

## Dry and cool for upper North Island, wet for South Island

<b>Rainfall</b>	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.
<b>Temperature</b>	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.
<b>Soil Moisture</b>	At the end of March, soil moisture levels were above normal for most of the North Island, eastern parts of Canterbury north of Ashburton, and parts of Otago and Southland. Soil moisture levels were below normal in northern parts of Northland, and Nelson. Elsewhere, soil moisture levels were mostly near normal.

Click on the link to jump to the information you require:

[Overview](#)

[Rainfall](#)

[Temperature](#)

[March 2023 climate in the six main centres](#)

[Highlights and extreme events](#)

### Overview

March was characterised by lower than normal mean sea level pressure (MSLP) in the Aotearoa New Zealand region, with numerous low pressure systems tracking in from the Tasman Sea during the month. After three consecutive years of La Niña, ENSO neutral conditions developed during March, and much of the country observed more frequent westerly winds than normal. Sea surface temperatures in New Zealand's coastal waters remained higher than average during March, and were the warmest on record for the month of March to the east of the South Island. The Southern Annular Mode (SAM) became strongly negative during the first two weeks of March, and the index reached as low as -2.5, which was the lowest March daily value since 2017, and 2002 prior to that.

March rainfall was below normal (50-79% of normal) or well below normal rainfall (<50% of normal) in Northland, Auckland, northern Waikato, coastal Bay of Plenty, Gisborne, northern Wairarapa and Nelson. In contrast, rainfall was above normal (120-149% of normal) or well above normal (>149% of

normal) across much of the South Island, as well as Wellington, southern Wairarapa, Whanganui and Taranaki.

March 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. This was despite an unseasonable cold snap later in the month which delivered snow to low elevations, and saw numerous locations set record or near-record low daily maximum and daily minimum temperatures (see *Highlights and extreme events* section for further details). The nationwide average temperature in March 2023 was 15.9°C. This was 0.1°C above the 1991-2020 March average from NIWA's seven station temperature series which begins in 1909.

#### **Further Highlights:**

- The highest temperature was 30.5°C, observed at Akaroa on 2 March.
- The lowest temperature was -4.1°C, observed at Manapouri on 30 March.
- The highest 1-day rainfall was 166 mm, recorded at Mt Cook Village on 20 March.
- The highest wind gust was 170 km/h, observed at Cape Turnagain on 30 March.
- Of the six main centres in March 2023, Auckland was the sunniest and driest, Auckland and Tauranga were the equal-warmest, Wellington was the wettest, Christchurch and Dunedin were the equal-coolest, and Dunedin was the least sunny.
- Of the available, regularly reporting sunshine observation sites, the sunniest four locations so far in 2023 are West Coast (795 hours), Central Otago (785 hours), Mackenzie Basin (766 hours), and Taranaki (764 hours).

#### **For further information, please contact:**

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## **Rainfall: Dry for the upper North Island, wet in the South Island**

March was a dry month for the upper North Island, with rainfall events few and far between. It was especially dry in Russell which received just 8 mm of rain (7% of the March normal), making it the town's third-driest March since records there began in 1919. Whangārei recorded 17 mm of rain (14% of the March normal), while Kaitaia, Kerikeri and Dargaville each received less than a third of their normal March rainfall. Auckland (Māngere) received 37 mm of rainfall, which is 41% of its March normal. However, Māngere has already recorded 64% of its normal *annual* rainfall so far this year, due to the exceptionally wet first two months of the year. It was a wet month for much of the South Island, where six locations observed record or near-record high March rainfall totals.

**Record<sup>1,2</sup> or near-record March rainfall totals were recorded at:**

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
<b>High records or near-records</b>				
Five Rivers	179	240	1982	Highest
Le Bons Bay	96	237	1984	2nd-highest
Pukaki	112	222	1972	2nd-highest
Windsor	51	193	2000	2nd-highest
Lumsden	170	229	1982	2nd-highest
Cheviot	119	248	1982	4th-highest
<b>Low records or near-records</b>				
Russell	8	7	1919	3rd-lowest

**Temperature: Cool for upper North Island, warm for coastal parts of South Island**

March was a cool month for northern parts of the country, and four North Island locations observed record or near-record low March mean temperatures. A relative lack of cloud cover contributed to enhanced radiative cooling at night in parts of northern Auckland and Northland, with Warkworth and Whangārei recording mean daily minimum temperatures that were 2.4°C and 1.7°C below average, respectively.

Warmer than normal sea surface temperatures contributed to relatively high air temperatures for some coastal fringes of the South Island. The mean temperature of both Chatham Island and Stewart Island was 1.5°C higher than average for March. The nationwide average temperature in March 2023 was 15.9°C. This was 0.1°C above the 1991-2020 March average from NIWA's seven station temperature series which begins in 1909.

**Record or near-record mean air temperatures for March were recorded at:**

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
Chatham Island	16.5	1.5	1878	3rd-highest
Oban (Stewart Island)	13.8	1.5	1975	4th-highest
Campbell Island	9.6	0.8	1991	4th-highest
<b>Low records or near-records</b>				
Mt Ruapehu Chateau	9.4	-1.6	2000	Lowest
Matamata	15.5	-1.3	1999	2nd-lowest
Warkworth	16.4	-1.1	1966	3rd-lowest
Purerua	18.2	-0.5	1983	4th-lowest

<sup>1</sup> The rankings (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>.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.

<sup>2</sup> All normal values in this climate summary are compared to the 1991-2020 normals.

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

Location	Mean maximum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
Campbell Island	11.6	0.7	1991	3rd-highest
Chatham Island	19.8	1.6	1878	3rd-highest
Motu	20.7	1.6	1990	4th-highest
Oban (Stewart Island)	17.7	1.5	1975	4th-highest
<b>Low records or near-records</b>				
Matamata	22.0	-1.2	1999	3rd-lowest
Port Taharoa	20.9	-1.3	1973	3rd-lowest
Mt Ruapehu Chateau	14.8	-1.4	2000	3rd-lowest

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

Location	Mean minimum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
Oban (Stewart Island)	9.9	1.5	1975	4th-highest
Campbell Island	7.5	0.8	1991	4th-highest
Chatham Island	13.3	1.5	1878	4th-highest
<b>Low records or near-records</b>				
Warkworth	10.4	-2.4	1966	2nd-lowest
Mt Ruapehu Chateau	4.0	-1.8	2000	2nd-lowest
Purerua	13.9	-1.2	1983	3rd-lowest
Whangārei	11.5	-1.7	1967	3rd-lowest
Matamata	9.0	-1.5	1999	3rd-lowest
Whakatu	9.4	-1.2	1965	4th-lowest
Waipounamu	6.5	-0.1	1980	4th-lowest

## March climate in the six main centres

March rainfall was below normal or well below normal in Auckland, Tauranga, and Hamilton, and above normal or well above normal in Wellington, Christchurch, and Dunedin. March temperatures were near average for most main centres, except for Hamilton (below average) and Dunedin (above average). Auckland observed its second-highest March sunshine hour total since records began in 1963, while Hamilton observed its third-highest March sunshine hour total (records began in 1936). Of the six main centres in March 2023, Auckland was the sunniest and driest, Auckland and Tauranga were the equal-warmest, Wellington was the wettest, Christchurch and Dunedin were the equal-coolest, and Dunedin was the least sunny.

### March 2023 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland <sup>a</sup>	18.2	-0.5	Near average
Tauranga <sup>b</sup>	18.2	-0.2	Near average
Hamilton <sup>c</sup>	16.0	-1.1	Below average
Wellington <sup>d</sup>	16.0	+0.1	Near average
Christchurch <sup>e</sup>	14.8	-0.1	Near average
Dunedin <sup>f</sup>	14.8	+0.9	Above average
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland <sup>a</sup>	37	41	Well below normal
Tauranga <sup>b</sup>	57 <sup>3</sup>	60	Below normal
Hamilton <sup>c</sup>	61	75	Below normal
Wellington <sup>d</sup>	134	134	Above normal
Christchurch <sup>e</sup>	126	279	Well above normal
Dunedin <sup>f</sup>	106	197	Well above normal
Sunshine			
Location	Sunshine (hours)		
Auckland <sup>a</sup>	258		
Tauranga <sup>b</sup>	225 <sup>4</sup>		
Hamilton <sup>g</sup>	244		
Wellington <sup>d</sup>	195		
Christchurch <sup>e</sup>	206		
Dunedin <sup>f</sup>	187 <sup>5</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>3</sup> Missing 3 days of data.

<sup>4</sup> Missing 4 days of data.

<sup>5</sup> Missing 1 day of data.

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## Highlights and extreme events

### Rain and flooding

The highest 1-day rainfall was 166 mm, recorded at Mt Cook Village on 20 March.

On 5 March, a torrential downpour caused surface flooding and damage to several stores in Taupō. *Fire and Emergency New Zealand* responded to four emergency callouts following the short but intense burst of rain. Taupō recorded 29 mm rain in the hour to 6 p.m.

Overnight from 5 to 6 March, heavy rain caused a washout which closed SH25 between Hikuai and Whangamatā. Fire and Emergency New Zealand were called out to ten homes in Tauranga and seven homes in Whangamatā which had been flooded.

On 17 March, heavy rain caused a slip on SH7 between Springs Junction and Reefton, forcing that section of road to be closed for six hours.

From 20-21 March, heavy rain caused surface flooding in parts of Southland and Otago. Several roads were closed due to flooding, particularly in the Clutha District. Farther north in the West Coast, SH6 was closed between Harihari and Ross due to a slip.

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

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Comments
Lumsden	63	20th	1982	Highest
Tiwai Point	71	20th	1970	Highest
Cheviot	59	5th	1982	2nd-highest
Gore	55	20th	1907	2nd-highest
Lake Moeraki	148	20th	1985	3rd-highest
Tara Hills	38	20th	1949	3rd-highest
Five Rivers	52	20th	1982	3rd-highest
Ōkārito	109	20th	1981	4th-highest
Le Bons Bay	33	21st	1984	4th-highest
Pukaki	37	4th	1972	4th-highest
Invercargill	50	20th	1939	4th-highest

### Drought and dry spells

In early March, farmers in parts of Southland and southern Otago reported that feed was running low due to ongoing dry conditions.

Dry-to-extremely dry soils that had been present in the upper West Coast and lower South Island during summer showed steady improvement through March due to regular rainfall events. By the end of the month, unusually dry soils had been replenished by moisture across most of the South Island.

### Temperatures

The highest temperature was 30.5°C, observed at Akaroa on 2 March.

The lowest temperature was -4.1°C, observed at Manapouri on 30 March.

On 28 March, a strong cold front moved up the South Island, bringing unseasonably low temperatures. In Invercargill, the maximum temperature was only 11.9°C, the city's lowest March daily maximum temperature in 14 years. Conversely, in Whangārei, where the cold front had not yet reached, the day's maximum temperature was 25.4°C, which is closer to the January average daily maximum temperature in the city.

On 29 March, the highest temperature recorded by a NIWA weather station across the North and South Islands of New Zealand was Kerikeri at 19.7°C. This marked the first day that no NIWA station reached 20°C since 17 September 2022.

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

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Comments
<b>High records or near-records</b>				
Motu	27.4	4th	1990	2nd-highest
Waipounamu	28.2	8th	1980	2nd-highest
Whangaparāoa	27.0	4th	1982	Equal 3rd-highest
Whitianga	28.2	4th	1962	4th-highest
Lumsden	27.9	8th	1982	4th-highest
Tākaka	28.0	2nd	1978	Equal 4th-highest
<b>Low records or near-records</b>				
Port Taharoa	15.9	29th	1974	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
Purerua	18.3	30th	1983	2nd-lowest
Lower Retaruke	12.5	29th	1972	2nd-lowest
Martinborough	12.7	30th	1986	2nd-lowest
Ngawi	12.4	29th	1972	2nd-lowest
Stratford	11.1	29th	1972	2nd-lowest
Ohakune	9.2	29th	1972	2nd-lowest
Whanganui	13.6	29th	1972	2nd-lowest
Arthurs Pass	5.6	29th	1973	2nd-lowest
Cheviot	10.2	29th	1982	2nd-lowest
Middlemarch	9.8	29th	2000	2nd-lowest
Windsor	11.1	29th	2000	Equal 2nd-lowest
Whangaparāoa	17.3	29th	1982	3rd-lowest
Matamata	16.6	29th	1999	3rd-lowest
Taumarunui	13.6	29th	1947	3rd-lowest
Mt Ruapehu Chateau	6.6	29th	2000	3rd-lowest
Paraparaumu	13.0	29th	1972	3rd-lowest
Hāwera	13.7	29th	1977	3rd-lowest



Waiouru	7.4	29th	1972	3rd-lowest
Culverden	9.2	29th	1930	3rd-lowest
Medbury	9.2	29th	1927	3rd-lowest
Lake Tekapo	6.0	28th	1928	3rd-lowest
Te Anau	8.1	28th	1973	3rd-lowest
Roxburgh	9.3	28th	1950	3rd-lowest
Wellington (Airport)	12.9	29th	1972	Equal 3rd-lowest
Manapouri	8.8	28th	1973	Equal 3rd-lowest
Tūrangi	13.8	29th	1968	4th-lowest
Hanmer Forest	8.3	29th	1972	4th-lowest
Waipara West	11.0	28th	1973	4th-lowest
Rangiora	11.1	28th	1972	4th-lowest
Pukaki	9.8	21st	1972	4th-lowest
Wānaka	10.4	28th	1972	4th-lowest
Five Rivers	8.7	28th	1982	4th-lowest
Cape Reinga	17.9	29th	1971	Equal 4th-lowest
Taupō	13.3	29th	1950	Equal 4th-lowest
Takapau Plains	11.5	29th	1972	Equal 4th-lowest
Upper Hutt (Trentham)	12.5	29th	1972	Equal 4th-lowest
Waiau	10.5	29th	1974	Equal 4th-lowest

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

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Comments
<b>High records or near-records</b>				
Dunedin (Airport)	19.1	9th	1972	Highest
Oban (Stewart Island)	15.6	2nd	1975	3rd-highest
Campbell Island	11.8	17th	1991	3rd-highest
Orari Estate	16.0	3rd	1972	Equal 4th-highest
<b>Low records or near-records</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
Whangaparāoa	9.7	30th	1982	2nd-lowest
Kawerau	3.1	30th	1954	2nd-lowest
Māhia	7.6	30th	1990	2nd-lowest
Tākaka	1.8	29th	1978	2nd-lowest
Arapito	2.1	29th	1978	2nd-lowest
Haast	2.1	29th	1949	2nd-lowest
Brothers Island	8.6	29th	1997	2nd-lowest
Manapouri	-4.1	30th	1963	2nd-lowest
Alexandra	-1.9	30th	1929	2nd-lowest
South West Cape	4.4	28th	1991	2nd-lowest



Kerikeri	4.9	31st	1945	3rd-lowest
Warkworth	4.4	30th	1966	3rd-lowest
Westport	3.1	29th	1937	3rd-lowest
Tara Hills	-3.8	30th	1949	3rd-lowest
Matamata	1.0	30th	1999	4th-lowest
Port Taharoa	7.8	30th	1973	4th-lowest
Ōkārīto	1.5	29th	1982	4th-lowest
Franz Josef	1.5	29th	1953	4th-lowest
Rotorua	1.9	30th	1964	Equal 4th-lowest
Whakatu	2.1	23rd	1965	Equal 4th-lowest
Wānaka	-0.9	30th	1955	Equal 4th-lowest
Lumsden	-2.0	30th	1982	Equal 4th-lowest

## Wind

The highest wind gust was 170 km/h, observed at Cape Turnagain on 30 March.

On 17 March, strong northerly winds forced several flights to divert their planned landing from Wellington Airport to other centres around the country. Wellington's *East by West* ferry service was operating a reduced timetable due to rough conditions on the harbour. Around 1,300 customers were affected by a power outage in Stokes Valley (Hutt Valley) which was caused by a tree hitting power lines. In Picton, tug boats were used to help a *Bluebridge* ferry berth due to strong winds.

On 21 March, strong winds brought down trees and branches in parts of Southland and Otago, including Invercargill and Dunedin. Approximately 6,000 customers in Southland and Otago lost power due to downed power lines.

On 30 March, strong southerly winds generated large swells for coastal parts of Wellington and Wairarapa. Cook Strait ferry crossings were cancelled, and several coastal roads in Wellington were closed due to debris being washed ashore.

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

Location	Extreme wind gust (km/h)	Date of extreme gust	Year records began	Comments
Māhia	96	29th	1991	Highest
Alexandra	87	21st	2001	Equal highest
Reefton	61	17th	1999	2nd-highest
Oamaru	95	13th	1984	2nd-highest
Queenstown	91	13th	1972	Equal 2nd-highest
Clyde	78	20th	1983	3rd-highest
Bromley	87	21st	1972	Equal 3rd-highest
Secretary Island	132	17th	1994	Equal 4th-highest

## Lightning, hail, and tornadoes

On 1 March around 1:30 pm, a funnel cloud was briefly observed over West Auckland before dissipating. It likely resulted from converging winds due to afternoon sea breeze circulations.

From 8-9 March, 1,970 lightning strikes were recorded over the South Island, with more than 800,000 recorded over the Tasman Sea. The phenomenal amount of lightning was triggered by a front between a Southern Ocean low pressure system and a large high pressure system over northern New Zealand. Strong pressure and temperature gradients created instability which fuelled the development of thunderstorms.

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*.

### **Snow and ice**

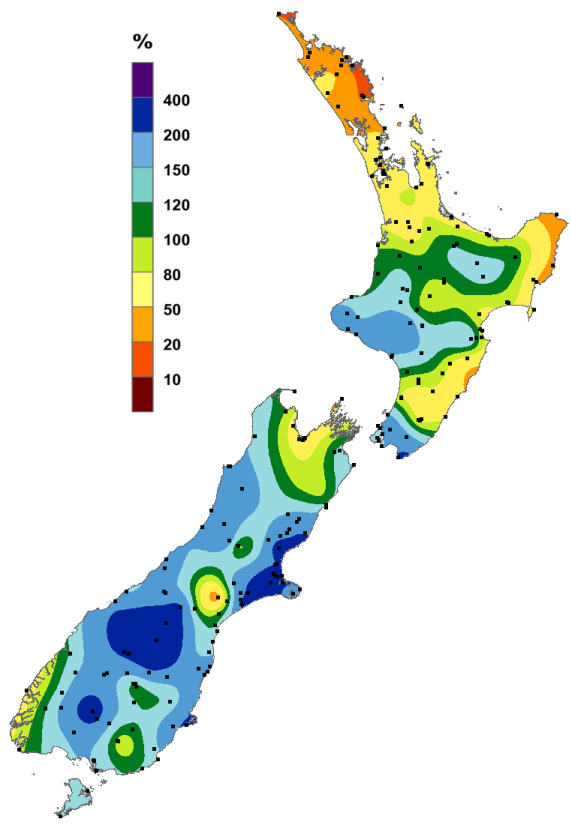
On 21 March, snow fell to approximately 800 metres above sea level over southern parts of the South Island. Snow flurries were reported on the Crown Range Road and the Lindis Pass, but the roads remained open.

On 28 March, snow fell to approximately 400 metres above sea level in parts of northern Southland. Snow settled at Lake Tekapo, and motorists were urged to take care over nearby Burkes Pass (SH8).

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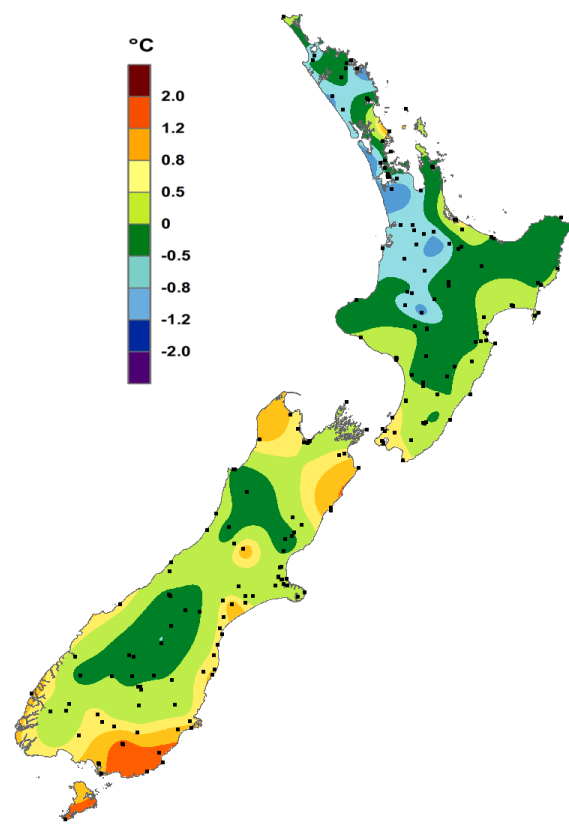
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### March rainfall

Expressed as a percentage of the 1991-2020 normal.



### March 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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