warm water was partly responsible for weather patterns not traditionally associated with a classical El Niño, such as moisture-fuelled low-pressure systems.

As an island nation, regional and local sea surface temperatures (SSTs) have an important influence on weather conditions in New Zealand. Warmer than average SSTs can increase humidity, lead to persistently above average air temperatures, especially near the coast, and provide more moisture for approaching low pressure systems. During 2023, coastal SSTs were average or above average nearly every month, with February ranking as the most unusually warm month with monthly SSTs off the west of the South Island peaking at 3.19°C above average. For the year, SSTs were at their warmest on record near the eastern South Island, 2<sup>nd</sup> warmest on record near the western North Island, northern South Island, and western South Island, and 3<sup>rd</sup> warmest on record in the eastern North Island since records began in 1981.

In the Indian Ocean, a see-saw of SST known as the Indian Ocean Dipole (IOD) transitioned into its positive phase during spring. This climate driver has historically been seen to amplify the circulation regimes associated with El Niño. However, despite this IOD event being one of the strongest on record, its impacts across the New Zealand region were muted in late 2023.

Finally, climate change continues to influence New Zealand’s long-term temperature trend, which has warmed at a rate of approximately 1.17°C (±0.2°C) per century according to NIWA’s seven-station series.

In January, wet and cloudy conditions dominated much of the North Island, while drier, hot, and sunny weather was observed in the South Island. On 27 January, a highly localised convective weather system delivered unprecedented rainfall amounts in an event dubbed the “Auckland Anniversary Floods.” Over 200 mm fell in just a few hours in many parts of Auckland and for the month of January as a whole, parts of the region received over 40% of their annual normal rainfall. In central Auckland’s Albert Park, it was the wettest month on record since records began in 1853.

As summer progressed, more heavy rainfall events marred the northern and eastern North Island. Ex-Tropical Cyclone Gabrielle impacted the North Island and the upper South Island during mid-February, leading to more historic flooding, this time in Hawke's Bay, particularly around the Esk River, while other areas of New Zealand experienced heavy rainfall, powerful winds, coastal inundation, and large waves.

Despite a transition to ENSO neutral in March, the month saw more westerly winds than normal, before both April and May returned to northerly-quarter air flow anomalies, more typical of a La Niña regime. Several low pressure systems, enhanced by warmer-than-average SSTs in the Coral Sea and Tasman Sea and an ongoing marine heatwave near New Zealand, brought rain, cloud, and gusty winds to New Zealand, as well as a series of thunderstorm outbreaks. Nationwide, it was the 4<sup>th</sup>-warmest autumn on record.

The beginning of winter heralded frequent high pressure systems, bringing regular frosts and many calm days. It was a relatively dry season for many parts of the country, with a considerable reduction in the number of rain-bearing storms arriving from the north of the country compared to earlier in the year. The lack of cold southerly air flows and ongoing warmer than average SSTs meant it was a warm start to winter for most of the country and a challenging start to the ski season due to a lack of natural and artificial snow. Despite several cold outbreaks and sea-level snowfall later in winter into spring, average and maximum snow depths were almost universally below average across NIWA's South Island snow observation network in 2023. At Mueller Hut, snow depths were at record-low levels for most of the season and melt out occurred one month earlier than average. Nationwide, it was the 5<sup>th</sup>-warmest winter on record.

During spring, El Niño was officially declared and strengthened in the tropical Pacific, with several strong westerly wind events signalling its building influence across New Zealand. It was a very wet season in Gisborne, northern Hawke's Bay, and central parts of Northland, with some locations receiving more than double their usual spring rainfall. In contrast, it was a dry season in parts of the Greater Wellington region, with Upper Hutt, Martinborough, and Paraparaumu each receiving little more than half of their normal spring rainfall. It was the 10<sup>th</sup>-warmest spring on record.

During December, spring-like weather conditions continued, marked by variable weather. Above average temperatures continued with frequent north-westerly winds, highlighted by a period of tropical humidity at the end of the month.

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## Section 1: The year in review

The monthly sequence of New Zealand climate was as follows:

### **January 2023: Unprecedented rainfall in the north, hot and dry for the south**

Above normal (120-149% of normal) or well above normal (>149% of normal) rainfall was observed across most of the North Island, northern Tasman and eastern Marlborough. It was an exceptionally wet month for the southern half of Northland, Auckland, the Coromandel Peninsula, western Bay of Plenty and parts of Hawke's Bay which all received at least 400% of normal January rainfall. Auckland observed its wettest ever month in records dating back to 1853. In stark contrast, below normal (50-79% of normal) or well below normal (<50% of normal) rainfall was observed across the majority of the South Island. Temperatures were above average (0.51-1.20°C above average) or well above average (>1.20°C above average) across the majority of the South Island, and most western, inland and northern parts of the North Island. Patches of below average temperatures (0.51-1.20°C below average) were observed in coastal parts of Gisborne and Wairarapa.

### **February 2023: Gabrielle has a historic impact in the north, warm in the south**

February rainfall was nothing short of exceptional in the North Island. Above normal (120-149% of normal) or well above normal (>149% of normal) rainfall was observed across most of the North Island, eastern Marlborough, northern and middle Canterbury, and parts of the central and lower West Coast, and inland Otago. Parts of southern Northland, Auckland, Gisborne, Hawke's Bay, and coastal Wairarapa received at least 400% of the normal February rainfall. Rainfall was below normal (50-79% of normal) along parts of the northern West Coast, inland Canterbury, and coastal Otago, with an area of well below normal rainfall (<50% of normal) in Fiordland. Temperatures were above average (0.51-1.20°C above average) or well above average (>1.20°C above average) across the majority of the South Island and the western and lower North Island.

### **March 2023: Dry and cool for upper North Island, wet for South Island**

Below normal rainfall (50-79% of normal) or well below normal rainfall (<50% of normal) was observed in Northland, Auckland, northern Waikato, coastal Bay of Plenty, Gisborne, northern Wairarapa and Nelson. Above normal rainfall (120-149% of normal) or well above normal rainfall (>149% of normal) was observed across much of the South Island, as well as Wellington, southern Wairarapa, Whanganui and Taranaki. Temperatures were below average (0.51-1.20°C below average) in parts of Northland, Auckland, Waikato, and the Ruapehu District. Temperatures were above average (0.51-1.20°C above average) in parts of Tasman, Marlborough, coastal parts of Canterbury south of Ashburton, Dunedin, and central and southern Southland. Temperatures were well above average (>1.20°C above average) for southern Otago, eastern Southland, and Stewart Island.

### **April 2023: Dry and warm for many parts of the country**

Below normal (50-79% of normal) or well below normal (<50% of normal) rainfall was common for Southland, coastal Otago, Canterbury, inland Manawatū-Whanganui, Hawke's Bay, Bay of Plenty, Waikato, and parts of Auckland. Rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) for Central Otago, parts of the West Coast, Nelson, northern Tasman, Wellington, Kāpiti Coast, Wairarapa, inland Taranaki, and parts of Northland. Temperatures were above average (0.51-1.20°C above average) or well above average (>1.20°C above average) across most of the country.

### **May 2023: Warmest May on record**

Temperatures were well above average (>1.20°C above average) for most of the country, and at least 2°C higher than average in parts of every region, except for Northland. Rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) for Northland, Auckland, Waikato, Bay of Plenty, Taranaki,



parts of Manawatū-Whanganui, Wellington, Tasman, Nelson, northern Marlborough, West Coast, inland Otago and western Southland. Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) in parts of Gisborne, Hawke's Bay, much of Canterbury, and northern Otago.

### **June 2023: Warm and dry for many, but wet in the east and north of North Island**

Temperatures were above average (0.51-1.20°C above average) or well above average (>1.20°C above average) for many parts of the country. Temperatures were below average (0.51-1.20°C below average) in parts of the southern Mackenzie Basin and Central Otago. Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) for inland, western, and southern parts of the North Island, and the majority of the South Island. Rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) for eastern and northern parts of the North Island.

### **July 2023: New Zealand's 4th-warmest July on record**

Well above average (>1.20°C above average) or above average (0.51-1.20°C above average) temperatures were observed for most of the country. Above normal (120-149% of normal) or well above normal (>149% of normal) rainfall was observed in eastern and southern parts of the South Island. Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) for inland, western, and northern parts of the South Island, and much of the North Island.

### **August 2023: New Zealand's coldest August in seven years**

Temperatures were below average (0.51-1.20°C below average) across most of the North Island, and the top and west of the South Island. Some isolated areas also experienced well below average temperatures (<1.20°C below average) in the North Island and top of the South Island. Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) for the eastern, central and northern parts of the North Island, as well as much of the South Island. A small area of above normal rainfall (120-149% of normal) was observed in the southern Wairarapa and the lower South Island.

### **September 2023: Warmest September on record**

Temperatures were above average (0.51°C to 1.20°C above average) or well above average (>1.20°C above average) in every region of the country. Rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) in parts of Southland, Otago, Canterbury, coastal Wairarapa, Gisborne, Bay of Plenty, Waikato, and Auckland. Rainfall was below normal (50-79% of normal) in parts of the Hutt Valley, Kāpiti Coast, Manawatū-Whanganui, southern Hawke's Bay, and Banks Peninsula.

### **October 2023: A month of large temperature swings; very wet in Northland**

Temperatures were above average (0.51°C to 1.20°C above average) or well above average (>1.20°C above average) in much of Northland, Auckland, northern Waikato, the Coromandel, Bay of Plenty, Gisborne, parts of northern and interior Canterbury, coastal South Canterbury, and eastern Otago. Below average temperatures (0.51°C to 1.20°C below average) were observed in the central and lower West Coast. Rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) in much of Northland, coastal Gisborne, and interior South Canterbury. Below normal (50-79% of normal) or well below normal (<50% of normal) rainfall was observed in southern Auckland, much of Waikato, Bay of Plenty, Hawke's Bay, Taranaki, Manawatū-Whanganui, Wellington, Tasman, Nelson, Marlborough, coastal Canterbury, the upper West Coast, much of Otago, and Southland.

### **November 2023: Dry and mild for most, wet for Gisborne and Hawke's Bay**

Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) for much of the South Island, the southwestern North Island, western and northern parts of Waikato, and southern parts of Northland. Rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) for in western and inland parts of Bay of Plenty, southeastern Waikato, Gisborne, Hawke's Bay, eastern

Wairarapa, and parts of mid Canterbury. Temperatures were above average (0.51°C to 1.20°C above average) for western and inland parts of the South Island, and much of Auckland, Waikato, Bay of Plenty, East Cape, inland Whanganui, parts of Manawatū, Kāpiti Coast, and inland Wairarapa.

**December 2023: A warm month with variable rainfall patterns**

Temperatures were above average (0.51°C to 1.20°C above average) or well above average (>1.20°C above average) across nearly all of New Zealand. However, near average temperatures ( $\pm 0.50^\circ\text{C}$  of average) were observed in small portions of coastal Wellington, Marlborough Sounds, and Southland. Rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) in western Northland, much of Auckland, western and interior Waikato, Gisborne, and much of the immediate West Coast. Below normal (50-79% of normal) or well below normal (<50% of normal) rainfall was observed in eastern Northland, parts of the Coromandel and Bay of Plenty, southern Hawke's Bay, Manawatū-Whanganui, Wairarapa, Nelson, Marlborough, northern and interior Canterbury, and interior Otago. Near normal rainfall (80-119% of normal) was observed elsewhere.

## Section 2: Monthly temperature

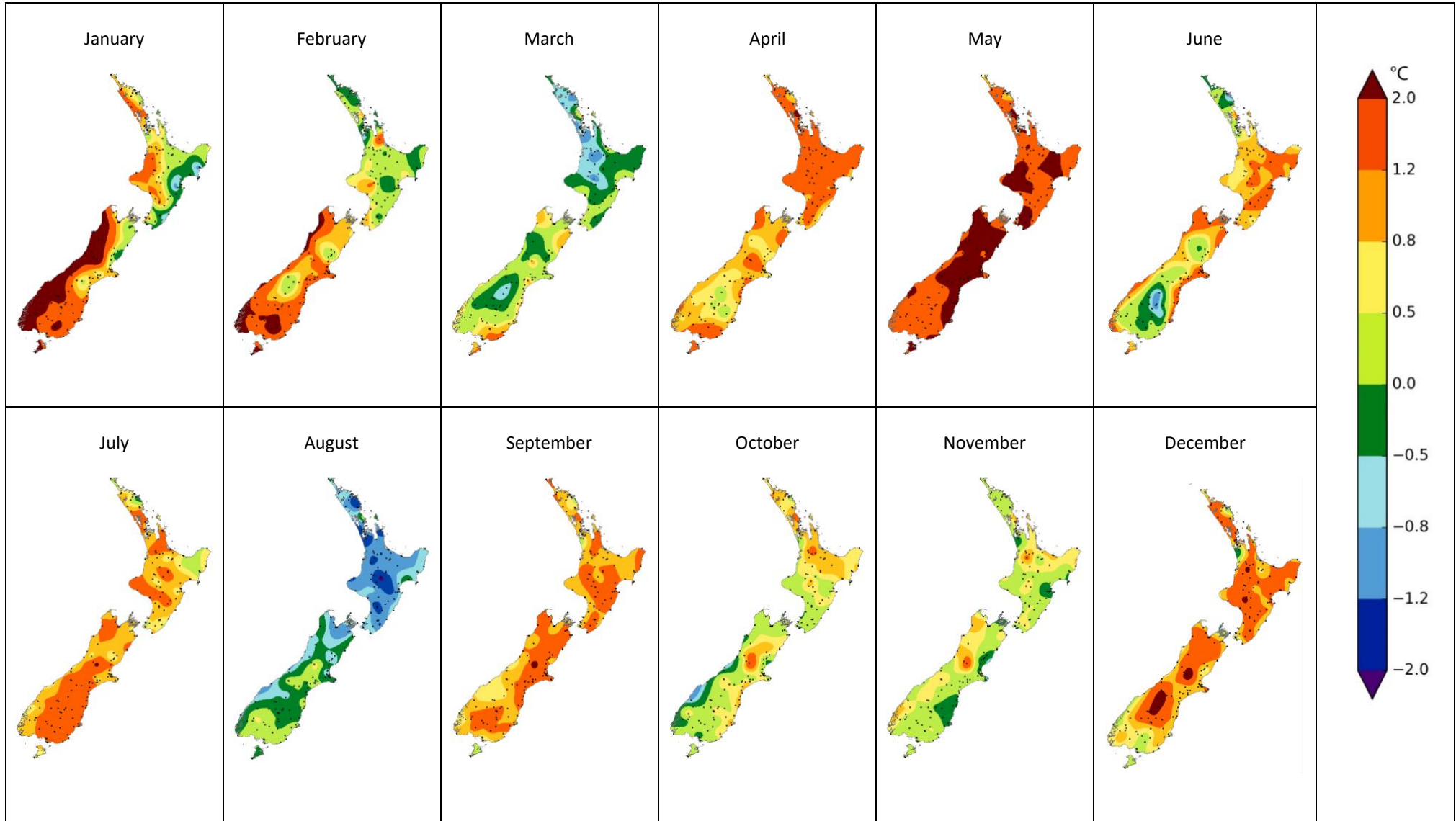


Figure 4: Monthly temperature anomalies (compared to the 1991-2020 monthly averages) for each month of 2023.

## Section 3: Monthly rainfall

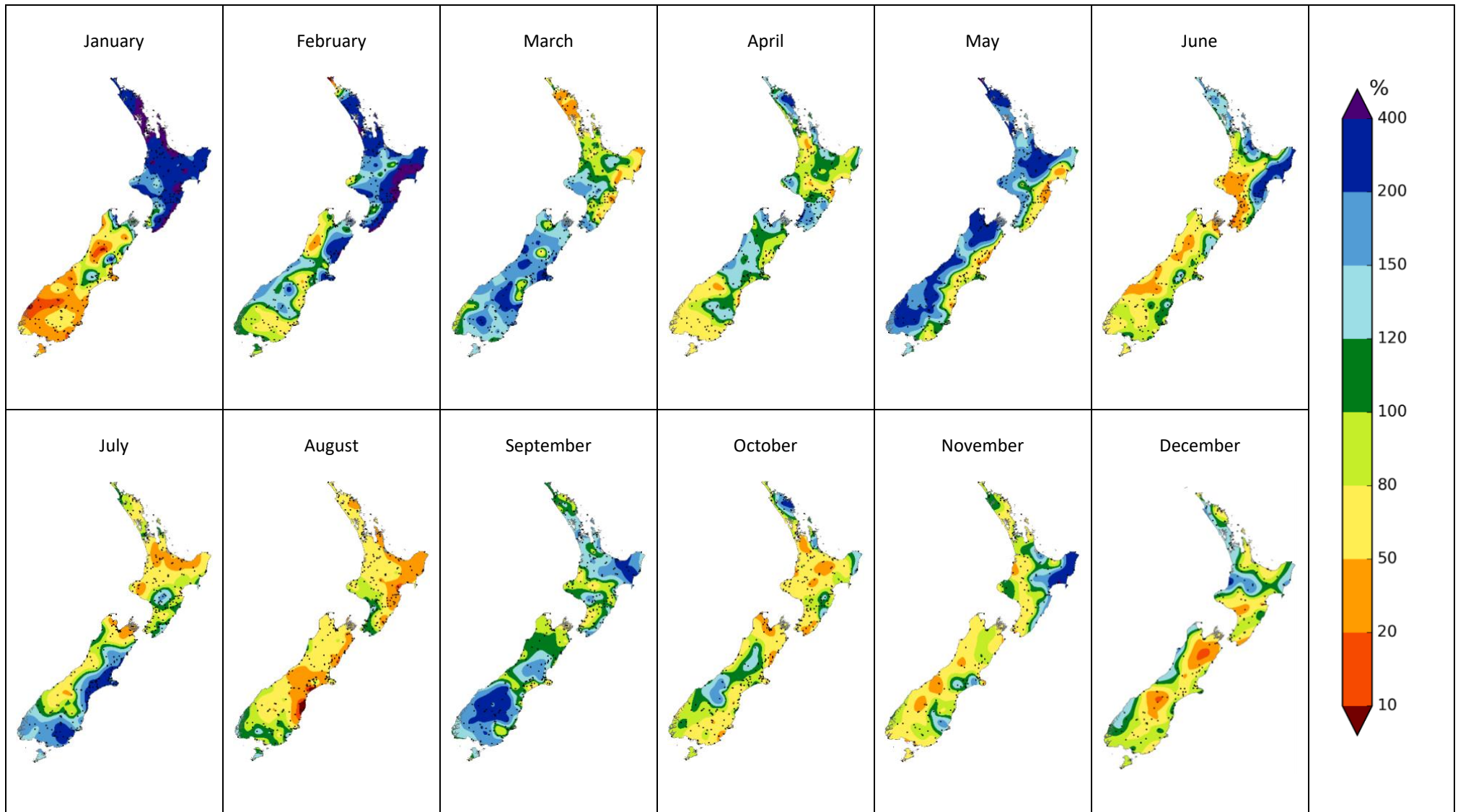


Figure 5: Monthly rainfall as a percentage of each 1991-2020 monthly normal for each month of 2023.

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## Section 4: Observations and statistics

Based on data available at the time of writing, NIWA analyses of month-by-month records show:

- The nationwide average temperature for 2023 was 13.61°C (0.87°C above the 1991–2020 annual average). Using NIWA’s seven-station temperature series, 2023 was the 2<sup>nd</sup> warmest year on record since records began in 1909.
- The nationwide average annual rainfall anomaly for 2023 was 104%, the 21<sup>st</sup> highest on record based on an analysis rainfall of NIWA’s VCSN which goes back to 1961.
- The nationwide average annual solar radiation anomaly for 2023 was 97%, the 4<sup>th</sup> lowest on record based on an analysis of NIWA’s VCSN which goes back to 1972.
- Leigh recorded the highest annual average temperature across the mainland for 2023 with 17.1°C, followed by Kaitaia at 16.4°C, and Whangaparāoa at 16.4°C.
- The highest air temperature of the year was 35.6°C recorded at Middlemarch on 4 February, followed by 35.1°C at Akaroa also on 4 February, and 34.4°C at Wakanui and at Ashburton recorded on 3 February.
- The lowest air temperature of the year was -10.6°C recorded at Tara Hills (near Ōmarama) on 10 June. This was followed by -9.6°C at Cass on 10 June and again on 17 June, and then -8.7°C at Ranfurly on 10 June.
- The top three daily rainfall totals from regularly reporting gauges in 2023 were 565 mm at Castle Mount on 16 September, 561 mm at Tareha (near the Esk River in Hawke’s Bay) on 13 February, and 371 mm at Ivory Glacier on 2 February.
- The top three daily rainfall totals from regularly reporting gauges in 2023 *excluding* high elevation stations were: 561 mm at Tareha (near the Esk River in Hawke’s Bay) on 13 February, 336 mm at Whakamārama (near Tauranga) on 17 June, and 316 mm at Tūtira (Hurford Rd) on 13 February.
- Of all the regularly reporting gauges, the wettest locations in 2023 were: Cropp River (West Coast, 975 metres above sea level) with 11717 mm, Tuke River (West Coast, 990 metres above sea level) with 10454 mm, and Hokitika (West Coast, 427 metres above sea level) with 8250 mm.
- The lowest rainfall recording locations for 2023 were Ranfurly with 359 mm, then Alexandra with 361 mm, followed by Cromwell with 404 mm.
- The Mackenzie Basin experienced New Zealand’s highest annual sunshine total during 2023 (2658 hours recorded at Lake Tekapo/Takapō), followed by the wider Nelson region (2639 hours recorded at Richmond), and Tasman (2574 hours recorded at Tākaka).
- The highest confirmed wind gust for 2023 was 246 km/h recorded at Cape Turnagain on 17 September.
- Of the six main centres in 2023, Tauranga was the wettest and sunniest, Dunedin was the driest, Auckland was the warmest, Christchurch and Dunedin were equal-coolest, and Wellington was the least sunny.

Ranked annual total rainfall, mean temperatures and sunshine hours for the stations available at time of writing are displayed on the following six pages. Some sites have missing days of data. The number of missing days is indicated by a superscript number next to the annual value in the tables below.



Location	Rainfall (mm)
CROPP AT WATERFALL	11717
TUKE AT TUKE HUT	10454
HOKITIKA AT PRICES FLAT	8250
DOON AT MIDDLE ARM	8107
IVORY AT RIPPLEROCK	7567
IVORY GLACIER CWS	7421 <sup>4</sup>
HOKITIKA AT RAPID CK	7370 <sup>11</sup>
HAAST AT CRON CK	7317
HOKITIKA AT COLLIERS CK	7279
WAIHO AT DOUGLAS HUT	6628
MILFORD SOUND AWS	6462 <sup>8</sup>
RAKAIA AT LAKE RAMSAY	5820
MT PHILISTINE EWS	5814 <sup>7</sup>
HAAST AT ROARING BILLY	5792
WHATAROA AT SHB	5502
GODLEY AT EADE HUT	5116
ARTHURS PASS AWS	4934 <sup>1</sup>
MURCHISON AT ROSE RIDGE	4919
ARTHURS PASS RAINE EWS	4709
CASTLE MOUNT EWS	4613 <sup>3</sup>
ARTHURS PASS EWS	4533 <sup>1</sup>
MATHIAS AT NZDSA HUT	4355
MUELLER HUT EWS	4339
FRANZ JOSEF EWS	4252
TAIPO AT SHBR	4061
MANAPOURI, WEST ARM JETTY EWS	3883
MT COOK EWS	3864
BUTCHERS CK AT BUTCHERS GULLY	3750
WAIPAOA AT MANGATU DIVIDE	3679
HAAST AWS	3401

HOKITIKA AERO AWS	3220 <sup>1</sup>
MURCHISON MTNS EWS	3140 <sup>1</sup>
KAIKOHE AWS	3126 <sup>2</sup>
NGAHERE AT NGAHERE HUT	3103 <sup>6</sup>
HOKITIKA AERO	3093 <sup>1</sup>
ŌKĀRITO EWS	3068 <sup>2</sup>
ALBERT BURN	2997 <sup>1</sup>
HOPKINS AT ELCHO FLATS	2934
HOKITIKA EWS	2917
HOPKINS AT BOANERGES RIDGE	2912
AHURIRI AT CASSINIA MORAINES	2756
PUYSEGUR POINT AWS	2612 <sup>1</sup>
MAHANGA EWS	2599 <sup>2</sup>
MAKOTUKU AT F TRIG	2545
UPPER RAKAIA EWS	2533 <sup>8</sup>
TONGARIRO AT MANGATOETOE	2482
MOTU AT WAITANGIRUA	2439
WHITIANGA AERO AWS	2361 <sup>1</sup>
GREYMOUTH AERO EWS	2350
EGLINTON, KNOBS FLAT CWS	2346 <sup>2</sup>
KERIKERI AERODROME AWS	2307
WHITIANGA EWS	2306 <sup>10</sup>
MT COOK AERO AWS	2263 <sup>1</sup>
MOTU EWS	2256
TE PUKE EWS	2230
COBB AT TRILOBITE	2220
WESTPORT AERO AWS	2199 <sup>1</sup>
TOLAGA BAY WXT AWS	2188 <sup>10</sup>
WARKWORTH EWS	2152 <sup>3</sup>
WHANGĀREI AERO AWS	2141 <sup>1</sup>
WHAKAPAPA AT MT RUAPEHU EWS	2139

WHANGĀREI EWS	2133
MANUKAU HEADS EWS	2114
WESTPORT EWS	2075
AUCKLAND, WHENUAPAI AWS	2050 <sup>5</sup>
AUCKLAND, NORTH SHORE ALBANY EWS	2023
ROTORUA AERO AWS	2017 <sup>1</sup>
WHANGANUI AT TE PORERE	1959
KERIKERI EWS	1954
KAITAIA AIRPORT AWS	1950 <sup>8</sup>
ARAPITO EWS	1927
AUCKLAND, MOTAT EWS	1926
TĀKAKA EWS	1921
STRATFORD EWS	1897
TŪTIRA CWS	1883 <sup>5</sup>
LEIGH 2 EWS	1876
PUREORA FOREST CWS	1853 <sup>2</sup>
TAURANGA AERO AWS	1845 <sup>8</sup>
MT RUAPEHU, CHATEAU EWS	1843 <sup>2</sup>
GISBORNE AERO AWS	1795 <sup>5</sup>
KAITAIA EWS	1776
KAITAIA AERO EWS	1744
TARAPOUNAMU EWS	1740
AUCKLAND AERO	1733 <sup>1</sup>
WHAKATĀNE AT TARAPOUNAMU	1733
WAIKAPA AT WAITETI STATION	1713
WHANGAPARĀOA AWS	1699
TE KUITI EWS	1691
ROTORUA EWS	1684
AUCKLAND, MĀNGERE 2 EWS	1672
WAIROA AERO AWS	1659 <sup>8</sup>
AUCKLAND AERO BACKUP AWS	1656 <sup>11</sup>
GISBORNE EWS	1653 <sup>1</sup>

MĀHIA AWS	1645 <sup>9</sup>
TONGARIRO AT TŪRANGI	1643
TŪRANGI 2 EWS	1643
THAMES EWS	1642
RANGITAIKI AT ANIWHENUA	1631
AWAKINO EWS	1615 <sup>2</sup>
REEFTON EWS	1603
WHAKATĀNE AERO AWS	1587 <sup>5</sup>
PURERUA AWS	1560
TAUMARUNUI EWS	1555
WAIROA, NORTH CLYDE EWS	1549 <sup>5</sup>
NEW PLYMOUTH AERO AWS	1543
PORT TAHAROA AWS	1536 <sup>1</sup>
AKITIO EWS	1522
MOKOHINAU ISLAND AWS	1516 <sup>8</sup>
MT LARKINS EWS	1501
WAIPAPA AT TTT RD CULVERT	1476
STEWART ISLAND EWS	1471
PUKEKOHE EWS	1436 <sup>10</sup>
WHAKATĀNE EWS	1431
WHAKAURU AT MOSSOP RD	1427
LOWER RETARUKE CWS	1413 <sup>2</sup>
POKAIWHENUA AT PUKETURUA	1399
WELLINGTON, KELBURN AWS	1397 <sup>2</sup>
WAIMARINO AT KEPA RD	1393
TAUMARUNUI AWS	1390
HAMILTON AERO AWS	1369 <sup>1</sup>
NAPIER AERO AWS	1363 <sup>3</sup>
TAKAPAU PLAINS AWS	1354 <sup>4</sup>
CASTLEPOINT AWS	1352
WHIRINAKI AT GALATEA	1351
GALATEA AWS	1347 <sup>2</sup>

TAHUNAATARA AT OHAKURI RD	1347
TAUPŌ CWS	1345 <sup>4</sup>
WELLINGTON, KELBURN 2	1331
MANAPOURI AERO AWS	1329 <sup>2</sup>
MATAMATA, HINUERA EWS	1318
MAKOTUKU AT SH49A BR	1305
LAKE KARAPIRO CWS	1303
NGAWI AWS	1295 <sup>3</sup>
MANGAKINO AT DILLON RD	1294
MANGARE STM AT MANGARE RD	1292
DARGAVILLE 2 EWS	1279
TAUPŌ AERO AWS	1277 <sup>1</sup>
SOUTH WEST CAPE AWS	1264 <sup>1</sup>
HAMILTON, RUAKURA 2 EWS	1262
MOTUEKA, RIWAKA EWS	1242 <sup>2</sup>
TAUTUKU EWS	1222
WAIKATO AT CAMBRIDGE GOLF COURSE	1220
AKAROA EWS	1214
WHANGANUI AT BELOW PIRIAKA	1210
FIRTH OF THAMES EWS	1209
FAREWELL SPIT AWS	1208 <sup>5</sup>
INVERCARGILL AERO AWS	1205
PAHIATUA EWS	1205
FLAT HILLS WXT AWS	1176
UPPER HUTT, TRENTHAM EWS	1173
KAIKŌURA AWS	1166 <sup>2</sup>
MASTERTON AERO AWS	1163
DANNEVIRKE EWS	1162
HAWERA AWS	1154 <sup>10</sup>
MAUNGARAKI 3	1147
WAIKERIA EWS	1141
WAIKATO AT REIDS FARM	1141

WELLINGTON, GRETA POINT CWS	1134
WAIOURU AERO AWS	1130 <sup>1</sup>
WAIOTAPU AT REPOROA	1128
GORE AWS	1114 <sup>1</sup>
INVERCARGILL AERO	1102 <sup>3</sup>
MARAEKAKAHO CWS	1093 <sup>8</sup>
WELLINGTON AERO BACKUP AWS	1072
CASS EWS	1066
HANMER FOREST EWS	1065
WELLINGTON AERO	1062
WINCHMORE 2, RAINE EWS	1059
INVERCARGILL AERO 2 EWS	1048 <sup>1</sup>
LEVIN AWS	1042
BIRCHWOOD WXT AWS	1039 <sup>4</sup>
METHVEN CWS	1029
WHANGANUI AERO AWS	1028 <sup>1</sup>
PARAPARAUMU AERO AWS	1028 <sup>1</sup>
WAIPAWA EWS	1025
NAPIER EWS	1005
WHAKATU EWS	1003
PORIRUA, ELSDON PARK AWS	999 <sup>5</sup>
MASTERTON, TE ORE ORE CWS	995
LUMSDEN AWS	988 <sup>3</sup>
NELSON AERO AWS	980 <sup>4</sup>
FIVE RIVERS CWS	979
PARAPARAUMU AERO	978 <sup>2</sup>
WAIKATO NORTH BRANCH EWS	975
WAIOURU EWS	967 <sup>1</sup>
NELSON AERO	964 <sup>4</sup>
OHAKA AWS	939 <sup>2</sup>
PALMERSTON NORTH EWS	927
PALMERSTON NORTH AERO AWS	927 <sup>1</sup>

MATUKITUKI AT WEST WĀNAKA	915
MASTERTON EWS	910 <sup>8</sup>
PARAPARAUMU AERO EWS	888
LEVIN EWS	886
RICHMOND EWS	884
APPLEBY 2 EWS	875 <sup>1</sup>
CHEVIOT EWS	848 <sup>1</sup>
DIAMOND HARBOUR EWS	847
TAPANUI EWS	844
QUEENSTOWN AERO AWS	841 <sup>1</sup>
LINCOLN, BROADFIELD RAINE EWS	831
HASTINGS AWS	824 <sup>14</sup>
CHRISTCHURCH AERO	819
QUEENSTOWN EWS	815 <sup>1</sup>
FAIRLIE AWS	812
MANA ISLAND AWS	807
MARTINBOROUGH EWS	779
CHRISTCHURCH AERO BACKUP AWS	775
LISMORE, RACEMANS HOUSE CWS	764
ASHBURTON AERO AWS	744
WINCHMORE 2 EWS	739
CHRISTCHURCH BOTANIC GARDENS EWS	726 <sup>2</sup>
CULVERDEN AWS	721 <sup>1</sup>
LINCOLN, BROADFIELD EWS	718
TARA HILLS AWS	718 <sup>1</sup>
WAIAMU SCHOOL CWS	715 <sup>1</sup>
NUGGET POINT AWS	705 <sup>1</sup>
AHURIRI AT STH DIADEM	703
BLENHEIM AERO AWS	685 <sup>2</sup>
DUNEDIN, MUSSELBURGH EWS	680
RANGIORA EWS	680
WĀNAKA CWS	679

WAKANUI 2 CWS	672 <sup>2</sup>
CHRISTCHURCH, KYLE ST EWS	664 <sup>10</sup>
MEDBURY CWS	664
DUNEDIN AERO AWS	653
ORARI ESTATE EWS	631 <sup>1</sup>
BALCLUTHA, FINEGAND EWS	606
BALCLUTHA, TELFORD EWS	596
WĀNAKA AERO AWS	592 <sup>3</sup>
ROXBURGH WXT AWS	591 <sup>5</sup>
BROMLEY EWS	582
OAMARU AWS	531 <sup>3</sup>
TIMARU AERO AWS	523 <sup>1</sup>
OTAIO @ SPRINGBANK ROAD	520
OAMARU AIRPORT AWS	519
MIDDLEMARCH EWS	519 <sup>1</sup>
BARING HEAD	516 <sup>1</sup>
LAKE TEKAPO EWS	488
TIMARU EWS	483
LAUDER EWS	482 <sup>1</sup>
ALEXANDRA AWS	481
BLENHEIM RESEARCH EWS	462
PUKAKI AERODROME AWS	423 <sup>1</sup>
OAMARU EWS	420
WINDSOR EWS	418
WAIMATE CWS	418
CLYDE 2 EWS	410
CROMWELL EWS	404
ALEXANDRA EWS	361
RANFURLY EWS	359
<b>Location</b>	<b>Mean temp (°C)</b>

LEIGH 2 EWS	17.1
KAITAIA EWS	16.4
WHANGAPARĀOA AWS	16.4
AUCKLAND AERO BACKUP AWS	16.2
PURERUA AWS	16.1
WHANGĀREI AERO AWS	16.1
AUCKLAND AERO	16.1
FAREWELL SPIT AWS	16.1
KAITAIA AERO EWS	16.1
AUCKLAND, MOTAT EWS	16.0
DARGAVILLE 2 EWS	16.0
AUCKLAND, MĀNGERE 2 EWS	16.0
TAURANGA AERO AWS	15.9
KERIKERI EWS	15.9
PORT TAHAROA AWS	15.8
AUCKLAND, NORTH SHORE ALBANY EWS	15.8
LAKE KARAPIRO CWS	15.7
WHANGĀREI EWS	15.6
WHAKATĀNE EWS	15.6
THAMES EWS	15.6
WHITIANGA EWS	15.6
NAPIER EWS	15.6
KERIKERI AERODROME AWS	15.5
WAIROA, NORTH CLYDE EWS	15.5
WHITIANGA AERO AWS	15.4
AUCKLAND, WHENUAPAI AWS	15.3
NGAWI AWS	15.3
RUSSELL CWS	15.2
GISBORNE AERO AWS	15.1
KAIKOHE AWS	15.1
WELLINGTON, GRETA POINT CWS	15.1
CAPE KIDNAPPERS WXT AWS	15.0

GISBORNE EWS	15.0
WHAKATĀNE AERO AWS	15.0
TOLAGA BAY WXT AWS	15.0
FIRTH OF THAMES EWS	15.0
WARKWORTH EWS	14.8
HAMILTON, RUAKURA 2 EWS	14.8
MANUKAU HEADS EWS	14.7
NAPIER AERO AWS	14.7
WAIKERIA EWS	14.5
WHANGANUI AERO AWS	14.5
TROUNSON CWS	14.5
MĀHIA AWS	14.5
WAIROA AERO AWS	14.4
HAMILTON AERO AWS	14.3
NEW PLYMOUTH AERO AWS	14.3
WELLINGTON AERO BACKUP AWS	14.3
WELLINGTON AERO	14.3
PUKEKOHE EWS	14.3
TE KUITI EWS	14.2
WHAKATU EWS	14.1
PALMERSTON NORTH EWS	14.1
NELSON AERO AWS	14.1
LEVIN AWS	14.1
MATAMATA, HINUERA EWS	13.9
OHAKEA AWS	13.9
ARAPITO EWS	13.8
CASTLEPOINT AWS	13.8
PARAPARAUMU AERO EWS	13.8
CAPE CAMPBELL AWS	13.8
PALMERSTON NORTH AERO AWS	13.8
PARAPARAUMU AERO AWS	13.7
AKAROA EWS	13.7

TŪTIRA CWS	13.7
GALATEA AWS	13.6
PORIRUA, ELSDON PARK AWS	13.6
WESTPORT AERO AWS	13.6
MANA ISLAND AWS	13.6
TAUPŌ CWS	13.6
WELLINGTON, KELBURN AWS	13.5
TAUMARUNUI EWS	13.5
TAUMARUNUI AWS	13.5
LEVIN EWS	13.5
GREYMOOUTH AERO EWS	13.4
TĀKAKA EWS	13.4
KAIKŌURA AWS	13.4
MASTERTON, TE ORE ORE CWS	13.4
WAIPAWA EWS	13.4
MARTINBOROUGH EWS	13.3
HAWERA AWS	13.3
BROMLEY EWS	13.2
ROTORUA AERO AWS	13.2
CHRISTCHURCH BOTANIC GARDENS EWS	13.2
ROTORUA EWS	13.2
FLAT HILLS WXT AWS	13.2
BLENHEIM AERO AWS	13.1
CHRISTCHURCH, KYLE ST EWS	13.1
DANNEVIRKE EWS	13.0
DIAMOND HARBOUR EWS	13.0
MASTERTON EWS	12.9
APPLEBY 2 EWS	12.9
RICHMOND EWS	12.9
UPPER HUTT, TRENTHAM EWS	12.9
AKITIO EWS	12.8
HOKITIKA AERO AWS	12.7

LINCOLN, BROADFIELD EWS	12.7
AWAKINO EWS	12.7
MASTERTON AERO AWS	12.7
PAHIATUA EWS	12.7
LISMORE, RACEMANS HOUSE CWS	12.6
HOKITIKA EWS	12.6
REEFTON EWS	12.6
CAPE TURNAGAIN AWS	12.6
ŌKĀRITO EWS	12.5
RANGIORA EWS	12.5
TAUPŌ AERO AWS	12.4
WAIAU SCHOOL CWS	12.4
DUNEDIN, MUSSELBURGH EWS	12.3
CHRISTCHURCH AERO BACKUP AWS	12.3
CHERTSEY CWS	12.3
CHEVIOT EWS	12.3
STRATFORD EWS	12.3
CHRISTCHURCH AERO	12.2
TŪRANGI 2 EWS	12.2
TAKAPAU PLAINS AWS	12.2
FRANZ JOSEF EWS	12.2
MOTU EWS	12.1
HAAST AWS	12.1
WAIMATE CWS	12.1
TIMARU EWS	12.0
KAIKŌURA, MIDDLE CREEK	12.0
ASHBURTON AERO AWS	12.0
OHOKA CWS	11.9
CROMWELL EWS	11.9
CULVERDEN AWS	11.9
ALEXANDRA EWS	11.8
OTAIO @ SPRINGBANK ROAD	11.7

LAKE MOERAKI EWS	11.7
ORARI ESTATE EWS	11.7
METHVEN CWS	11.7
WĀNAKA AERO AWS	11.6
MILFORD SOUND AWS	11.6
MILFORD SOUND EWS	11.5
TIWAI POINT EWS	11.5
QUEENSTOWN EWS	11.5
OAMARU EWS	11.4
WINCHMORE 2 EWS	11.4
TIMARU AERO AWS	11.4
WĀNAKA CWS	11.4
OAMARU AIRPORT AWS	11.3
MEDBURY CWS	11.3
TAUTUKU EWS	11.2
WINDSOR EWS	11.2
STEWART ISLAND EWS	11.2
CLYDE 2 EWS	11.2
NUGGET POINT AWS	11.2
ALEXANDRA AWS	11.2
DUNEDIN AERO AWS	11.2
BALCLUTHA, FINEGAND EWS	11.1
GORE AWS	11.1
SUGAR LOAF AWS	11.0
BIRCHWOOD WXT AWS	11.0
FAIRLIE AWS	11.0
INVERCARGILL AERO AWS	10.9
MAYFIELD AT RUAPUNA FORECAST	10.9
HANMER FOREST EWS	10.9
TAPANUI EWS	10.9
GORE EWS	10.9
BALCLUTHA, TELFORD EWS	10.9

INVERCARGILL AERO 2 EWS	10.7
QUEENSTOWN AERO AWS	10.6
MIDDLEMARCH EWS	10.6
WAIPOUNAMU CWS	10.6
TE ANAU AT PARK HQ CWS	10.5
FIVE RIVERS CWS	10.5
LAUDER EWS	10.5
LUMSDEN AWS	10.3
CASS EWS	10.2
WAI PARA NORTH BRANCH EWS	10.1
PUKAKI AERODROME AWS	10.1
TARA HILLS AWS	10.0
TARAPOUNAMU EWS	10.0
MANAPOURI, WEST ARM JETTY EWS	10.0
MANAPOURI AERO AWS	10.0
WAIOURU EWS	9.9
RANFURLY EWS	9.8
LAKE TEKAPO EWS	9.7
MT COOK AERO AWS	9.6
MT COOK EWS	9.6
WAIOURU AERO AWS	9.5
ARTHURS PASS EWS	9.0
ARTHURS PASS AWS	8.9
MT RUAPEHU, CHATEAU EWS	8.1
ALBERT BURN	6.1
MURCHISON MTNS EWS	5.8
IVORY GLACIER CWS	5.5
MUELLER HUT EWS	3.8
MAHANGA EWS	2.3
MT LARKINS EWS	1.9

Location	Sunshine (hours)
LAKE TEKAPO EWS	2658
RICHMOND EWS	2639 <sup>1</sup>
TĀKAKA EWS	2574
CROMWELL EWS	2531
ALEXANDRA EWS	2508
APPLEBY 2 EWS	2502 <sup>3</sup>
BLENHEIM RESEARCH EWS	2498
NEW PLYMOUTH AERO AWS	2488 <sup>3</sup>
QUEENSTOWN AERO AWS	2451 <sup>2</sup>
HOKITIKA AERO AWS	2400 <sup>2</sup>
WHAKATĀNE SUNSHINE	2399 <sup>1</sup>
WESTPORT EWS	2380 <sup>4</sup>
BROMLEY EWS	2335
DIAMOND HARBOUR EWS	2311
TAURANGA AERO AWS	2301 <sup>6</sup>
NAPIER EWS	2296 <sup>10</sup>
CHEVIOT EWS	2284 <sup>1</sup>
ROTORUA EWS	2274 <sup>1</sup>
WINCHMORE 2 EWS	2270
OAMARU EWS	2240 <sup>1</sup>
ASHBURTON AERO AWS	2232 <sup>2</sup>
CHRISTCHURCH AERO	2228
LINCOLN, BROADFIELD EWS	2182
RANGIORA EWS	2167
AKITIO EWS	2164
AUCKLAND, MOTAT EWS	2153 <sup>1</sup>
PARAPARAUMU AERO EWS	2135
ARAPITO EWS	2123
DUNEDIN, MUSSELBURGH EWS	2119 <sup>1</sup>
HOKITIKA AERO	2109 <sup>1</sup>



AUCKLAND, MĀNGERE 2 EWS	2086
GREYMOUTH AERO EWS	2077
PARAPARAUMU AERO	2076 <sup>2</sup>
TŪRANGI 2 EWS	2075 <sup>2</sup>
HAMILTON, RUAKURA 2 EWS	2066
MIDDLEMARCH EWS	2058 <sup>4</sup>
AKAROA EWS	2042
WELLINGTON, KELBURN AWS	2038 <sup>4</sup>
LEVIN EWS	2033 <sup>1</sup>
GORE EWS	2013 <sup>1</sup>
GISBORNE AERO AWS	2010 <sup>7</sup>
MASTERTON EWS	1980
INVERCARGILL AERO	1973 <sup>4</sup>
MANUKAU HEADS EWS	1970
UPPER HUTT, TRENTHAM EWS	1954
WAIKERIA EWS	1948 <sup>1</sup>
REEFTON EWS	1946
FIRTH OF THAMES EWS	1945
FRANZ JOSEF EWS	1928
INVERCARGILL AERO 2 EWS	1893 <sup>12</sup>
PALMERSTON NORTH EWS	1884 <sup>1</sup>
KAWERAU AWS	1882 <sup>13</sup>
WHANGĀREI EWS	1843
TE KUITI EWS	1832
WAIPAWA EWS	1810 <sup>4</sup>
KAITAIA EWS	1789 <sup>1</sup>
TAUMARUNUI AWS	1773 <sup>2</sup>
STRATFORD EWS	1763 <sup>5</sup>
BALCLUTHA, TELFORD EWS	1710 <sup>4</sup>
DANNEVIRKE EWS	1703
MARTINBOROUGH EWS	1586
DARGAVILLE 2 EWS	1418 <sup>1</sup>

## Section 5: Annual temperature – Another one for the record books

2023 was New Zealand’s 2<sup>nd</sup> warmest year on record based on NIWA’s seven-station series, shy of last year’s record by 0.15 °C, but surpassing 2021 by 0.05 °C. New Zealand’s three warmest years on record have all occurred in the last three years.

In terms of annual minimum and maximum temperatures, it was the 2<sup>th</sup> warmest year on record.

Across the country, 58 locations observed a record or near-record annual mean temperature, 43 locations observed a record or near-record annual mean maximum temperature, and 52 locations observed a record or near-record annual mean minimum temperature. For the 8<sup>th</sup> consecutive year, no locations experienced a record or near-record cold year.

The record or near-record heat experienced around the country throughout 2023 and in recent years is consistent with expectations of a warming planet caused by anthropogenic climate change. However, local climate drivers also helped influence temperatures in New Zealand during 2023, with SSTs near the coasts of New Zealand exhibiting record or near-record warmth in regions but the northern North Island.

Further afield, SSTs around the Tasman Sea and Coral Sea were also warmer than average for the majority of the year, aiding to increase the water vapour content of the atmosphere around New Zealand. This contributed to higher-than-average humidity, contributing to warmer-than-average nights.

**Table 1: Record or near-record high or low annual average temperature departures for 2023<sup>4</sup>.**

Location	Mean air temp. (°C)	Departure from average(°C)	Year records began	Comments
<b>Mean temperature</b>				
Farewell Spit	16.2	1.8	1971	Highest
Arapito	14.0	1.6	1978	Highest
Chatham Island Airport	13.6	1.4	1878	Highest
Christchurch (Botanic Gardens)	13.3	1.3	1863	Highest
Stewart Island	11.4	1.3	1975	Highest
Waimate	12.2	1.3	1908	Highest
Dunedin (Musselburgh)	12.4	1.2	1947	Highest
Lincoln (Broadfield)	12.9	1.1	1881	Highest
South West Cape	11.4	1.1	1991	Highest
Secretary Island	12.9	1.0	1985	Highest
Tautuku	11.4	1.0	1976	Highest
Campbell Island	8.0	0.9	1991	Highest
Windsor	11.4	0.9	2000	Highest
Taupō	13.7	1.8	1949	2nd-highest
Greymouth Airport	13.5	1.4	1947	2nd-highest

<sup>4</sup> The rankings (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> etc.) in Tables 1 to 11 are relative to climate data from a group of nearby stations, some of which may no longer be operating. The current climate value is compared against all values from any member of the group, without any regard for homogeneity between one station’s record and another. This approach is used because of the practical limitations of performing homogeneity checks in real-time.

Motu	12.3	1.2	1990	2nd-highest
Napier	15.7	1.2	1870	2nd-highest
Balclutha (Finegand)	11.2	1.1	1964	2nd-highest
Franz Josef	12.3	1.1	1953	2nd-highest
Gore	11.1	1.1	1907	2nd-highest
Hokitika Airport	12.9	1.1	1866	2nd-highest
Rangiora	12.6	1.1	1965	2nd-highest
Five Rivers	10.6	1.0	1982	2nd-highest
Invercargill Airport	11.1	1.0	1905	2nd-highest
Orari Estate	11.8	1.0	1972	2nd-highest
Kaikōura	13.5	0.9	1963	2nd-highest
Nugget Point	11.2	0.9	1970	2nd-highest
Te Puke	15.2	0.9	1973	2nd-highest
Oamaru	11.8	0.8	1967	2nd-highest
Tākaka	13.5	0.8	1978	2nd-highest
Tiwai Point	11.5	0.8	1970	2nd-highest
Haast	12.3	1.0	1949	3rd-highest
Hamilton (Ruakura)	14.9	1.0	1906	3rd-highest
Levin	14.3	1.0	1895	3rd-highest
Mt Cook Airport	9.7	1.0	1929	3rd-highest
Wānaka Airport	11.7	1.0	1955	3rd-highest
Whakatāne	15.7	1.0	1974	3rd-highest
Lake Tekapo/Takapō	9.9	0.9	1927	3rd-highest
Palmerston North	14.3	0.9	1928	3rd-highest
Waikeria	14.7	0.9	1957	3rd-highest
Roxburgh	11.9	0.8	1950	3rd-highest
Middlemarch	10.6	0.7	2000	3rd-highest
Ōkārīto	12.5	0.6	1982	3rd-highest
Pukaki Airport	10.2	0.6	1972	3rd-highest
Te Anau	10.6	1.2	1963	4th-highest
Timaru	12.0	1.2	1885	4th-highest
Paraparaumu Airport	14.1	0.9	1953	4th-highest
Reefton	12.6	0.9	1960	4th-highest
Tapanui	11.0	0.9	1900	4th-highest
Westport Airport	13.7	0.9	1937	4th-highest
Akaroa	13.8	0.8	1978	4th-highest
Cromwell	12.0	0.8	1949	4th-highest
Manapouri (West Arm Jetty)	10.0	0.8	1971	4th-highest
Milford Sound	11.4	0.8	1934	4th-highest
Tauranga Airport	15.9	0.8	1913	4th-highest
Cheviot	12.4	0.7	1982	4th-highest
Waipawa	13.4	0.7	1945	4th-highest
Port Taharoa	15.8	0.6	1973	4th-highest
<b>Mean maximum temperature</b>				
Arapito	18.6	1.5	1978	Highest
Lake Tekapō	16.3	1.4	1927	Highest
Appleby	19.2	1.2	1932	Highest
Dunedin (Musselburgh)	16.1	1.2	1947	Highest

Secretary Island	16.0	1.2	1985	Highest
South West Cape	14.0	1.2	1991	Highest
Stewart Island	15.1	1.2	1975	Highest
Mt Cook Airport	15.5	1.1	1929	Highest
Clyde	18.5	1.0	1978	Highest
Campbell Island	10.2	0.8	1991	Highest
Farewell Spit	20.4	2.7	1971	2nd-highest
Greymouth Airport	17.6	2.0	1947	2nd-highest
Franz Josef	17.4	1.6	1953	2nd-highest
Balclutha (Finegand)	16.5	1.4	1964	2nd-highest
Chatham Island Airport	16.7	1.4	1878	2nd-highest
Cromwell	18.9	1.4	1949	2nd-highest
Five Rivers	16.0	1.2	1982	2nd-highest
Paraparaumu Airport	18.2	1.1	1953	2nd-highest
Windsor	17.3	1.1	2000	2nd-highest
Dunedin Airport	17.2	1.0	1962	2nd-highest
Reefton	18.0	1.0	1960	2nd-highest
Nugget Point	14.5	0.9	1970	2nd-highest
Tautuku	15.6	0.9	1976	2nd-highest
Oamaru	16.2	0.7	1967	2nd-highest
Ōkārīto	16.9	0.7	1982	2nd-highest
Taupō	18.7	1.8	1949	3rd-highest
Orari Estate	17.6	1.4	1972	3rd-highest
Invercargill Airport	15.8	1.3	1905	3rd-highest
Haast	16.3	1.2	1949	3rd-highest
Manapouri Airport	15.8	1.0	1963	3rd-highest
Middlemarch	17.4	1.0	2000	3rd-highest
Wānaka Airport	17.3	1.0	1955	3rd-highest
Tiwai Point	15.1	0.9	1970	3rd-highest
Westport Airport	17.4	0.8	1937	3rd-highest
Balclutha (Telford)	16.4	1.7	1964	4th-highest
Motu	17.2	1.3	1990	4th-highest
Levin	18.7	1.2	1895	4th-highest
Manapouri (West Arm Jetty)	14.2	1.2	1971	4th-highest
Ranfurly	16.5	1.1	1897	4th-highest
Kaikōura	16.9	1.0	1963	4th-highest
Tākaka	19.1	0.8	1978	4th-highest
Whakatāne	20.3	0.6	1974	4th-highest
Cheviot	18.2	0.5	1982	4th-highest
<b>Mean minimum temperature</b>				
Christchurch (Botanic Gardens)	8.5	1.7	1863	Highest
Arapito	9.4	1.6	1978	Highest
Chatham Island Airport	10.6	1.6	1878	Highest
Taupō	8.6	1.6	1949	Highest
Lincoln (Broadfield)	8.1	1.3	1881	Highest
Waimate	7.3	1.3	1908	Highest
Dunedin (Musselburgh)	8.7	1.2	1947	Highest
Gisborne Airport	10.9	1.2	1905	Highest

Stewart Island	7.6	1.2	1975	Highest
Timaru	7.5	1.2	1885	Highest
Nugget Point	8.0	1.0	1970	Highest
Tautuku	7.1	1.0	1976	Highest
Campbell Island	5.8	0.9	1991	Highest
Kaikōura	10.1	0.9	1963	Highest
Oamaru	7.4	0.9	1967	Highest
Farewell Spit	11.9	0.8	1971	Highest
Te Puke	11.0	1.6	1973	2nd-highest
Kaitia	13.3	1.5	1948	2nd-highest
Port Taharoa	13.0	1.2	1973	2nd-highest
Rangiora	7.2	1.2	1965	2nd-highest
Motu	7.4	1.1	1990	2nd-highest
Waikeria	9.3	1.0	1957	2nd-highest
Cheviot	6.6	0.9	1982	2nd-highest
Masterton	8.5	0.9	1906	2nd-highest
Gore	6.3	0.8	1907	2nd-highest
Kerikeri Airport	11.6	0.8	1945	2nd-highest
South West Cape	8.7	0.8	1991	2nd-highest
Whakatāne	11.1	1.5	1974	3rd-highest
Hamilton (Ruakura)	9.9	1.4	1906	3rd-highest
Tauranga Airport	12.0	1.2	1913	3rd-highest
Dannevirke	8.9	1.1	1951	3rd-highest
Whitianga Airport	11.4	1.1	1962	3rd-highest
Greymouth Airport	9.5	0.8	1947	3rd-highest
Kerikeri	11.5	0.8	1945	3rd-highest
New Plymouth Airport	10.7	0.8	1944	3rd-highest
Ngawi	12.2	0.8	1972	3rd-highest
Secretary Island	9.8	0.8	1985	3rd-highest
Auckland (Whenuapai)	11.3	0.7	1945	3rd-highest
Five Rivers	5.1	0.7	1982	3rd-highest
Lower Retaruke	8.1	0.6	1966	3rd-highest
Stratford	8.4	0.6	1960	3rd-highest
Te Anau	6.2	2.1	1963	4th-highest
Waiouru	5.6	1.2	1962	4th-highest
Waipawa	8.0	1.1	1945	4th-highest
Akaroa	9.5	0.9	1978	4th-highest
Auckland (Western Springs)	12.3	0.8	1948	4th-highest
Haast	8.3	0.8	1949	4th-highest
Levin	9.9	0.8	1895	4th-highest
Roxburgh	6.8	0.7	1950	4th-highest
Tiwai Point	7.8	0.6	1970	4th-highest
Windsor	5.4	0.6	2000	4th-highest
Purerua	12.7	0.5	1983	4th-highest

A particularly notable event occurred during early January, when Greymouth registered a temperature of over 30°C, the first time this has happened since records began in 1947. Additionally, another



notable event occurred from 1-7 February, when a hot, humid flow from Queensland brought a string of exceptionally warm nights, leading to 34 separate locations experiencing record or near-record minimum (overnight) temperatures.

**Table 2: Record or near-record high or low annual temperature extremes for 2023.**

Location	Temperature (°C)	Date of occurrence	Year records began	Comments
<b>Highest extreme maximum temperatures</b>				
Windsor	33.6	Feb-03rd	2000	Highest
Greymouth Airport	30.9	Jan-08th	1947	Highest
Milford Sound	29.4	Feb-04th	1934	Highest
Westport Airport	29.1	Jan-28th	1937	Highest
Pukaki Airport	33.7	Feb-04th	1972	2nd-highest
Manapouri (West Arm Jetty)	30.1	Jan-09th	1971	2nd-highest
Arapito	29.4	Jan-28th	1978	2nd-highest
Whangaparāoa	29.0	Jan-19th	1982	2nd-highest
Haast	28.3	Feb-15th	1949	2nd-highest
Ōkārito	26.9	Jan-30th	1982	2nd-highest
Gore	34.1	Feb-04th	1907	3rd-highest
Five Rivers	30.3	Feb-04th	1982	Equal 4th-highest
<b>Lowest extreme maximum temperatures</b>				
Castlepoint	6.4	Aug-10th	1972	Equal 2nd-lowest
Balclutha (Telford)	3.5	Jun-09th	1972	3rd-lowest
Tiwai Point	4.8	Jun-09th	1972	3rd-lowest
Pukaki Airport	-1.7	Jun-16th	1972	4th-lowest
<b>Highest extreme minimum temperatures</b>				
South West Cape	18.5	Feb-05th	1991	Highest
Paraparaumu Airport	20.7	Feb-05th	1972	Equal highest
Arapito	19.9	Feb-05th	1978	Equal highest
Campbell Island	13.7	Feb-02nd	1991	Equal highest
Akaroa	22.8	Feb-05th	1978	2nd-highest
Dunedin (Musselburgh)	20.2	Feb-05th	1947	2nd-highest
Te Anau At Park Hq	19.2	Feb-05th	1973	2nd-highest
Greymouth Airport	19.1	Jan-29th	1972	2nd-highest
Haast	18.9	Jan-31st	1949	2nd-highest
Franz Josef	18.4	Feb-05th	1953	2nd-highest
Tiwai Point	18.4	Feb-05th	1972	2nd-highest
Winchmore	22.3	Feb-05th	1949	3rd-highest
Purerua	20.9	Feb-03rd	1983	3rd-highest
Hawera	19.8	Feb-04th	1977	3rd-highest
Queenstown Airport	19.6	Feb-05th	1871	3rd-highest
Lake Tekapo/Takapō	19.1	Feb-05th	1928	3rd-highest
Ranfurly	19.1	Feb-05th	1897	3rd-highest
Tautuku	18.7	Feb-05th	1976	3rd-highest
Oamaru Airport	18.3	Feb-03rd	1972	3rd-highest

Balclutha (Telford)	17.0	Feb-05th	1972	3rd-highest
Waiau School	21.5	Feb-06th	1974	4th-highest
Alexandra	21.3	Feb-05th	1930	4th-highest
Palmerston North	20.5	Feb-05th	1940	4th-highest
Upper Hutt (Trentham)	20.5	Feb-05th	1972	4th-highest
Tākaka	20.2	Feb-05th	1978	4th-highest
Cheviot	20.1	Feb-06th	1982	4th-highest
Gore	19.7	Feb-05th	1907	4th-highest
Westport Airport	19.7	Feb-03rd	1966	4th-highest
Cromwell	21.1	Feb-05th	1949	Equal 2nd-highest
Milford Sound	18.3	Feb-05th	1935	Equal 2nd-highest
Kaitaia	22.2	Feb-03rd	1948	Equal 3rd-highest
Levin	21.0	Feb-05th	1950	Equal 3rd-highest
Invercargill Airport	20.0	Feb-05th	1905	Equal 3rd-highest
Manapouri (West Arm Jetty)	17.7	Feb-05th	1972	Equal 3rd-highest
New Plymouth Airport	20.9	Feb-04th	1944	Equal 4th-highest
Whangaparāoa	20.2	Feb-03rd	1982	Equal 4th-highest
<b>Lowest extreme minimum temperatures</b>				
South West Cape	0.3	Oct-27th	1991	3rd-lowest
Tūrangi	-6.7	Aug-29th	1968	Equal 3rd-lowest
Ōkārīto	-2.2	Aug-03rd	1982	4th-lowest
Mokohinau Island	7.9	Jul-27th	1994	Equal 4th-lowest

## Section 6: Annual rainfall – Historic rainfall and flooding

The past year will be widely remembered for the series of extreme rainfall events that occurred. Starting with the Auckland Anniversary Floods, during which over 200 mm of rainfall fell in a 6-hour period in Auckland. Around two weeks later, Ex-Tropical Cyclone Gabrielle unleashed torrential rainfall across the North Island, with some stations near the Esk River reporting over half a metre of rainfall within 24 hours (Tareha recorded 561 mm on 13 February). Another extreme rainfall event occurred in Southland and Otago during September, where an atmospheric river (a long, transient plume of moisture deriving from the tropics) led to record rainfall and flooding.

Towards the end of spring and into summer, drier conditions began to emerge in some regions. According to the New Zealand Drought Index (NZDI), by the end of the year, areas of dry and very dry conditions were present in the lower North Island and northern and eastern South Island.

**Table 3: Record or near-record annual rainfall totals for the year 2023.**

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
<b>High records or near-records</b>				
Gisborne Airport	1795	180	1905	Highest
Napier Airport	1363	173	1870	Highest
Auckland (Albany)	2023	170	1966	Highest
Whangaparāoa	1699	170	1946	Highest
Auckland (Māngere)	1672	151	1959	Highest
Whangārei	2133	166	1937	2nd-highest
Auckland (Western Springs)	1926	156	1948	2nd-highest
Whakatu	1003	140	1965	2nd-highest
Purerua	1560	131	1983	2nd-highest
Leigh	1876	172	1966	3rd-highest
Castlepoint	1352	146	1902	3rd-highest
Kaitaia	1776	135	1948	3rd-highest
<b>Low records or near-records</b>				
<i>None observed.</i>				

**Table 4: Record or near-record high extreme 1-day rainfall totals that occurred in 2023.**

Location	1-day extreme rainfall (mm)	Date	Year records began	Comments
Tareha	561	Feb-13th	1949	Highest
Whakamārama	336	Jun-17th	1950	Highest
Rings Beach	237	Feb-13th	1986	Highest
Auckland (Māngere)	265	Jan-27th	1959	Highest
Auckland (Airport)	245	Jan-27th	1962	Highest
Brentwood	239	Feb-13th	1966	Highest
Auckland (Albany)	230	Jan-27th	1966	Highest
Auckland (Western Springs)	215	Jan-27th	1948	Highest

Akaroa	199	Jul-22nd	1977	Highest
Mt Ruapehu Chateau	154	Feb-12th	2000	Highest
Waipawa	117	Feb-13th	1945	Highest
Kaikohe	169	Apr-30th	1956	2nd-highest
Whakatu	122	Feb-13th	1967	2nd-highest
Hastings	126	Feb-13th	1967	2nd-highest
Tūrangi	115	Jan-28th	1968	3rd-highest
Port Taharoa	84	Jan-27th	1973	3rd-highest
Whangārei	216	Feb-12th	1943	4th-highest
Leigh	165	Feb-13th	1967	4th-highest
Te Kuiti	132	Jan-28th	1957	4th-highest
Wānaka	98	Sep-21st	1927	4th-highest

## Section 7: 2023 climate in the six main centres

Auckland experienced its wettest year on record, largely due to several extreme rainfall events at the beginning of the year. Tauranga experienced well above normal rainfall, while Christchurch saw above normal rainfall. All other major centres saw near normal rainfall. None of the major centres experienced below average temperatures; Auckland and Wellington observed near average mean temperatures; Tauranga, Hamilton and Christchurch experienced above average mean temperatures; and Dunedin had well-above average mean temperatures. Of the six main centres in 2023, Tauranga was the wettest and sunniest, Dunedin was the driest, Auckland was the warmest, Christchurch and Dunedin were equal-coolest, and Wellington was the least sunny.

**Table 5: 2023 climate in the six main centres.**

Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland <sup>a</sup>	1672	151	Well above normal (highest on record)
Tauranga <sup>b</sup>	1845 <sup>h</sup>	154	Well above normal
Hamilton <sup>c</sup>	1369 <sup>i</sup>	113	Near normal
Wellington <sup>d</sup>	1331	108	Near normal
Christchurch <sup>e</sup>	819	133	Above normal
Dunedin <sup>f</sup>	680	94	Near normal
Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland <sup>a</sup>	16.0 <sup>i</sup>	0.5	Near average
Tauranga <sup>b</sup>	15.9 <sup>h</sup>	0.8	Above average
Hamilton <sup>c</sup>	14.4 <sup>j</sup>	0.6	Above average
Wellington <sup>d</sup>	13.6 <sup>k</sup>	0.5	Near average
Christchurch <sup>e</sup>	12.3 <sup>l</sup>	0.7	Above average
Dunedin <sup>f</sup>	12.3 <sup>i</sup>	1.1	Well above average
Sunshine			
Location	Sunshine (hours)		
Auckland <sup>a</sup>	2086		
Tauranga <sup>b</sup>	2300 <sup>j</sup>		
Hamilton <sup>g</sup>	2066		
Wellington <sup>d</sup>	2038 <sup>m</sup>		
Christchurch <sup>e</sup>	2228		
Dunedin <sup>f</sup>	2119 <sup>i</sup>		

<sup>a</sup>Māngere <sup>b</sup>Tauranga Airport <sup>c</sup>Hamilton Airport <sup>d</sup>Kelburn <sup>e</sup>Christchurch Airport <sup>f</sup>Musselburgh <sup>g</sup>Ruakura <sup>h</sup>eight days missing <sup>i</sup>one day missing <sup>j</sup>six days missing <sup>k</sup>seven days missing <sup>l</sup>nine days missing <sup>m</sup>four days missing

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## Section 8: Significant weather and climate events in 2023

This section contains information pertaining to some of the more significant weather and climate events that occurred in 2023. Note that a more detailed list of significant weather events for 2023 can be found in the *Highlights and extreme events* section of NIWA's Monthly Climate Summaries. These summaries are available online at <https://niwa.co.nz/climate/summaries>.

### Ex-Tropical Cyclone Gabrielle

On 8 February, Tropical Cyclone Gabrielle formed in the Coral Sea. By 10 February, Gabrielle strengthened into a severe category 3 with wind gusts reaching 185 km/h. On 12 February, Gabrielle began impacting Northland and Auckland. In central Auckland, the air pressure fell to 971.5 hPa, surpassing that which was observed during the Cyclone of 1936 (973.5 hPa). On 14 February, Gabrielle's centre of circulation drifted eastward toward East Cape, passing just kilometres offshore during the evening. A MetService analysis indicated a central pressure of 965 hPa. Gabrielle then moved away from the mainland and passed north of Chatham Island on 15 February.

Numerous locations observed record high daily rainfall totals for February during this event. These are listed in Table 6. The following is a non-exhaustive list of impacts in New Zealand caused by Gabrielle:

#### 12 February

- Northland reported numerous downed trees and flooding, particularly in the Whāngarei area; Whāngarei recorded 216 mm between 9:00 am 12 February – 9:00 a.m. 13 February, its wettest February day on record and over 2.5 times the February monthly normal.
- Auckland's Harbour Bridge was closed around 3:30 pm on 12 February until early morning 13 February due to strong winds; many ferry services were also cancelled.
- Mercury Energy warned that Lake Taupō and the Waikato River may reach record high levels, causing flooding along the shores.

#### 13 February

- Over 20,000 households were reported to have lost power in both Northland and Auckland between 12-13 February; Northlanders were warned that power outages could last for days.
- Between 13-14 February, states of emergency were declared in numerous districts ahead of Ex-Tropical Cyclone Gabrielle or immediately following its worst effects.
- In the evening, homes in west Auckland's Karekare and Muriwai were brought down by slips; one responding fire fighter was trapped and died while another was seriously injured and later died.

#### 14 February

- A national state of emergency was declared for only the third time in New Zealand's history.
- In the morning, it was reported that the Coromandel was largely cut off from neighbouring regions due to numerous slips and flooding.
- Tens of thousands of homes were without power across several North Island regions with Coromandel, Taranaki, and Hawke's Bay among the worst affected; by afternoon, the number had ballooned to 225,000 across the country.
- The Hikuwai River north of Tolaga Bay reached 14 m, prompting the evacuation of at least two dozen residents; communications were largely cut off in much of the Gisborne region.

- The Waipāoa River breached its banks and flooded numerous homes in the settlement of Te Karaka, inland of Gisborne; about 500 people were stuck on top of a hill for 27 hours.
- Exceptional flooding was reported in Hawke's Bay, particularly Esk Valley, Hastings, where floodwater levels reached nearly to the roofs of homes and trapped at least 40 people.
- In Rotorua, hundreds of trees came down and local roads and biking trails were closed due to slips.
- Wairoa was isolated after the Wairoa River burst its banks, flooding the homes of about half the town's population; communications were also largely cut off and food and fresh water supplies were low.
- Hawke's Bay agricultural, horticultural, and viticultural lands were severely affected by the cyclone with apples floating in the floodwater, fields of corn flattened, strawberry rows decimated, grape vines severely damaged and buried in silt, and drowned livestock.

### **15 February**

- Over 400 people had been rescued by helicopter following the cyclone.
- At the time, police said that over 1400 people were registered as uncontactable, but believed that it was mostly related to communication lines being down.
- Two navy ships were deployed to cut-off communities in Hawke's Bay and Gisborne – for many communities in these regions, there was still no power, no cell coverage, little remaining water and food, and no fuel, with the only way in or out by air travel.

### **16 February**

- 250,000 people were still without power across the North Island.

### **17 February**

- During the morning, the Gisborne water plant failed and residents were asked to stop using water immediately.
- As the response shifted to recovery in the days and weeks following Gabrielle, the death toll sadly continued to rise in the eastern North Island. As of the end of February, there were 11 fatalities reported to be associated with the cyclone.

### **Floods and high rainfall**

From 10-11 January, Ex-Tropical Cyclone Hale severely impacted much of the northern and eastern North Island, with a state of local emergency declared in Gisborne. Heavy rain caused flooding, slips and road closures across parts of Northland, north Auckland, Great Barrier Island, the Coromandel Peninsula and Gisborne, and reportedly caused substantial crop damage in many areas. High and rough seas caused appreciable beach erosion in the eastern Coromandel. Residents of Tokomaru Bay were forced to evacuate due to flooding. The Hikuwai River (north of Gisborne) peaked at a height of 13.51 m, exceeding the peak height reached during Cyclone Bola in 1988 (13.31 m). Farther south, heavy rain on 11 January caused slips and road closures in the Masterton District, and surface flooding was reported on SH1 between Picton and Blenheim.

From 27-28 January, torrential rainfalls occurred over much of the northern North Island, with widespread impacts particularly observed in Northland, Auckland, Coromandel and the Bay of Plenty. The rainfall observed in Auckland was unprecedented, with maximum rainfall totals for 1-hr,



2-hr, 6-hr, 12-hr, 24-hr and 48-hr durations all exceeding the previous highest totals on record, respectively. The following bullet points list some of the most notable impacts and observations:

- Four people died due to the severe weather event.
- A state of emergency was declared in Auckland.
- At least 5,000 Auckland properties were being assessed for flood or landslide damage, with at least 77 homes red stickered.
- Auckland Airport was severely flooded, with floodwaters throughout the terminal buildings forcing the airport to close temporarily. Tens of thousands of travellers were impacted by cancelled and diverted flights.
- The Coromandel Peninsula was totally cut off by road closures, and a section of SH25A between Kopu and Hikuai had collapsed making it impassable.
- A state of emergency was declared for Waitomo District, with some residents forced to evacuate their homes due to flooding.
- The homogenised central Auckland rainfall series recorded a January total of 539 mm at Albert Park, shattering the previous all-months record of 420 mm from February 1869. Rainfall data from this series began in 1853.
- Māngere recorded 478 mm of rainfall for the month, which is equivalent to 43% of the average annual rainfall at that location.

On 24 February, a front became stalled across Auckland and southern Northland. Early in the afternoon, a thunderstorm led to intense downpours near Mangawhai, a town in southern Northland, leading to flooding, road closures, and serious property damage. Due to the flooding, 40 to 50 people were placed in a temporary shelter at the Mangawhai golf course. A Northland Regional Council rain gauge “Hakaru at Tara” recorded an incredible 24-hour rainfall total of 380 mm between the morning of 24 February and the morning of 25 February. Based on available climatological data, that amount of rain would constitute over 670% of the February normal in nearby Mangawhai. About 20 students and their parents were stranded overnight at Kaiwaka school in Northland. In Dairy Flat, Auckland, a group of people had to be rescued from their cars by boats because of rising floodwaters. Kayaks were used to navigate the flooding in Riverhead, Auckland. Fourteen people were trapped at Silverdale school in Auckland. Farther south, Esk Valley, Hawke’s Bay, was evacuated as a precaution due to the forecast for heavy rain.

On 9 May, a state of emergency was declared in Auckland after a series of showers and thunderstorms delivered more than 40 mm of rain in an hour to some areas. Parts of SH1 were closed due to flooding during the evening rush hour. Many workplaces sent their employees home, with at least 17 schools closing due to the deluge. Farther north, thunderstorms brought flash flooding to Northland, and 29 mm fell in 30 minutes at Kaikohe. The flash flooding impacted a group of secondary school students and their teachers, who were exploring the Abbey Caves (Whangārei) during a field trip on 9 May. One student died because of the flooding.

From 20-21 May, a low pressure system and front produced heavy rainfall and led to mandatory evacuations in the central North Island at Marton. Multiple state highways closed because of slips and flooding, as Tutaenui stream and Turakina River burst their banks. Surface flooding was reported in parts of Whanganui and Manawatū, which closed SH3 between Warrengate Road and Whanganui. SH1 at Mangaweka was blocked by a slip.

On 22 June, prolonged heavy rain brought areas of surface flooding and caused many slips in Gisborne and Hawke’s Bay. A State of Emergency was declared in Gisborne, with residents in Te Karaka evacuating due to rising levels of the Waipaoa River. Several State Highways were closed including SH2 between Ormond and Matawai, and between Wairoa to Napier, SH5 from Taupō to Eskdale, and SH35 from Okitu to Ruatoru. In total, 73 local roads were closed or significantly obstructed by slips. Farther north, heavy rain in Hamilton caused flooding in the suburb of Glenview.

From 21-22 September, heavy rain caused flooding in parts of Southland, Otago, and Canterbury, with a State of Emergency declared in Southland and Queenstown. The Gore and Maitua combined stormwater and wastewater network was reportedly overwhelmed, leading to widespread surface flooding that threatened homes and businesses. Surface flooding was also prominent in other parts of Southland, with flooded storm water drains reported to be contaminated with sewage in Winton, Lumsden, and Nightcaps. A number of State Highways and rural roads were closed due to flooding. In Queenstown, 68 properties were evacuated due to flooding and associated debris.

**Table 6: Record high monthly extreme 1-day rainfall totals were recorded in 2023 at:**

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Ranking
<b>January</b>				
Auckland (Whenuapai)	190	27th	1943	Highest
Auckland (Albany)	230	27th	1966	Highest
Auckland (Airport)	245	27th	1962	Highest
Auckland (Henderson)	199	27th	1948	Highest
Auckland (Western Springs)	215	27th	1948	Highest
Whangapoua	137	27th	1991	Highest
Auckland (Māngere)	265	27th	1959	Highest
Pukekohe	198	27th	1944	Highest
Whatawhata	119	27th	1952	Highest
Te Kuiti	132	28th	1957	Highest
Waiawa, Whareama	109	11th	1968	Highest
<b>February</b>				
Rings Beach	237	13th	1986	Highest
Mamaranui	131	13th	1951	Highest
Whangārei	216	12th	1943	Highest
Leigh	165	13th	1967	Highest
Auckland (Western Springs)	147	13th	1948	Highest
Whangapoua	194	13th	1991	Highest
Rings Beach	274	13th	1986	Highest
Athenree	162	13th	2000	Highest
Te Aroha, Bowler Road	161	13th	1992	Highest
Mt Ruapehu Chateau	154	12th	2000	Highest
Waiwhero Station	201	13th	1951	Highest
Marangai Station	141	14th	1914	Highest
Waiawa, Whareama	122	14th	1968	Highest
Mokairau, Pakarae	157	13th	1947	Highest
Tūtira	316	13th	1894	Highest

Napier	176	13th	1870	Highest
Hastings	126	13th	1967	Highest
Whakatu	122	13th	1967	Highest
Gwavas	170	13th	1890	Highest
Brentwood	239	13th	1966	Highest
Makaretu North	161	13th	1960	Highest
Waipawa	117	13th	1945	Highest
<b>March</b>				
Te Aroha, Bowler Road	91	17th	1992	Highest
Kokiri, Maori Gully Road	170	8th	1980	Highest
Lumsden	63	20th	1982	Highest
Mandeville	65	20th	1967	Highest
Tiwai Point	71	20th	1970	Highest
<b>April</b>				
Kaikohe	169	30th	1956	Highest
<b>May</b>				
Waiharara	132	3rd	1956	Highest
Mokohinau	98	9th	1994	Highest
Hamilton (Airport)	79	9th	1935	Highest
Waituna	84	20th	1984	Highest
Sanson, Ngahere	56	20th	1973	Highest
Oxton	63	20th	1950	Highest
Whanganui	62	20th	1937	Highest
Ngahere	70	20th	1961	Highest
Norbury	58	20th	1999	Highest
Chatham Island	78	30th	1878	Highest
<b>June</b>				
Rings Beach	137	5th	1986	Highest
Brentwood	133	22nd	1966	Highest
Campbell Island	69	28th	1991	Highest
<b>July</b>				
Woodend, Gladstone	113	22nd	1981	Highest
Christchurch	86	22nd	1873	Highest
Mcqueens Valley	68	22nd	1947	Highest
Leeston, Jollies Road	64	22nd	1986	Highest
Akaroa	199	22nd	1977	Highest
Gore	35	2nd	1907	Highest
Campbell Island	39	9th	1991	Highest
<b>August</b>				
Murchison	55	19th	1997	Highest
<b>September</b>				
Edgecumbe	99	25th	1990	Highest
Kawhia	86	23rd	1905	Highest
Pirinoa	62	26th	1967	Highest
Norbury	47	23rd	1999	Highest
Tara Hills	68	21st	1949	Highest
Wānaka	98	21st	1927	Highest

Queenstown	87	21st	1890	Highest
Lumsden	68	21st	1982	Highest
Waipounamu	62	21st	1917	Highest
Cromwell	45	21st	1949	Highest
Clyde	50	21st	1978	Highest
Alexandra	47	21st	1922	Highest
Gore	68	21st	1907	Highest
<b>October</b>				
Kaikohe	150	29th	1956	Highest
Russell	127	29th	1919	Highest
Karangahake Gorge	113	30th	1981	Highest
<b>November</b>				
None observed				
<b>December</b>				
None observed				

### Drought and low rainfall

During mid-February, meteorological drought emerged in pockets of eastern Otago, with very dry to extremely dry conditions occurring across the rest of Otago, much of Southland, South Canterbury, Banks Peninsula, northern West Coast, and inland Tasman.

On 16 February, level 1 water restrictions were implemented in Invercargill, with level 3 restrictions in place for Gore and Mataura. The Gore District Council had to start pumping water from the Mataura River to supply Mataura residents due to a lack of water flowing into the Pleura Dam.

On 23 February, residents across the Southland district were being urged to conserve water. Across Southland, 70 consent holders were forced to cease abstraction of water. One of the water bores that supplies the township of Mossburn had been dry for five weeks.

On 27 February, the *GODZONE* adventure race had to alter their course for one of the river sections, as the river flow of the Oreti River (Southland) was too low to facilitate paddling.

A prolonged period of settled weather prevailed over inland parts of the South Island during the first half of September, continuing a dry spell which began in August 2023. Cromwell recorded 14.2 mm of rain on 16 September, ending a 45-day dry spell which began on 2 August 2023. Both Alexandra and Clyde observed 42-day dry spells, which ended when approximately 16 mm of rain was recorded on 16 September at each location.

On 21 December, Wellington residents were urged to store emergency water supplies over the holiday period as Wellington Water was preparing for the possibility of level four water restrictions.

### Temperature extremes

From 1-3 May, a blocking high situated to the east of New Zealand directed a warm and moist flow of air from the subtropics. This resulted in a series of exceptionally warm days and nights. Aided by foehn winds, some areas saw temperatures as high as 10°C above the average for May.

High pressure delivered frequent frosts for much of the South Island during June. In addition, an inversion, an increase in temperature with height, became established over inland parts of the South Island from approximately 6-25 June, with cold air pooling in valleys and basins. This contributed to relatively low daily maximum and minimum temperatures in several locations. Particularly notable was Lauder, where the air temperature remained below freezing for 114 consecutive hours (nearly 5 days) – from 7 pm on 6 June to 1 pm on 11 June. On 10 June, Lauder's maximum temperature was only -2.7°C.

Timaru recorded a maximum temperature of 28.9°C on 20 September, which is New Zealand's fifth-highest September temperature on record. The north-westerly airflow remained strong overnight, and contributed to a number of locations setting record or near-record high daily minimum temperatures for September. On 21 September, the exceptional heat shifted to the North Island. Wairoa recorded a maximum temperature of 29.6°C. This is New Zealand's third-highest September temperature on record, and the North Island's highest September temperature on record. The North Island's previous highest September temperature was 27.7°C, recorded in Hastings in 1955, and Waikaremoana in 1975.

**Table 7: Extremes of high daily maximum temperature in 2023 were recorded at:**

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Ranking
<b>January</b>				
Westport	29.1	28th	1937	Highest
Greymouth	30.9	8th	1947	Highest
Ōkārito	26.9	30th	1982	Highest
<b>February</b>				
Haast	28.3	15th	1949	Highest
Milford Sound	29.4	4th	1934	Highest
Secretary Island	28.3	15th	1985	Highest
Middlemarch	35.6	4th	2000	Highest
Lumsden	31.2	4th	1982	Highest
Gore	34.1	4th	1907	Highest
Campbell Island	21.2	5th	1991	Highest
Waipounamu	31.7	4th	1980	Equal highest
<b>March</b>				
None observed				
<b>April</b>				
None observed				
<b>May</b>				
Hamilton (Ruakura)	24.3	2nd	1906	Highest
Hamilton (Airport)	23.5	2nd	1946	Highest
Taumarunui	23.1	2nd	1947	Highest
New Plymouth	22.1	1st	1944	Highest
Martinborough	23.8	8th	1986	Highest
Ngawi	23.6	8th	1972	Highest
Hāwera	21.4	2nd	1977	Highest

Waiouru	20.2	2nd	1962	Highest
Taihape	23.0	8th	1972	Highest
Whanganui	24.7	1st	1937	Highest
Arapito	24.5	1st	1978	Highest
Ōkārito	21.4	1st	1982	Highest
Franz Josef	23.2	1st	1953	Highest
Ranfurlly	22.7	2nd	1897	Highest
Manapouri (Airport)	21.3	3rd	1963	Highest
Queenstown	23.0	3rd	1871	Highest
Cromwell	24.0	3rd	1949	Highest
Tapanui	23.7	3rd	1900	Highest
Invercargill	23.8	3rd	1905	Highest
Tiwai Point	21.9	3rd	1970	Highest
Oban (Stewart Island)	20.9	3rd	1975	Highest
Haast	21.5	1st	1949	Equal highest
Balclutha	24.0	3rd	1964	Equal highest
<b>June</b>				
Purerua	20.7	2nd	1983	Highest
Westport	20.3	25th	1937	Highest
Hokitika	20.2	23rd	1866	Highest
Greymouth	18.8	23rd	1947	Highest
Middlemarch	21.1	1st	2000	Highest
Dunedin (Airport)	20.8	1st	1962	Highest
Tautuku	18.7	1st	1976	Highest
Chatham Island	17.4	2nd	1878	Highest
<b>July</b>				
Greymouth	18.4	24th	1947	Highest
Pelorus Sd, Crail Bay	18.3	18th	1982	Highest
Blenheim	19.8	18th	1932	Highest
Brothers Island	18.4	4th	1997	Highest
Middlemarch	18.4	18th	2000	Highest
Waipounamu	17.9	31st	1980	Highest
Cromwell	18.7	18th	1949	Highest
Ophir	18.0	18th	1924	Highest
Clyde	19.0	18th	1978	Equal highest
Oban (Stewart Island)	16.0	15th	1975	Equal highest
<b>August</b>				
None observed				
<b>September</b>				
Kaikohe	23.5	20th	1973	Highest
Auckland (Whenuapai)	22.6	21st	1945	Highest
Waiheke Island	22.5	21st	1985	Highest
Te Puke	24.9	20th	1973	Highest
Kawerau	26.0	20th	1954	Highest
Taupō	23.8	20th	1949	Highest
Motu	25.8	20th	1990	Highest
Auckland (Airport)	23.0	21st	1959	Highest
Mt Ruapehu Chateau	19.4	20th	2000	Highest

Takapau Plains	25.0	21st	1962	Highest
Dannevirke	23.4	21st	1951	Highest
Gisborne	27.1	21st	1905	Highest
Waipawa	25.3	21st	1945	Highest
Ohakune	21.3	21st	1962	Highest
Waiouru	21.3	21st	1962	Highest
Secretary Island	21.4	26th	1985	Highest
Pukaki Airport	24.3	20th	1972	Highest
Orari Estate	28.4	20th	1972	Highest
Timaru	28.9	20th	1885	Highest
Windsor	25.2	21st	2000	Highest
Ranfurly	23.6	20th	1897	Highest
Waipounamu	23.5	20th	1980	Highest
Tapanui	24.6	20th	1900	Highest
Oban (Stewart Island)	23.5	20th	1975	Highest
Balclutha	26.6	20th	1964	Highest
Nugget Point	24.7	20th	1970	Highest
Tautuku	25.6	20th	1976	Highest
Pukekohe	22.0	21st	1969	Equal highest
<b>October</b>				
Matamata	24.9	21st	1999	Highest
New Plymouth	24.3	31st	1944	Highest
Mt Ruapehu Chateau	23.8	5th	2000	Highest
<b>November</b>				
Whangaparāoa	26.4	21st	1982	Highest
Waikeria	29.7	22nd	1957	Highest
<b>December</b>				
Hāwera	25.8	23rd	1977	Highest
Westport	27.7	30th	1937	Highest

**Table 8: Extremes of low daily maximum temperature in 2023 were recorded at:**

Location	Extreme low maximum (°C)	Date of extreme temperature	Year records began	Ranking
<b>January</b>				
None observed				
<b>February</b>				
Cape Reinga	17.7	13th	1971	Lowest
Purerua	18.3	13th	1983	Lowest
Whangaparāoa	17.7	13th	1982	Lowest
Tiri Tiri Lighthouse	18.5	24th	1982	Lowest
Whakatāne	18.0	27th	1975	Lowest
Pukekohe	16.4	24th	1969	Lowest
<b>March</b>				
Tiri Tiri Lighthouse	16.5	29th	1982	Lowest
Port Taharoa	15.9	29th	1974	Lowest



Castlepoint	11.1	29th	1972	Lowest
Māhia	12.5	29th	1990	Lowest
Brothers Island	12.1	29th	1997	Lowest
Kaikōura	9.9	29th	1972	Lowest
Winchmore	7.9	28th	1949	Lowest
Ashburton	8.0	28th	1928	Lowest
Akaroa	9.5	28th	1978	Lowest
Le Bons Bay	8.5	28th	1984	Lowest
Mokohinau	16.5	29th	1994	Equal lowest
<b>April</b>				
None observed				
<b>May</b>				
None observed				
<b>June</b>				
None observed				
<b>July</b>				
None observed				
<b>August</b>				
Palmerston North	6.0	10th	1940	Lowest
<b>September</b>				
Clyde	5.5	22nd	1978	Lowest
<b>October</b>				
None observed				
<b>November</b>				
None observed				
<b>December</b>				
None observed				

**Table 9: Extremes of low daily minimum temperature in 2023 were recorded at:**

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Ranking
<b>January</b>				
None observed				
<b>February</b>				
Tiri Tiri Lighthouse	11.6	13th	1982	2nd-lowest
<b>March</b>				
Purerua	7.8	30th	1983	Lowest
Whangārei	4.2	30th	1967	Lowest
Mokohinau	13.4	30th	1994	Lowest
Five Rivers	-3.0	30th	1982	Lowest
Waipounamu	-1.3	30th	1980	Lowest
Clyde	-2.1	30th	1978	Lowest
Le Bons Bay	3.5	29th	1984	Equal lowest
<b>April</b>				
None observed				

<b>May</b>				
None observed				
<b>June</b>				
None observed				
<b>July</b>				
None observed				
<b>August</b>				
None observed				
<b>September</b>				
None observed				
<b>October</b>				
South West Cape	0.3	27th	1991	Lowest
<b>November</b>				
None observed				
<b>December</b>				
None observed				

**Table 10: Extremes of high daily minimum temperature in 2023 were recorded at:**

<b>Location</b>	<b>Extreme high minimum (°C)</b>	<b>Date of extreme temperature</b>	<b>Year records began</b>	<b>Ranking</b>
<b>January</b>				
Westport	21.1	7th	1966	Highest
Waipounamu	17.2	6th	1980	Highest
<b>February</b>				
Paraparaumu	20.7	5th	1972	Highest
Westport	22.4	3rd	1966	Highest
Franz Josef	18.4	5th	1953	Highest
Secretary Island	20.0	5th	1988	Highest
Appleby	20.9	5th	1941	Highest
Dunedin (Musselburgh)	20.2	5th	1947	Highest
Te Anau	19.2	5th	1973	Highest
Alexandra	22.1	5th	1992	Highest
Gore	20.9	5th	1907	Highest
Oban (Stewart Island)	18.4	5th	1975	Highest
Nugget Point	17.8	5th	1972	Highest
Tautuku	18.7	5th	1976	Highest
South West Cape	18.5	5th	1991	Highest
Milford Sound	18.3	5th	1935	Equal highest
Windsor	17.6	3rd	2000	Equal highest
Waipounamu	17.8	2nd	1980	Equal highest
Campbell Island	13.7	2nd	1991	Equal highest
<b>March</b>				
Dunedin (Airport)	19.1	9th	1972	Highest

April				
Secretary Island	17.4	17th	1988	Highest
May				
Kaitaia	20.2	1st	1948	Highest
Kaikohe	17.8	1st	1973	Highest
Purerua	18.6	3rd	1983	Highest
Whangārei	19.0	6th	1967	Highest
Auckland (Western Springs)	19.2	2nd	1971	Highest
Whitianga	18.8	5th	1971	Highest
Matamata	17.0	4th	1999	Highest
Tauranga	18.8	5th	1941	Highest
Te Puke	17.8	3rd	1973	Highest
Whakatāne	18.7	3rd	1975	Highest
Rotorua	16.7	2nd	1972	Highest
Taupō	16.4	2nd	1950	Highest
Auckland (Airport)	18.3	4th	1961	Highest
Hamilton (Airport)	17.4	4th	1946	Highest
Port Taharoa	17.9	6th	1974	Highest
Waikeria	17.2	4th	1972	Highest
Tūrangi	15.8	2nd	1968	Highest
Mt Ruapehu Chateau	11.4	2nd	2000	Highest
Ngawi	18.8	3rd	1972	Highest
Hāwera	16.7	3rd	1977	Highest
Ohakune	15.4	3rd	1972	Highest
Waiouru	14.2	2nd	1972	Highest
Westport	16.8	2nd	1966	Highest
Arapito	15.8	2nd	1978	Highest
Greymouth	15.9	2nd	1972	Highest
Ōkārīto	16.4	3rd	1983	Highest
Franz Josef	15.7	3rd	1953	Highest
Haast	15.9	3rd	1949	Highest
Motueka	16.1	7th	1972	Highest
Nelson	17.4	3rd	1862	Highest
Appleby	16.4	2nd	1941	Highest
Brothers Island	16.2	3rd	1997	Highest
Grassmere Salt Works	18.9	3rd	1972	Highest
Arthurs Pass	12.4	9th	1978	Highest
Akaroa	18.1	4th	1978	Highest
Dunedin (Airport)	13.2	3rd	1972	Highest
Auckland (Whenuapai)	18.2	4th	1951	Equal highest
Hamilton (Ruakura)	17.2	4th	1940	Equal highest
Wellington (Kelburn)	17.0	3rd	1931	Equal highest
Stratford	15.2	2nd	1972	Equal highest
June				
Paraparaumu	15.8	2nd	1972	Highest
Westport	14.6	23rd	1966	Highest
Motueka	15.0	24th	1972	Highest

Brothers Island	14.9	2nd	1997	Highest
Cheviot	12.4	24th	1982	Highest
Peel Forest	10.5	2nd	1973	Highest
Rangiora	12.6	24th	1972	Highest
Christchurch	12.6	24th	1863	Highest
Windsor	10.4	1st	2000	Highest
Oamaru	12.1	20th	1972	Highest
Nugget Point	10.7	20th	1972	Highest
Dannevirke	14.2	2nd	1951	Equal highest
Wellington (Airport)	15.7	2nd	1972	Equal highest
<b>July</b>				
Haast	12.9	24th	1949	Highest
Orari Estate	8.6	24th	1972	Highest
Waipounamu	10.9	18th	1980	Highest
Wānaka	9.2	19th	1972	Equal highest
<b>August</b>				
None observed				
<b>September</b>				
Whakatāne	16.0	23rd	1975	Highest
Mt Ruapehu Chateau	7.9	23rd	2000	Highest
Martinborough	15.4	23rd	1986	Highest
Hastings	16.8	18th	1972	Highest
Whakatu	16.7	18th	1972	Highest
Waipawa	14.9	18th	1945	Highest
Paraparaumu	14.3	23rd	1972	Highest
Wellington (Kelburn)	13.3	23rd	1931	Highest
Wellington (Airport)	14.8	23rd	1972	Highest
Upper Hutt (Trentham)	14.5	23rd	1972	Highest
Ōkārito	13.1	22nd	1983	Highest
Pelorus Sd, Crail Bay	14.0	21st	1986	Highest
Appleby	13.6	23rd	1941	Highest
Brothers Island	13.4	18th	1997	Highest
Kaikōura	14.2	21st	1972	Highest
Cheviot	13.8	17th	1982	Highest
Winchmore	14.3	21st	1949	Highest
Peel Forest	16.3	21st	1973	Highest
Ashburton	15.1	21st	1928	Highest
Waipara West	17.2	21st	1973	Highest
Rangiora	16.3	21st	1972	Highest
Christchurch	16.0	21st	1863	Highest
Lincoln	16.8	21st	1881	Highest
Akaroa	16.5	21st	1978	Highest
Pukaki Airport	13.1	21st	1972	Highest
Orari Estate	13.3	21st	1972	Highest
Wānaka	12.1	21st	1972	Highest
Ranfurly	13.4	21st	1897	Highest
Middlemarch	16.1	21st	2000	Highest

Dunedin (Musselburgh)	16.5	21st	1947	Highest
Alexandra	16.5	21st	1992	Highest
Clyde	13.5	21st	1978	Highest
Roxburgh	16.7	21st	1950	Highest
Reefton	12.8	21st	1972	Equal highest
Grassmere Salt Works	15.9	22nd	1972	Equal highest
Lake Tekapo/Takapō	11.5	21st	1928	Equal highest
Lauder	14.5	21st	1924	Equal highest
<b>October</b>				
Chatham Island	14.1	27th	1878	Equal highest
<b>November</b>				
None observed				
<b>December</b>				
Cape Reinga	18.7	29th	1971	Highest
Kaitia	21.7	31st	1948	Highest
Kerikeri	21.2	31st	1952	Highest
Kaikohe	20.1	31st	1973	Highest
Whangārei	21.4	31st	1967	Highest
Whitianga	20.4	26th	1971	Highest
Whakatāne	21.5	31st	1975	Highest
Waikeria	22.0	31st	1972	Highest
Martinborough	20.6	25th	1986	Highest
Hicks Bay	19.8	31st	1972	Highest
Māhia	19.4	31st	1990	Highest
Hāwera	19.2	25th	1977	Highest
Tara Hills	18.0	21st	1949	Highest
Wānaka	18.3	21st	1972	Highest
Leigh	19.9	31st	1966	Equal highest
Mt Ruapehu (Chateau)	14.2	25th	2000	Equal highest
Palmerston North	19.4	24th	1940	Equal highest

### Strong winds

During 13-14 February, powerful winds associated with Ex-Tropical Cyclone Gabrielle brought considerable damage to forestry areas in the central North Island. Nine sites recorded their strongest gust on record during the 13<sup>th</sup>, including a 124 km/h gust at Mt Ruapehu Chateau. Over 6,000 ha of pine was destroyed by a possible sting jet, a phenomenon where powerful winds from the atmosphere descend the surface during intense storms.

From 17-18 September, strong winds occurred over much of the South Island and lower North Island, with widespread reports of damage and accidents as a result. Approximately 7,000 properties in Wellington were without power, as were properties in Waimatua (near Invercargill) as strong winds caused damage to power lines. A campervan and SUV were blown over by strong winds on the road between Tekapo and Twizel (SH8), while two campervans were blown over on the Mt Cook Highway (SH80). There were a raft of flight cancellations throughout the country but especially in Wellington, where aircraft were simply unable to land on the evening of 17 September due to the winds. A tree was blown onto a house in Levin, with downed trees also reported in Invercargill,

Puramahoi (near Golden Bay), and Wainuiomata. Strong winds lifted roofs in parts of the Manawatū and Wellington. Fires near Culverden, Dunsandel, Kaikōura and Renwick were exacerbated by gusty winds, before being brought under control by the local Fire Services.

On 14 October, an area of low pressure moving across the South Island delivered damaging winds to Canterbury in particular, with some gusts exceeding 150 km/h. More than 8,000 homes were left without electricity, while FENZ had more than 25 responses underway by early afternoon due to downed power lines, fallen trees, lifting roofs, and a tree that had fallen onto a car in central Christchurch. The Southern Cross hospital in Christchurch had part of its roof destroyed by the high winds. At least 21 flights in and out of Christchurch Airport were cancelled, while an Emirates A380 had to circle the city for an hour before successfully landing. SH1 was closed for a time due to a fallen tree south of Cheviot.

**Table 11. Maximum wind gust extremes in 2023 were recorded at:**

Location	Maximum wind gust (km/h)	Date of maximum wind gust	Year records began	Ranking
<b>January</b>				
Cape Reinga	141	3rd	1974	Highest
<b>February</b>				
Kaitiāia	109	13th	1972	Highest
Dargaville	128	13th	1997	Highest
Whangārei	102	13th	1973	Highest
Mokohinau	150	12th	1994	Highest
Auckland (Western Springs)	82	14th	1994	Highest
Taupō	107	14th	1982	Highest
Tūrangi	96	14th	1973	Highest
Mt Ruapehu Chateau	124	13th	2000	Highest
Whakatu	89	13th	1997	Highest
New Plymouth	128	14th	1972	Equal highest
Oamaru	85	5th	1984	Equal highest
<b>March</b>				
Māhia	96	29th	1991	Highest
<b>April</b>				
Bromley	91	24th	1972	Highest
Reefton	54	24th	1999	Equal highest
<b>May</b>				
Secretary Island	169	10th	1994	Highest
Hanmer Forest	165	15th	1995	Highest
<b>June</b>				
Puysegur Point	161	1st	1986	Highest
<b>July</b>				
None observed				
<b>August</b>				
Palmerston North	96	29th	1991	Highest
Mt Cook (Airport)	146	1st	2000	Highest
Windsor	93	1st	2001	Highest

South West Cape	172	1st	1991	Highest
<b>September</b>				
Baring Head	161	17th	1991	Highest
Palmerston North	98	18th	1991	Highest
Puysegur Point	183	20th	1986	Highest
Hanmer Forest	109	17th	1995	Highest
Mt Cook (Airport)	178	17th	2000	Highest
Middlemarch	135	20th	2000	Highest
Whanganui	98	17th	1977	Equal highest
Wānaka	93	20th	1992	Equal highest
South West Cape	180	20th	1991	Equal highest
<b>October</b>				
Whitianga	87	10th	1991	Highest
Rangiora	102	14th	1999	Highest
Clyde	100	2nd	1983	Highest
Mokohinau Island	122	29th	1994	Equal highest
Te Puke	61	2nd	1987	Equal highest
<b>November</b>				
Farewell Spit	111	15th	1973	Highest
Mt Cook (Airport)	172	15th	2000	Highest
South West Cape	209	15th	1991	Highest
<b>December</b>				
Mt Cook (Airport)	133	9th	2000	Equal highest

## Snow and ice

On 22 February, a strong southerly change resulted in sub-freezing temperatures and snow across the tops of the Southern Alps. More than 30 centimetres fell at Mt Hutt, Canterbury, which saw visitors skiing and snowboarding during the mountain's open day on 25 February.

On 19 June, Mount Hutt ski area (Canterbury) was forced to close due to a lack of snow, after opening for the season on 10 June. The snowpack depth was relatively low to start the season, and warm temperatures combined with a period of rain meant the lower elevation runs became unskiable. Farther south, Coronet Peak (Otago) opened their learner area and Meadows Chair on 16 June, but the ski area was also forced to subsequently close on 26 June due to deteriorating conditions and a lack of snow.

On 22 September, heavy snow fell to low elevations in inland parts of Canterbury and northern Otago. SH80 to Mount Cook Village was closed because of snow, notably just a day after it had been closed due to a fire at Pukaki Downs. Ōhau ski area reported 1 metre of new snow. Farther south, Coronet Peak ski area was forced to call an early end to their ski season after warm temperatures and heavy rainfall melted a great deal of their snowpack. Although fresh snowfall did occur at Coronet Peak on 22 September, it wasn't enough to recover from the snowpack losses from the preceding days. Across the Wakatipu Basin, the Remarkables ski area also suffered from rainfall during the early portion of the event, but reported up to 45 cm of new snow at higher elevations by the end of the event.



## **Lightning, hail and tornadoes**

On 25 February around 9:00 am, a tornado was spotted in Waihi Beach, damaging homes, cars, trees, and cutting power to nearly 2500 properties. Based on photo evidence, it initially appeared to be a waterspout (tornado over the water) before moving onto land, thus becoming a tornado.

Late in the evening of 20 March, a small tornado was reported in Greymouth, causing damage to properties and downing power lines on Turumaha Street. Debris from the tornado caused damage to at least a dozen cars at nearby *Greenfield Motors*.

On 9 April, ten homes were yellow-stickered after a tornado passed through the Auckland suburbs of Pakuranga, Golflands, East Tāmaki, Dannemora, Flat Bush, Botany and Howick. Reported damage included downed trees and fences, lifted tiles of roofs, broken windows and damaged cars.

On 10 April, a tornado impacted approximately 50 homes in parts of Upper Moutere, lifting roofs off houses, and downing trees and power lines. Approximately 34,000 lightning strikes were reported in the New Zealand region, with 8,827 of those strikes over land.

On 11 April, at least 20 homes in Paraparaumu were damaged by a tornado, with one home lifted off its piles. One person was confirmed injured. A waterspout was spotted off the coast north of Titahi Bay. Farther north, a tornado caused damage to several properties in Waitara (Taranaki) in the early hours of the morning. In addition, a tornado caused damage to a kiwifruit orchard in Katikati (Bay of Plenty).

On 10 May, a tornado was reported in south Taranaki, near Eltham.

On 5 June, thunderstorms occurred over upper parts of the North Island. A funnel cloud was sighted off the coast of Langs Beach, Northland. Farther south, approximately 500 lightning strikes were detected near the Coromandel Peninsula.

On 12 December, a severe thunderstorm produced hailstones measuring up to 12 mm in the Wellington area. Earlier that day, the same system moved across Canterbury, producing large hail in places such as Timaru and Methven. A lightning strike caused a brush fire in Yaldhurst, while lightning impacted lighting and navigation systems at Christchurch Airport. Lightning strikes also caused power cuts in Halswell, Dallington, Harewood, and Waddington.

## **Cloud and fog**

For much of June, but especially 6-25 June, high pressure persisted over much of the South Island. This resulted in an inversion becoming established, with low cloud and fog trapped in many inland valleys and basins. Cromwell was one location subject to persistent low cloud cover, with the town receiving just 54 hours of sunshine for the month – its lowest sunshine total for June since records began in 1979.

On 24 July, thick fog at Auckland Airport resulted in the cancellation of 31 domestic flights.

On 19 and 21 November, low cloud about Wellington Airport caused major travel disruption, with numerous flights diverted or cancelled.

Beginning around 20 December, smoke from bushfires in New South Wales crossed the Tasman Sea to bring hazy skies to parts of the South Island.

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**For climate data or media comment, please contact:**

**Tristan Meyers**

Analytical Meteorologist/Forecaster, NIWA Wellington

Tel. 09 386 0906

**Note for editors:**

Climate measurements have been made in New Zealand for about 150 years, with reasonable coverage of reliable data from at least the early 1900s. NIWA makes its raw climate data publicly available for free online. Journalists are advised, however, to take extreme care when interpreting trends from raw data to ensure they have not been compromised by changes in site location, urbanisation, exposure, or instrumentation over time. If in any doubt, please call us.

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