

New Zealand's coldest August in seven years

| | |
|----------------------|--|
| Temperature | 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. The remainder of New Zealand experienced near average temperatures ($\pm 0.50^\circ\text{C}$ of average). |
| Rainfall | 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. Near normal rainfall (80-119% of normal) was experienced in Manawatū-Whanganui, parts of Wellington, parts of Otago, and much of Southland. |
| Soil Moisture | At the end of the month, soil moisture levels were below normal about East Cape, inland South Canterbury, and Marlborough Sounds. Soil moisture levels were above normal for parts of eastern Otago and the North Canterbury. Elsewhere, soil moisture levels were near normal. |

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Overview

August was the first month since May 2017 that Aotearoa New Zealand experienced colder-than-average temperatures, and it was the coldest August since 2016. The nationwide average temperature in August 2023 was 8.4°C. This was 0.55°C below the 1991-2020 August average according to NIWA's seven station temperature series, which began in 1909, and just scraping in as "below average" (the threshold for below average is more than 0.5°C below the 1991-2020 average).

These below average temperatures owed to higher-than-normal pressures in the Tasman Sea and to the southeast of New Zealand. This allowed for more frequent southerly airflows, which brought cool and dry air from the south, a pattern indicative of a developing El Niño.

With several cold outbreaks and sea-level snow for southern parts, 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 pockets of the North Island also experienced well below average temperatures (<1.20°C below

average). The remainder of New Zealand generally experienced near average temperatures ($\pm 0.50^{\circ}\text{C}$ of average).

A lack of moist, northerly quarter air flows and higher-than-normal pressures contributed to generally dry conditions for most of New Zealand. Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) for the east, 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 southern Wairarapa and the lower South Island. Near normal rainfall (80-119% of normal) was experienced in the Manawatū-Whanganui, parts of Wellington, parts of Otago, and much of Southland.

Further Highlights:

- The highest temperature was 21.2°C , observed at Hastings on 14 August.
- The lowest temperature was -8.3°C , observed at Cass on 11 August.
- The highest 1-day rainfall was 82 mm, recorded at Arthur's Pass on 19 August.
- The highest wind gust was 172 km/h, observed at South West Cape on 1 August.
- Of the six main centres in August 2023, Christchurch was the coldest, Auckland was the warmest, Dunedin was the driest, Wellington was the wettest, Tauranga was the sunniest, and Hamilton was the least sunny.
- Of the available, regularly reporting sunshine observation sites, the sunniest four locations in 2023 so far are wider Nelson (1644 hours), Mackenzie Basin (1617 hours), Taranaki (1605 hours) and Tasman (1586 hours).

For further information, please contact:

Tristan Meyers
Analytical Meteorologist
Tel. 04 386 0906

Temperature: Our first colder-than-average month in over six years

New Zealand experienced a colder-than-average month for the first time since May 2017, and it was the coldest August since 2016. No locations in New Zealand experienced a near-record or record high mean temperature and 13 locations experienced a record or near-record cold August.

The typical progression of weather systems during the month featured several strong Southern Ocean cold fronts, each of which brought low-level snow, including snow to sea level on 10 August around Banks Peninsula. Behind these cold fronts, high pressure quickly built, generating a string of cold nights. A total of 32 locations observed a record or near-record cold August in terms of mean minimum temperatures. Seven locations experienced mean minimum temperatures that were more than 2°C below average, including Tūrangi, New Plymouth, and Rotorua.

Record¹ or near-record mean air temperatures for August were recorded at:

| Location | Mean air temp. (°C) | Departure from normal (°C) | Year records began | Comments |
|------------------------------|---------------------|----------------------------|--------------------|------------|
| High records or near-records | | | | |
| <i>None observed</i> | | | | |
| Low records or near-records | | | | |
| Mt Ruapehu (Chateau) | 1.8 | -1.7 | 2000 | Lowest |
| Pukekohe | 9.3 | -1.7 | 1969 | 2nd-lowest |
| Matamata | 7.8 | -1.5 | 1999 | 2nd-lowest |
| Warkworth | 9.5 | -1.4 | 1966 | 2nd-lowest |
| Whangārei | 10.3 | -1.4 | 1967 | 2nd-lowest |
| Ōkārīto | 7.4 | -1.0 | 1982 | 2nd-lowest |
| Brothers Island | 10.0 | -0.7 | 1997 | 2nd-lowest |
| Stratford | 7.0 | -1.6 | 1960 | 3rd-lowest |
| Hamilton (Airport) | 8.4 | -1.3 | 1946 | 3rd-lowest |
| Te Kuiti | 8.3 | -1.3 | 1959 | 3rd-lowest |
| Purerua | 11.7 | -0.6 | 1983 | 3rd-lowest |
| Waikeria | 8.2 | -1.4 | 1957 | 4th-lowest |
| Takapau Plains | 6.6 | -1.0 | 1962 | 4th-lowest |

Record or near-record mean maximum air temperatures for August were recorded at:

| Location | Mean maximum air temp. (°C) | Departure from normal (°C) | Year records began | Comments |
|------------------------------|-----------------------------|----------------------------|--------------------|-------------|
| High records or near-records | | | | |
| Campbell Island | 8.0 | 0.6 | 1991 | 4th-highest |
| Low records or near-records | | | | |

¹ The rankings (1st, 2nd, 3rd.etc) in all Tables in this summary 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 due to the practical limitations of performing homogeneity checks in real-time.

| | | | | |
|----------------------|------|------|------|------------|
| Mt Ruapehu (Chateau) | 5.9 | -1.4 | 2000 | 2nd-lowest |
| Brothers Island | 11.6 | -0.9 | 1997 | 2nd-lowest |
| Ōkārīto | 12.0 | -1.0 | 1982 | 3rd-lowest |
| Whangārei | 14.9 | -1.0 | 1967 | 4th-lowest |
| Matamata | 13.9 | -0.7 | 1999 | 4th-lowest |

Record or near-record mean minimum air temperatures for August were recorded at:

| Location | Mean minimum air temp. (°C) | Departure from normal (°C) | Year records began | Comments |
|-------------------------------------|-----------------------------|----------------------------|--------------------|----------------|
| High records or near-records | | | | |
| <i>None observed</i> | | | | |
| Low records or near-records | | | | |
| Tūrangi | -1.3 | -3.4 | 1968 | Lowest |
| Kawerau | 2.3 | -2.5 | 1954 | Lowest |
| Rotorua | 1.7 | -2.4 | 1964 | Lowest |
| Warkworth | 4.4 | -2.4 | 1966 | Lowest |
| Matamata | 1.7 | -2.2 | 1999 | Lowest |
| New Plymouth | 4.4 | -2.1 | 1944 | Lowest |
| Orari Estate | -0.5 | -2.0 | 1972 | Lowest |
| Mt Ruapehu (Chateau) | -2.3 | -1.9 | 2000 | Lowest |
| Whangārei | 5.1 | -1.9 | 1967 | Lowest |
| Waiau | -0.3 | -1.7 | 1974 | Lowest |
| Waipawa | 1.5 | -1.6 | 1945 | Lowest |
| Waikeria | 1.9 | -2.4 | 1957 | 2nd-lowest |
| Hamilton (Airport) | 2.4 | -2.3 | 1946 | 2nd-lowest |
| Te Kuiti | 2.2 | -2.3 | 1959 | 2nd-lowest |
| Stratford | 2.5 | -2.2 | 1960 | 2nd-lowest |
| Appleby | 0.5 | -1.8 | 1932 | 2nd-lowest |
| Whakatu | 2.0 | -1.6 | 1965 | 2nd-lowest |
| Cheviot | 0.3 | -1.5 | 1982 | 2nd-lowest |
| Middlemarch | -1.5 | -1.2 | 2000 | 2nd-lowest |
| Purerua | 7.9 | -1.1 | 1983 | 2nd-lowest |
| Windsor | -0.3 | -1.0 | 2000 | 2nd-lowest |
| Christchurch | 0.4 | -1.6 | 1863 | 3rd-lowest |
| Hicks Bay | 6.9 | -1.5 | 1969 | 3rd-lowest |
| Takapau Plains | 2.1 | -1.3 | 1962 | 3rd-lowest |
| Ōkārīto | 2.7 | -1.2 | 1982 | 3rd-lowest |
| Clyde | -2.1 | -1.0 | 1978 | 3rd-lowest |
| Whangaparāoa | 8.2 | -1.1 | 1982 | Eq. 3rd-lowest |
| Whitianga | 4.2 | -2.4 | 1962 | 4th-lowest |
| Palmerston North | 3.2 | -2.0 | 1928 | 4th-lowest |
| Tākaka | 1.8 | -1.5 | 1978 | 4th-lowest |
| Pukaki | -3.4 | -1.4 | 1972 | 4th-lowest |
| Hāwera | 4.3 | -1.3 | 1977 | 4th-lowest |

Rainfall: A dry month for many

Although there were no shortage of cold fronts (rain-bearing systems) during the month, the fronts generally lacked any tropical connection. This meant that these rainmakers generally did not bring much significant or widespread rainfall.

Due to their lack of exposure to these weather systems, eastern areas of both Islands, including Bay of Plenty, Gisborne, Hawke's Bay, and Canterbury all experienced below normal rainfall. Otaio, Waimate, Orari, Ohoka, Oamaru, Cromwell, Windsor, Pukaki, Bromley and Kaikoura all recorded 29 or more dry days (where daily rainfall totals were less than 1 mm) during August. Oamaru, Waimate, Windsor and Whakatu had their driest August on record. In a sharp turnaround from the first half of 2023, places that have been very wet for the first six months of 2023 experienced near-record dry conditions, including Kerikeri, parts of Auckland, Whakatāne, and Gisborne.

Notably, this August differed considerably to last year (2022), which featured several rain events and had a record-breaking atmospheric river that brought devastating flooding to parts of New Zealand.

Record or near-record August rainfall totals were recorded at:

| Location | Rainfall total (mm) | Percentage of normal | Year records began | Comments |
|-------------------------------------|---------------------|----------------------|--------------------|------------------|
| High records or near-records | | | | |
| Campbell Island | 154 | 142 | 1992 | 2nd-highest |
| Low records or near-records | | | | |
| Oamaru | 1 | 3 | 1941 | Lowest |
| Waimate | 2 | 6 | 1898 | Lowest |
| Windsor | 2 | 7 | 2000 | Lowest |
| Whakatu | 11 | 19 | 1965 | Lowest |
| Orari Estate | 7 | 11 | 1897 | 2nd-lowest |
| Gisborne | 17 | 19 | 1905 | 2nd-lowest |
| Wairoa | 25 | 27 | 1964 | 2nd-lowest |
| Whakatāne | 41 | 32 | 1952 | 2nd-lowest |
| Raoul Island | 46 | 35 | 1991 | 2nd-lowest |
| Whitianga | 72 | 39 | 1961 | 2nd-lowest |
| Tutira | 18 | 14 | 1894 | 3rd-lowest |
| Waiau | 17 | 25 | 1974 | 3rd-lowest |
| Russell | 44 | 31 | 1919 | 3rd-lowest |
| Te Puke | 66 | 42 | 1973 | 3rd-lowest |
| Kerikeri | 79 | 46 | 1935 | 3rd-lowest |
| Hastings | 16 | 29 | 1965 | Equal 3rd-lowest |
| Cheviot | 10 | 16 | 1982 | 4th-lowest |
| Winchmore | 16 | 27 | 1947 | 4th-lowest |
| Hicks Bay | 39 | 29 | 1916 | 4th-lowest |
| Waipawa | 23 | 37 | 1945 | 4th-lowest |
| Auckland (Western Springs) | 68 | 52 | 1948 | 4th-lowest |
| Purerua | 100 | 77 | 1983 | 4th-lowest |

August climate in the six main centres

Temperatures were below average in all main centres except for Dunedin, which was near average. It was also a dry month for the six centres, as no centre recorded above normal rainfall, and Auckland and Tauranga both recorded 50% or less of their August normal. Parts of Auckland (Western Springs) experienced their 4th-lowest August rainfall on record, a stark change from the first half of the year, where Auckland recorded more than their annual average within six months. Of the six main centres in August 2023, Christchurch was the coldest, Auckland was the warmest, Dunedin was the driest, Wellington was the wettest, Tauranga was the sunniest, and Hamilton was the least sunny.

August 2023 main centre climate statistics:

| Temperature | | | |
|---------------------------|------------------|----------------------------|--------------------|
| Location | Mean temp. (°C) | Departure from normal (°C) | Comments |
| Auckland ^a | 10.8 | -1.0 | Below average |
| Tauranga ^b | 10.2 | -0.8 | Below average |
| Hamilton ^c | 8.4 | -1.3 | Well-below average |
| Wellington ^d | 8.8 | -0.9 | Below average |
| Christchurch ^e | 6.4 | -0.9 | Below average |
| Dunedin ^f | 8.1 | 0.3 | Near average |
| Rainfall | | | |
| Location | Rainfall (mm) | % of normal | Comments |
| Auckland ^a | 59 | 50 | Below normal |
| Tauranga ^b | 43 | 39 | Well below normal |
| Hamilton ^c | 96 | 81 | Near normal |
| Wellington ^d | 126 | 90 | Near normal |
| Christchurch ^e | 44 | 76 | Below normal |
| Dunedin ^f | 42 | 76 | Below normal |
| Sunshine | | | |
| Location | Sunshine (hours) | | |
| Auckland ^a | 117 | | |
| Tauranga ^b | 229 | | |
| Hamilton ^g | 119 | | |
| Wellington ^d | 153 | | |
| Christchurch ^e | 208 | | |
| Dunedin ^f | 156 | | |

^a Māngere ^b Tauranga Airport ^c Hamilton Airport ^d Kelburn ^e Christchurch Airport ^f Musselburgh ^g Ruakura

Highlights and extreme events

Temperatures

The highest temperature was 21.2°C, observed at Hastings on 14 August.

The lowest temperature was -8.3°C, observed at Cass on 11 August.

Following a cold front, a strong ridge of high pressure built across New Zealand on 3-4 August. This resulted in widespread frosts through the central and northern North Island, and the central and eastern South Island. Additionally, Greymouth dropped to -1.3°C, Westport to -0.7°C, and Kawerau dropped to -2.7°C; their 4th-lowest August minimum on record.

On 9 August, a strong cold front brought low-level snow across the South Island. The front moved over the North Island overnight, and a separate surface low associated with the front moved over the South Island on 10 August. The low brought sea-level snowfall to parts of eastern Canterbury, including around Banks Peninsula, while snowflakes were observed during the morning and early afternoon in the greater Christchurch area. Meanwhile, parts of the North Island recorded an exceptionally cold August day, including Palmerston North, which only rose to 6°C, their coldest August day on record.

In the wake of this wintry outbreak, widespread frost and sub-zero temperatures were recorded. Over 115 observation sites recorded sub-zero temperatures on the morning of 11 August.

Record or near-record daily maximum air temperatures for August were recorded at:

| Location | Extreme maximum (°C) | Date of extreme temperature | Year records began | Comments |
|------------------------------|----------------------|-----------------------------|--------------------|------------------|
| High records or near-records | | | | |
| None observed | | | | |
| Low records or near-records | | | | |
| Palmerston North (Airport) | 6.0 | 10th | 1940 | Lowest |
| Castlepoint | 6.4 | 10th | 1972 | 2nd-lowest |
| Dannevirke | 4.7 | 10th | 1951 | 2nd-lowest |
| Levin | 7.4 | 10th | 1950 | 3rd-lowest |
| Martinborough | 7.4 | 10th | 1986 | 4th-lowest |
| Milford Sound | 3.7 | 15th | 1935 | 4th-lowest |
| Mt Ruapehu (Chateau) | 0.5 | 10th | 2000 | 4th-lowest |
| Ōkārīto | 7.7 | 15th | 1983 | 4th-lowest |
| Tākaka | 8.4 | 10th | 1978 | Equal 4th-lowest |

Record or near-record daily minimum air temperatures for August were recorded at:

| Location | Extreme minimum (°C) | Date of extreme temperature | Year records began | Comments |
|------------------------------|----------------------|-----------------------------|--------------------|-------------|
| High records or near-records | | | | |
| Puysegur Point | 11.9 | 24th | 1978 | 3rd-highest |

| Low records or near-records | | | | |
|-----------------------------|------|------|------|------------------|
| Brothers Island | 3.9 | 10th | 1997 | 2nd-lowest |
| Tūrangi | -6.7 | 29th | 1968 | 2nd-lowest |
| Greymouth | -1.3 | 3rd | 1947 | 4th-lowest |
| Kawerau | -2.7 | 4th | 1954 | 4th-lowest |
| Westport | -0.7 | 3rd | 1937 | 4th-lowest |
| Whangārei | 0.6 | 12th | 1967 | Equal 4th-lowest |

Rain and slips

The highest 1-day rainfall was 82 mm, recorded at Arthurs Pass on 19 August.

A plume of moisture from the tropics delivered widespread rainfall for the south Island and parts of the North Island between 19-21 August. Milford Sound recorded 92mm during this period, Hokitika 73 mm, and Tākaka 58 mm. Roxburgh in Central Otago recorded 19mm, their 3rd-wettest August day on record.

Record or near-record August extreme 1-day rainfall totals were recorded at:

| Location | Extreme 1-day rainfall (mm) | Date of extreme rainfall | Year records began | Comments |
|----------|-----------------------------|--------------------------|--------------------|-------------|
| Roxburgh | 19 | 1st | 1950 | 3rd-highest |

Wind

The highest wind gust was 172 km/h, observed at South West Cape on 1 August.

The cold front that arrived at the beginning of August brought exceptionally windy weather to parts of New Zealand. Although the windiest conditions were during 1 August morning in Southland, many areas experienced very windy weather from 1-2 August. Even the exposed South West Cape recorded a 172 km/h wind gust, the highest August wind gust recorded there. Meanwhile, Mt Cook Airport recorded a gust of 146 km/h and Windsor a 92 km/h gust, both of which were their highest on record for August. Fifteen other locations recorded near-record high wind gusts during 1-2 August, including parts of Auckland.

Record or near-record August extreme wind gusts were recorded at:

| Location | Extreme wind gust (km/h) | Date of extreme gust | Year records began | Comments |
|------------------|--------------------------|----------------------|--------------------|-------------|
| South West Cape | 172 | 1st | 1991 | Highest |
| Mt Cook Airport | 146 | 1st | 2000 | Highest |
| Palmerston North | 96 | 29th | 1991 | Highest |
| Windsor | 93 | 1st | 2001 | Highest |
| Mokohinau Island | 122 | 21st | 1994 | 2nd-highest |
| Winchmore | 113 | 1st | 1970 | 2nd-highest |
| Ranfurly | 83 | 1st | 2000 | 2nd-highest |
| Puysegur Point | 158 | 1st | 1986 | 3rd-highest |
| Secretary Island | 126 | 19th | 1994 | 3rd-highest |
| Waiouru | 117 | 19th | 1970 | 3rd-highest |
| Whakatāne | 106 | 2nd | 1974 | 3rd-highest |

| | | | | |
|----------------------------|-----|-----|------|-------------------|
| Auckland (Whenuapai) | 100 | 2nd | 1972 | Equal 3rd-highest |
| Farewell Spit | 95 | 2nd | 1973 | Equal 3rd-highest |
| Te Puke | 56 | 2nd | 1987 | Equal 3rd-highest |
| Baring Head | 145 | 2nd | 1991 | 4th-highest |
| Dunedin Airport | 109 | 1st | 1972 | 4th-highest |
| Port Taharoa | 107 | 2nd | 1978 | 4th-highest |
| Bromley | 95 | 2nd | 1972 | 4th-highest |
| Middlemarch | 98 | 1st | 2000 | Equal 4th-highest |
| Oamaru | 83 | 1st | 1984 | Equal 4th-highest |
| Auckland (Western Springs) | 76 | 2nd | 1994 | Equal 4th-highest |

Snow and ice

From 2-3 August, a cold southerly outbreak delivered widespread snowfalls to elevated terrain. On 2 August, snow fell to approximately 200 metres above sea level over the lower South Island, with snow reported in many areas including Queenstown, Arrowtown, Naseby, Ranfurly, St Bathans and Oturehua. NIWA's atmospheric research station observed settled snowfall (Figure 1). Several flights were cancelled at Queenstown airport due to snow on the runway. A number of roads were closed for a time due to snow including the Milford Road (SH94), SH94 between Mossburn and Te Anau, SH96 between Ohai and Nightcaps, SH85 between Kyeburn and Palmerston, the Crown Range Road, the Lindis Pass (SH8), Porters Pass and Arthur's Pass (SH73).



Figure 1: August 2 at NIWA's atmospheric research station in Lauder (Otago).

On 9 August, another strong cold front brought low-level snow across the South Island and parts of the North Island. A separate surface low associated with the front moved over the South Island on 10 August. Sea level snow was observed in Banks Peninsula on 10 August, with wet flakes seen about Christchurch. Snow warnings were issued for SH 5 Napier-Taupō Rd. Several parts of the state highways were affected by heavy snow in Southland, Otago, and Canterbury.

Lightning, hail, and tornadoes

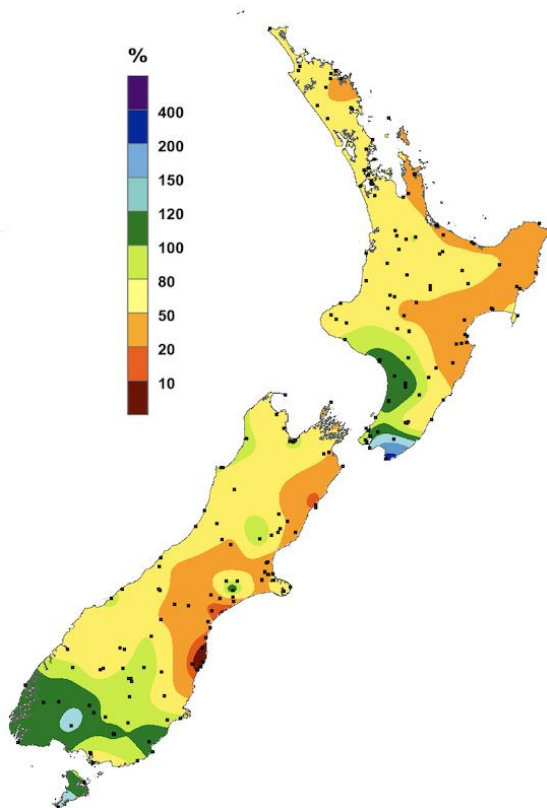
On the evening of the 15 August and on the 16 August, a cut off low and surface low pressure system generated a series of organised showers and thunderstorms which produced heavy showers and hail for Wellington.

For further information, please contact:

Tristan Meyers

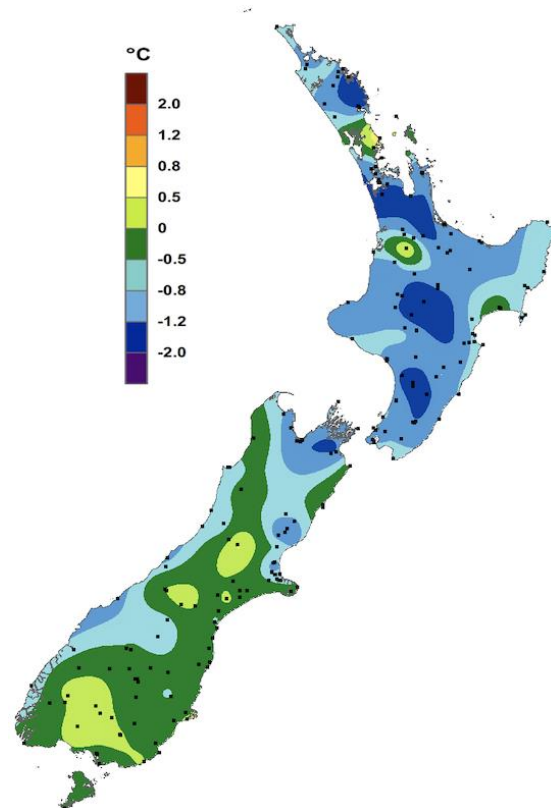
Analytical Meteorologist, NIWA Wellington

Tel. 04 386 0906



August rainfall

Expressed as a percentage of the 1991-2020 normal.



August temperature

Expressed as a departure from the 1991-2020 average in degrees Celsius.

<https://www.niwa.co.nz/our-science/climate>

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