

The year 2016: New Zealand's warmest on record

Temperature	Annual temperatures were above average (0.51°C to 1.20°C above the annual average) throughout the country, with very few locations observing near average temperatures (within 0.5°C of the annual average) or lower. The year 2016 was the warmest on record for New Zealand, based on NIWA's seven-station series which begins in 1909.
Rainfall	Yearly rainfall in 2016 was above normal (120-149% of the annual normal) for parts of Kapiti Coast, Tasman, West Coast and Fiordland. In contrast, rainfall was below normal (50-79% of the annual normal) in parts of the eastern North Island south of Napier, and parts of the eastern South Island north of Christchurch. Rainfall was near normal (within 20% of the annual normal) for the remainder of New Zealand.
Soil moisture	Below normal soil moisture levels prevailed in eastern parts of north Canterbury and eastern parts of the Wairarapa for much of the year. By the end of April, soil moisture levels were below normal for the time of year for eastern and inland parts of the South Island, and extensive parts of the North Island. Abundant November rainfall contributed to soil moisture levels that were above normal for the time of year in Bay of Plenty, Wellington, Tasman, Nelson, Marlborough, Otago and Southland.
Sunshine	Annual sunshine was predominantly near normal (90-109% of the annual normal) throughout New Zealand, although small sections of the country observed above average sunshine (110-125% of the annual normal). Richmond experienced New Zealand's highest annual sunshine total on record. Sunshine was below normal (75-89% of the annual normal) in parts of Bay of Plenty.

Click on the following links to jump to the information you require:

[Overview](#)

[The year in review](#)

[Temperature anomaly maps](#)

[Rainfall anomaly maps](#)

[The numbers](#)

[Annual temperature](#)

[Annual rainfall](#)

[Annual sunshine](#)

[2016 climate in the six main centres](#)

[Significant weather and climate events in 2016](#)

Overview

Overall, annual mean sea level pressures for 2016 were lower than normal to the southwest of New Zealand and slightly higher than normal to the east of the North Island. This pressure set-up produced more northerlies and northwesterlies than normal over the country, which contributed to the exceptional warmth experienced in New Zealand during the year. In addition, sea surface temperatures both surrounding and west of New Zealand were typically higher than normal, particularly from January to July. These warmer

than normal sea surface temperatures enhanced the favourable conditions for warmer than average air temperatures to occur in New Zealand. El Niño Southern Oscillation (ENSO)-positive conditions were present at the beginning of the year, although the strong El Niño event weakened rapidly from February, and ENSO-neutral conditions prevailed by May.

Temperature-wise, 2016 as a whole was above average (0.51°C to 1.20°C above the annual average¹) throughout the country. These temperature anomalies were especially high in Northland, Auckland, Bay of Plenty, Hawke's Bay, Whanganui, Manawatu, Kapiti Coast, Wellington, West Coast, Otago and Southland. Near average temperatures (within 0.5°C of the annual average) were observed in only a few locations including parts of Tasman and south Otago, Timaru and Oamaru. No locations observed below average temperatures (0.51°C to 1.20°C below the annual average).

The first seven months of the year from January to July were remarkably warm, with the nation-wide average temperature higher than average for each month, respectively. The three warmest months in 2016 in terms of the seven-station temperature series were February (2.2°C above average), May (2.1°C above average) and June (1.6°C above average). Notably, these months were New Zealand's warmest May, second-warmest February and third-warmest June on record. August (0.5°C below average) and December (0.3°C below average) were the only two months in 2016 when New Zealand's nation-wide average temperature was cooler than average. The nation-wide average temperature for 2016 was 13.4°C (0.8°C above the 1981–2010 annual average), using NIWA's seven-station temperature series which begins in 1909. 2016 was the warmest year since 1909, based on this seven-station series, and surpassed New Zealand's previous warmest year on record which occurred in 1998.

As a whole, annual rainfall totals for 2016 were near normal (within 20% of the annual normal) for much of the country. However, annual rainfall totals were above normal (120-149% of the annual normal) for parts of Kapiti Coast, Tasman, West Coast and Fiordland. It was an especially wet year in Milford Sound which observed its wettest year on record (9259mm, 138% of the annual normal). In contrast, rainfall was below normal (50-79% of the annual normal) in parts of the eastern North Island south of Napier, and parts of the eastern South Island north of Christchurch. No locations observed record or near-record low annual rainfall totals.

The below average annual rainfall for some eastern parts of New Zealand was reflected in soil moisture levels during the year. Below normal soil moisture levels prevailed in eastern parts of north Canterbury and eastern parts of the Wairarapa for much of the year. By the end of April, soil moisture levels were below normal for the time of year for eastern and inland parts of the South Island, and extensive parts of the North Island. In June 2016, the drought classification for the east coast of the South Island was extended until the end of December 2016; the drought had been officially declared on 12 February 2015. Abundant November rainfall contributed to soil moisture levels that were above normal for the time of year in Bay of Plenty, Wellington, Tasman, Nelson, Marlborough, Otago and Southland. By the end of December, soil moisture levels were below normal for the time of year for much of the North Island. Soils were slightly drier than normal about Otago and Southland, with near normal soil moisture levels for the remainder of the South Island.

¹ Note all temperature, rainfall and sunshine anomalies reported in this document are relative to the 1981-2010 average/normal.

Annual sunshine was largely near normal (90-109% of the annual normal) throughout New Zealand. However, sunshine was above normal (110-125% of the annual normal) in parts of Taranaki, Wairarapa, and isolated coastal parts of the South Island. Most notably, Richmond observed 2840 total sunshine hours, which is New Zealand's highest annual sunshine total on record. Sunshine was below normal (75-89% of the annual normal) in parts of Bay of Plenty, where both Tauranga and Rotorua observed near-record low annual sunshine totals.

Section 1: The year in review

The monthly sequence of New Zealand climate (with some exceptions) was as follows:

January 2016: Warm for the north and wet for many

Temperatures were well above average (>1.20°C above the January average) or above average (0.51°C to 1.20°C above the January average) in most parts of the North Island and north and west of the South Island. Temperatures were well below average (>1.20°C below the January average) or below average (0.51°C to 1.20°C below the January average) in the eastern and southern South Island. Rainfall was well above normal (>149% of the January normal) or above normal (120-149% of the January normal) in most parts of the north and east of both islands. Rainfall was below normal (50-79% of the January normal) or well below normal (<50% of the January normal) in isolated parts of Taranaki and Queenstown-Lakes. Sunshine was below normal (75-89% of the January normal) or well below normal (<75% of the January normal) for the South Island, and near normal (90-109% of the January normal) or below normal for the North Island.

February 2016: Second-warmest February on record for New Zealand

February temperatures were well above average (>1.20°C above the February average) across the entirety of New Zealand with the exception of a handful of climate stations where above average (0.51°C to 1.20°C above the February average) temperatures were recorded. Rainfall was well above normal (>149% of the February normal) in parts of the northern half of the North Island, Nelson, Tasman, the West Coast and Southland. Conversely rainfall was well below normal (<50% of the February normal) for parts of the southern half of the North Island, Canterbury and Otago. Total sunshine hours were above normal (110-125% of the February normal) or well above normal (>125% of the February normal) in the South Island and southern parts of the North Island. Sunshine was below normal (75-89% of the February normal) in the Bay of Plenty and parts of Waikato.

March 2016: Warm month for New Zealand with flooding in the South Island

March temperatures were well above average (>1.20°C above the March average) or above average (0.51°C to 1.20°C above the March average) across virtually the entirety of New Zealand. Rainfall was well above normal (>149% of the March normal) for Tasman, Nelson, parts of Northland, Coromandel, Bay of Plenty, Whanganui, and the west coast of the South Island. Conversely, rainfall was well below normal (<50% of the March normal) for southern Northland, Auckland, Hamilton, Wellington, Banks Peninsula, coastal Otago and Invercargill. At the end of March soil moisture levels were above normal for the time of year for parts of Northland, Coromandel Peninsula, Bay of Plenty, eastern Waikato, northern Hawke's Bay, Nelson, Tasman, Fiordland, and Stewart Island. Drier than normal soils were evident for the remainder of the North Island and the eastern and southern South Island, in particular for Southland.

April 2016: Warm, dry and sunny for most of New Zealand

April temperatures were well above average (>1.20°C above the April average) or above average (0.51°C to 1.20°C above the April average) in most parts of New Zealand. It was an especially warm month for much of Southland where mean temperatures were 2°C or more above average. Rainfall was well below normal (<50% of the April normal) for parts of Northland, Auckland, Waikato, Hawke's Bay, Whanganui, Manawatu, Wairarapa, Wellington, Nelson, Tasman, Marlborough, Canterbury and Otago. Conversely, rainfall was well above normal (>149% of the April normal) or above normal (120-149% of the April normal) in the southwest of the South Island and Stewart Island. Sunshine was well above normal (>125% of the April normal) or above normal (110-125% of the April normal) in many parts of the country. The exception was parts of Northland, Auckland, Waikato, Bay of Plenty and Southland where sunshine was near normal (90-109% of the April normal). Soil moisture levels were below normal for the time of year for eastern and inland parts of the South Island, and extensive parts of the North Island.

May 2016: Warmest May on record and plenty of rain for western regions

May temperatures were well above average (>1.20°C above the May average) for the entire North Island as well as the majority of the South Island. Pockets of above average temperatures (0.51°C to 1.20°C above the May average) were observed in Marlborough, Nelson, Tasman, the West Coast and Southland. Rainfall was well above normal (>149% of the May normal) for large parts of the South Island. The exceptions were parts of central and eastern Canterbury where below normal (50-79% of the May normal) and well below normal (<50% of the May normal) rainfall was recorded. In the North Island, rainfall was well above normal in Taranaki, Manawatu and Whanganui as well as the western portion of the Wellington region. Well below normal rainfall was recorded along the coastal fringes of Gisborne, Hawke's Bay and eastern Wellington. Soil moisture levels were below normal for the time of year for large parts of Gisborne, Hawke's Bay, the Wairarapa as well as central and northern parts of Canterbury. Sunshine was below normal (75-89% of the May normal) in Southland, the West Coast, Tasman, Manawatu, Whanganui and Taranaki. Above normal sunshine (110-125% of the May normal) was recorded along the eastern portions of Gisborne, Hawke's Bay and eastern Wellington.

June 2016: Third-warmest June on record, unusually dry and sunny for many

June temperatures were well above average (>1.20°C above the June average) for much of the South Island except in parts of Tasman and Marlborough where temperatures were above average (0.51°C to 1.20°C above the June average). No New Zealand location observed below average temperatures (0.51°C to 1.20°C below the June average). Rainfall was well below normal (<50% of the June normal) for much of Gisborne, southern Hawke's Bay, Wairarapa, central and northern Canterbury, Otago and eastern Southland. Pockets of above normal rainfall (120-149% of the June normal) were observed in parts of the Bay of Plenty, eastern Waikato and the north of Otago. Sunshine was above normal (110-124% of the June normal) in Southland, the West Coast, Otago, Canterbury and the majority of the North Island, with sections of well above normal sunshine (>125% of the June normal) in these areas.

July 2016: A mild month overall and dry for eastern areas of the country

July temperatures were above average (0.51°C to 1.20°C above the July average) in many parts of New Zealand. Inland South Island, Kaikoura and Auckland observed well above average mean temperatures

(>1.20°C above the July average). Rainfall was well below normal (less than 50% of the July normal) for many eastern areas of the country, particularly in Gisborne, Hawke's Bay, coastal Wairarapa and eastern Canterbury. Conversely, rainfall was well above normal (>149% of the July normal) or above normal (120-149% of the July normal) for most remaining parts of the South Island, Whanganui and the Central Plateau. Mid-winter sunshine was well above normal (>125% of the July normal) or above normal (110-125% of the July normal) in many parts of the country.

August 2016: A chilly month for the South Island, some flooding in the North Island

August temperatures were below average (0.51°C to 1.20°C below the August average) in the north and east of the South Island. It was an especially chilly month across the northwestern Tasman region where mean temperatures were well below average (>1.20°C below the August average). Rainfall was below normal (50-79% of the August normal) or well below normal (<50% of the August normal) across Westland, Southland, and parts of the Queenstown-Lakes region. Rainfall was also below normal across middle and northern Canterbury, Nelson, Marlborough, parts of Taranaki, Wairarapa, and much of the Bay of Plenty and Waikato. Conversely, rainfall was above normal (120-149% of the August normal) or well above normal (>149% of the August normal) for coastal southern Canterbury, coastal Otago, much of Hawke's Bay and north Auckland. Sunshine was above normal (110-125% of the August normal) across much of the South Island and west of the North Island.

September 2016: Wet for the North Island, dry for the South Island, warm almost everywhere

September rainfall was generally above normal (120-149% of the September normal) or well above normal (>149% of the September normal) for much of the North Island, particularly in Auckland, Bay of Plenty, Gisborne, Hawke's Bay and Wellington, but below normal (50-79% of the September normal) or well below normal (< 50% of the September normal) for much of the South Island, particularly in Otago and Southland. Soil moisture levels were much lower than normal for the time of year across middle and northern Canterbury as well as coastal Wairarapa, and slightly lower than normal for southern Canterbury, north Otago and parts of Southland. September temperatures were above average (0.50°C to 1.20°C above the September average) or well above average (>1.20°C above the September average) for the majority of New Zealand. Sunshine was below normal (75-89% of the September normal) or well below normal (<75% of the September normal) for most of the North Island, and well above normal (>125% of the September normal) in some central and western areas of the South Island.

October 2016: Wet for parts of the South Island and eastern North Island, warm for most

October rainfall was generally above normal (120-149% of the October normal) or well above normal (>149% of the October normal) for much of the southern South Island, Nelson, eastern Tasman, western Marlborough, coastal Gisborne, northern Hawke's Bay and eastern Bay of Plenty. Rainfall was well below normal (<50% of the October normal) in coastal Wairarapa and isolated parts of the Far North. Soil moisture levels were much lower than normal for the time of year in coastal northern Canterbury and coastal Wairarapa. October temperatures were above average (0.51°C to 1.20°C above the October average) throughout much of New Zealand. October sunshine was below normal (75-89% of the October normal) or well below normal (<75% of the October normal) in parts of the southwestern North Island, central Canterbury and Central Otago, whereas well above normal (>125% of the October normal) sunshine was experienced in far northern Northland.

November 2016: Wet and cloudy for many

Rainfall was above normal (120-149% of the November normal) for large parts of the North Island with the exception of coastal Gisborne and Hawke's Bay where below normal (50-79% of the November normal) or well below normal (<50% of the November normal) rainfall was observed. In the South Island, rainfall was above normal in Otago, Tasman, Nelson, Marlborough and large parts of Canterbury. Sunshine was below normal (75-89% of the November normal) for most of the South Island, Taranaki, western Manawatu, Whanganui and Wellington. November temperature was above average (0.51°C to 1.20°C above the November average) in Gisborne and Hawke's Bay as well as parts of Manawatu, Whanganui and coastal Canterbury.

December 2016: Dry with average to below average temperatures

Rainfall was below normal (50-79% of the December normal) or well below normal (<50% of the December normal) for the majority of the country. Sunshine was well above normal (>125% of the December normal) in the north and west of the North Island as well as parts of the West Coast, Southland and Otago. Temperatures were below average (0.51°C to 1.20°C below the December average) for parts of Waikato, Taranaki, Wellington, Tasman and the West Coast. The remainder of the country experienced near average (-0.50°C to +0.50°C of the December average) temperatures. At the end of the month, soil moisture levels were below normal for the time of year for much of the North Island with the driest soils compared to normal located in the Far North. Soils were also slightly drier than normal about Southland and Otago.

Section 2: Monthly temperature (in °C, as a departure from the 1981-2010 monthly averages)

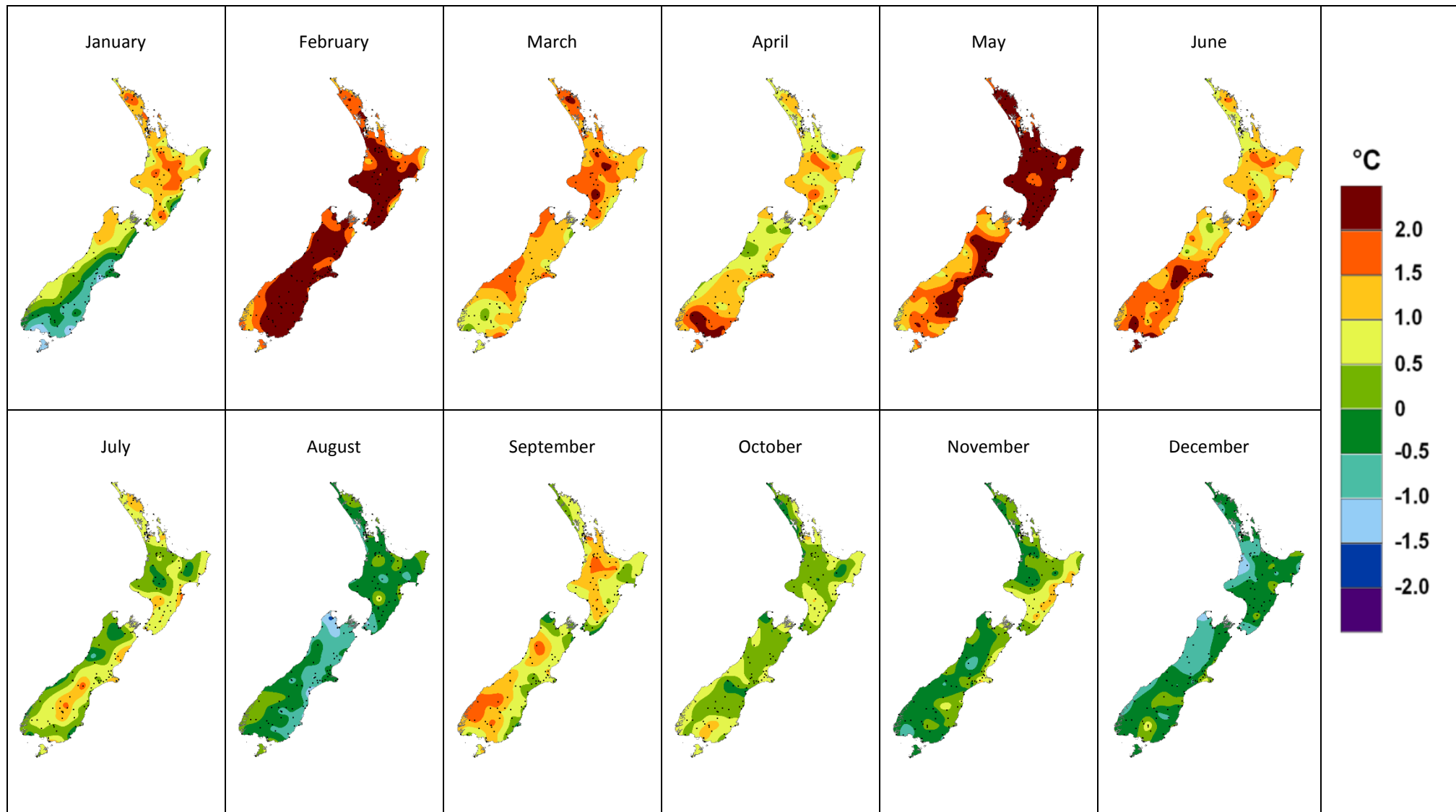


Figure 1: Monthly temperature anomalies (compared to the 1981-2010 monthly averages) for each month of 2016.

Section 3: Monthly rainfall (as a percentage of the 1981-2010 monthly normals)

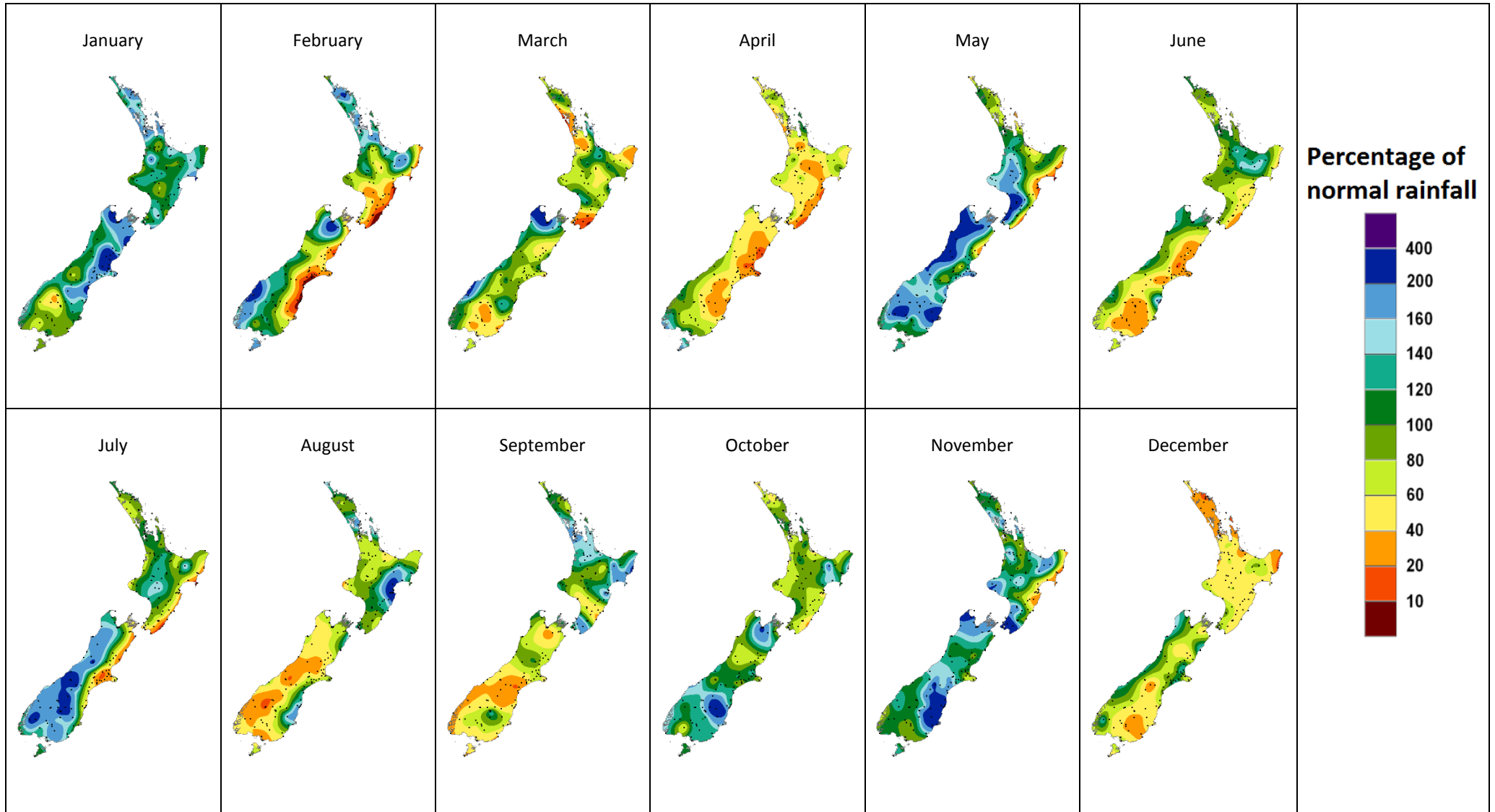


Figure 2: Monthly rainfall as a percentage of the 1981-2010 monthly normals for each month of 2016.

Section 4: The numbers

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

- The nation-wide average temperature for 2016 was 13.4°C (0.8°C above the 1981–2010 annual average), using NIWA’s seven-station temperature series which begins in 1909. 2016 was the warmest year on record since 1909, based on this seven-station series.
- Leigh recorded the highest annual average temperature for 2016 with 17.3°C, followed by Whangarei with 16.9°C, and Kaitaia with 16.7°C.
- The highest air temperature of the year was 35.5°C recorded at Clyde and Alexandra on 3 February, followed by 35.3°C at Christchurch (Riccarton) on 27 February and 35.0°C at Ettrick on 3 February.
- The lowest air temperatures of the year were all recorded at Mt Cook Airport; -14.1°C observed on 8 August, -13.4°C on 7 August and -11.8°C on 10 August.
- The top 3 daily rainfall totals from regularly reporting gauges in 2016 were 350 mm at North Egmont on 17 February, 316 mm at Collingwood on 23 March and 314 mm observed at Upper Takaka on 23 March.
- Of all of the regularly reporting gauges, the wettest locations in 2016 were: Cropp River (West Coast, 975 metres above sea level) with 11921 mm, Tuke River (West Coast, 975 metres above sea level) with 11373 mm, and Doon River (West Coast, 1211 metres above sea level) with 9892 mm.
- Of the regularly reporting gauges, the wettest locations in 2016 *excluding* high elevation stations were: Milford Sound with 9259 mm, Franz Josef with 5235 mm, and Haast with 4131 mm.
- The lowest rainfall recording locations for 2016 were: Cromwell with 338 mm of rainfall recorded for the year, followed by Clyde with 352 mm, then Alexandra with 377 mm.
- Richmond was the sunniest location in 2016, recording 2840 sunshine hours, followed by Blenheim (2582 hours) and Takaka (2534 hours)².
- The highest confirmed wind gusts for 2016 were all recorded at Cape Turnagain; 196 km/hr observed on 10 March, 195 km/hr on 24 July and 183 km/hr on 10 January.
- Of the six main centres, for 2016 as a whole, Auckland was the warmest, Christchurch was the driest, Wellington was the wettest, and Dunedin was the coldest.

Ranked annual total rainfall, mean temperatures and sunshine hours for the stations available at time of writing are displayed on the following four 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.

² Three sunshine recording instruments are sited within approximately 8 km of each other (*Richmond Ews, Nelson Aero and Appleby 2 Ews*), therefore only the highest recording of these three climate stations is featured in the annual ranking for New Zealand. The annual sunshine totals for each of these three stations are included in the sunshine total table on page 13.

Location	Rainfall (mm)
CROPP AT WATERFALL	11921
TUKE AT TUKE HUT	11373
CROPP AT CROPP HUT	10999
DOON AT MIDDLE ARM	9892
HAAST AT CRON CK	9351
MILFORD SOUND	9259
HOKITIKA AT COLLIERS CK	8509
HAAST AT ROARING BILLY	6212
CASTLE MOUNT EWS	5494
ARTHURS PASS AWS	5454
MUELLER HUT EWS	5283
FRANZ JOSEF EWS	5235
MANAPOURI, WEST ARM JETTY EWS	4418
MT COOK EWS	4238
HAAST AWS	4131
MT PHILISTINE EWS	3689
HOKITIKA AWS	3454
MT RUAPEHU, CHATEAU EWS	3126
PUYSEGUR POINT AWS	3004
MURCHISON MTNS EWS	2784
TAKAKA EWS	2686
GREYMOUTH AERO EWS	2664
ARAPITO EWS	2586
MT COOK AERO AWS	2520
EGLINTON, KNOBS FLAT CWS	2495
WESTPORT AERO AWS	2478
MAHANGA EWS	2471
MOTU EWS	2410
WHITIANGA AERO AWS	2306

UPPER RAKAIA EWS	2238
WHITIANGA EWS	2096
REEFTON EWS	2010
STRATFORD EWS	1975
KERIKERI AERODROME AWS	1928
KAIKOHE AWS	1885
TARAPOUNAMU EWS	1852
WHATAWHATA 2 EWS	1567
FAREWELL SPIT AWS	1536
TAUMARUNUI AWS	1525
WAIROA AERO AWS	1499
WARKWORTH EWS	1493
MT POTTS EWS	1483
PAEROA AWS	1477
TE KUITI EWS	1475
UPPER HUTT, TRENTHAM EWS	1434
TURANGI 2 EWS	1424
KAITAIA AERO EWS	1399
ROTORUA EWS	1390
OHAKUNE EWS	1376
WELLINGTON, KELBURN AWS	1360
NELSON AWS	1341
MT LARKINS EWS	1321
ROTORUA AERO AWS	1310
MANAPOURI AERO AWS	1277
PUKEKOHE EWS	1263
LEIGH 2 EWS	1250
TAURANGA AERO AWS	1250
WHANGAPARAOA AWS	1246
WHANGAREI EWS	1236
APPLEBY 2 EWS	1232

RICHMOND EWS	1222
WAIROA, NORTH CLYDE EWS	1212
PARAPARAUMU AERO AWS	1211
FIRTH OF THAMES EWS	1206
PAHIATUA EWS	1190
LEVIN AWS	1177
HAMILTON AWS	1163
PURERUA AWS	1154
AUCKLAND, MANGERE EWS	1137
AUCKLAND AERO	1129
NEW PLYMOUTH AWS	1103
WAIOURU AIRSTRIP AWS	1102
AUCKLAND, NORTH SHORE ALBANY EWS	1092
PALMERSTON NORTH EWS	1073
GALATEA AWS	1066
PALMERSTON NORTH AWS	1057
MATAMATA, HINUERA EWS	1031
HICKS BAY AWS	1023
PORT TAHAROA AWS	1018
HAWERA AWS	1013
WHAKATANE AERO AWS	999
DARGAVILLE 2 EWS	985
INVERCARGILL AERO AWS	979
TIWAI POINT EWS	971
HAMILTON, RUAKURA 2 EWS	964
MANA ISLAND AWS	928
TAKAPAU PLAINS AWS	926
WHANGANUI, SPRIGGENS PARK EWS	884
FIVE RIVERS CWS	876
GORE AWS	876
LUMSDEN AWS	875

GISBORNE AWS	868
MAHIA AWS	846
CAPE REINGA AWS	834
MASTERTON AERO AWS	833
MOKOHINAU AWS	819
DANNEVIRKE EWS	817
AKAROA EWS	813
CAPE TURNAGAIN AWS	779
NGAWI AWS	750
AKITIO EWS	744
METHVEN CWS	740
BLENHEIM AERO AWS	730
QUEENSTOWN AERO AWS	729
CHATHAM ISLAND AERO AWS	726
DUNEDIN AERO AWS	715
HANMER FOREST EWS	715 ¹
TAUPO AWS	711
FAIRLIE AWS	677
OAMARU AWS	669
MARTINBOROUGH EWS	669
DUNEDIN, MUSSELBURGH EWS	662
CHATHAM ISLAND EWS	650
HASTINGS AWS	648
BARING HEAD	628
NAPIER AERO AWS	627
ASHBURTON AERO AWS	627
NUGGET POINT AWS	621
WANAKA CWS	601
BALCLUTHA, TELFORD EWS	596
OAMARU AIRPORT AWS	595
WANAKA AERO AWS	592

TIMARU EWS	592
PUKAKI AERODROME AWS	579
LE BONNS BAY AWS	562
TIMARU AERO AWS	560
WAIPARA WEST EWS	560
WAIMATE CWS	559
WHAKATU EWS	546
CHRISTCHURCH, KYLE ST EWS	544
WAIPAWA EWS	544
TARA HILLS AWS	542
CHRISTCHURCH AERO	538
RANGIORA EWS	531
LAKE TEKAPO EWS	527
MASTERTON EWS	526
WINDSOR EWS	521
KAIKOURA AWS	519
WINCHMORE EWS	516
MIDDLEMARCH EWS	511
LINCOLN, BROADFIELD EWS	492
CHEVIOT EWS	484
OAMARU EWS	481
CULVERDEN AWS	459
LAUDER EWS	439
RANFURLY EWS	415
CAPE CAMPBELL AWS	395
HAKATARAMEA VALLEY CWS	381
ALEXANDRA CWS	377
CLYDE 2 EWS	352
CROMWELL EWS	338

Location	Mean temp (°C)
LEIGH 2 EWS	17.3
WHANGAREI AERO AWS	16.9
KAITAIA AERO EWS	16.7
AUCKLAND, MANGERE EWS	16.6
NORTH SHORE, AUCKLAND	16.6
WHANGAPARAOA AWS	16.6
AUCKLAND AERO	16.3
CAPE REINGA AWS	16.3
KAIKOHE AWS	16.3
PURERUA AWS	16.2
LINCOLN RD, AUCKLAND	16.1
PENROSE EWS, AUCKLAND	16.1
DARGAVILLE 2 EWS	16.0
KERIKERI AERODROME AWS	16.0
GISBORNE EWS	15.9
TAURANGA AERO AWS	15.9
AUCKLAND, WHENUAPAI AWS	15.7
WHITIANGA AERO AWS	15.7
PAEROA AWS	15.5
WAIROA, NORTH CLYDE EWS	15.5
NGAWI AWS	15.3
PUKEKOHE EWS	15.3
NAPIER AERO AWS	15.1
WARKWORTH EWS	15.1
WHAKATANE AERO AWS	15.1
TE PUKE EWS	15.0
WHANGANUI 2 AWS	15.0
FAREWELL SPIT AWS	14.9
HAMILTON, RUAKURA 2 EWS	14.9

HASTINGS AWS	14.9
MAHIA AWS	14.9
TOENEPI EWS	14.9
FIRTH OF THAMES EWS	14.7
NEW PLYMOUTH AWS	14.6
CASTLEPOINT AWS	14.5
HAMILTON AWS	14.5
WELLINGTON AERO	14.5
MASTERTON, TE ORE ORE CWS	14.4
PALMERSTON NORTH AWS	14.4
LEVIN AWS	14.2
PARAPARAUMU AERO	14.2
TE KUITI EWS	14.2
CHRISTCHURCH, KYLE ST EWS	14.0
AKAROA EWS	13.9
BLENHEIM RESEARCH EWS	13.9
WELLINGTON, KELBURN AWS	13.9
BARING HEAD	13.8
GALATEA AWS	13.8
MATAMATA, HINUERA EWS	13.8
NELSON AERO	13.8
TAUMARUNUI EWS	13.8
HAWERA AWS	13.7
ROTORUA EWS	13.7
ARAPITO EWS	13.6
DANNEVIRKE EWS	13.6
CAPE CAMPBELL AWS	13.5
KAIKOURA AWS	13.5
LOWER RETARUKE CWS	13.5
MOTUEKA, RIWAKA EWS	13.5
RICHMOND EWS	13.4

WESTPORT AERO AWS	13.3
PAHIATUA EWS	13.2
UPPER HUTT, TRENTHAM EWS	13.2
WAIPARA WEST EWS	13.2
TAUPO AWS	13.0
DIAMOND HARBOUR EWS	12.9
TAKAKA EWS	12.9
RANGIORA EWS	12.7
LINCOLN, BROADFIELD EWS	12.6
STRATFORD EWS	12.6
WAIAU SCHOOL CWS	12.6
CHATHAM ISLAND AERO AWS	12.5
CHEVIOT EWS	12.5
GREYMOUTH AERO EWS	12.5
HOKITIKA AERO	12.5
REEFTON EWS	12.5
TAKAPAU PLAINS AWS	12.5
CHRISTCHURCH AERO	12.4
APPLEBY 2 EWS	12.3
FRANZ JOSEF EWS	12.2
CROMWELL EWS	12.1
CULVERDEN AWS	12.1
ROXBURGH WXT AWS	12.1
TURANGI 2 EWS	12.1
LE BONS BAY AWS	12.0
METHVEN CWS	12.0
PUYSEGUR POINT AWS	11.9
DUNEDIN, MUSSELBURGH EWS	11.8
MEDBURY	11.8
ASHBURTON AERO AWS	11.7
WANAKA AERO AWS	11.7

OAMARU AWS	11.6
HAKATARAMEA VALLEY CWS	11.5
WINCHMORE EWS	11.5
MILFORD SOUND	11.3
OHAKUNE EWS	11.3
ALEXANDRA AWS	11.2
CLYDE 2 EWS	11.2
FAIRLIE AWS	11.2
TIMARU EWS	11.2
DUNEDIN AERO AWS	11.1
WINDSOR EWS	11.1
HANMER FOREST EWS	11.0
INVERCARGILL AERO	10.9
SOUTH WEST CAPE AWS	10.8
MIDDLEMARCH EWS	10.7
BALCLUTHA, TELFORD EWS	10.6
GORE AWS	10.6
QUEENSTOWN AERO AWS	10.6
TARA HILLS AWS	10.6
TE ANAU AT PARK HQ CWS	10.6
LUMSDEN AWS	10.5
NUGGET POINT AWS	10.5
PUKAKI AERODROME AWS	10.5
FIVE RIVERS CWS	10.4
MANAPOURI AERO AWS	10.2
LAKE TEKAPO EWS	9.9
RANFURLY EWS	9.9
WAIOURU AIRSTRIP AWS	9.8
MT COOK AERO AWS	9.6
ARTHURS PASS EWS	8.6
MT RUAPEHU, CHATEAU EWS	8.4

Location	Sunshine (hours)
RICHMOND EWS	2840
APPLEBY 2 EWS	2669
BLENHEIM RESEARCH EWS	2582 ²
TAKAKA EWS	2534
NEW PLYMOUTH AWS	2503
NELSON AERO	2483 ¹
LAKE TEKAPO EWS	2483 ²
WHAKATANE SUNSHINE	2473
WAIPARA WEST EWS	2438
KAITAIA EWS	2377 ¹¹
GISBORNE AWS	2371 ³
CROMWELL EWS	2328 ¹
DIAMOND HARBOUR EWS	2308
AUCKLAND, NORTH SHORE ALBANY EWS	2297 ²
MASTERTON EWS	2282
RANGIORA EWS	2260 ¹⁰
ASHBURTON AERO AWS	2243 ²
QUEENSTOWN AERO AWS	2239 ¹
PARAPARAUMU AERO AWS	2233 ¹
AKITIO EWS	2205 ⁹
CHEVIOT EWS	2193
OAMARU EWS	2178
WAIPAWA EWS	2167 ⁸
UPPER HUTT, TRENTAM EWS	2130 ¹
AKAROA EWS	2104
WHANGAREI EWS	2085
STRATFORD EWS	2083 ⁴
HOKITIKA AWS	2081 ¹

DARGAVILLE 2 EWS	2037
AUCKLAND, MANGERE EWS	2033
TAURANGA AERO	2020
CHRISTCHURCH AERO	2018 ⁹
DANNEVIRKE EWS	1985
ROTORUA EWS	1972
WELLINGTON, KELBURN	1962 ¹
TURANGI 2 EWS	1944
KAWERAU AWS	1937 ⁹
BALCLUTHA, TELFORD EWS	1935
GREYMOUTH AERO EWS	1922
ARAPITO EWS	1874
TE KUITI EWS	1851 ³
HAMILTON, RUAKURA 2 EWS	1835
DUNEDIN, MUSSELBURGH EWS	1824 ³³
OHAKUNE EWS	1792 ¹³
MIDDLEMARCH EWS	1773 ¹
INVERCARGILL AERO	1762 ¹
TAUMARUNUI AWS	1746 ³
HOKITIKA AERO	1732 ¹
REEFTON EWS	1683 ¹
PALMERSTON NORTH EWS	1645 ¹⁰
MT COOK EWS	1569

Section 5: Annual Temperature – Record-breaking warmth for many

2016 was New Zealand’s warmest on record, with mean temperatures above average throughout the country. Dozens of locations observed record or near-record high mean, mean maximum and mean minimum temperatures.

Table 1: Near-record or record high or low annual average temperature departures for 2016³.

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
Mean temperature				
Kerikeri	16.0	0.9	1945	Highest
Kaikohe	16.3	1.6	1973	Highest
Whangaparaoa	16.6	0.9	1982	Highest
Auckland (Whenuapai)	15.7	1.0	1945	Highest
Tauranga	15.9	1.0	1913	Highest
Te Puke	15.0	1.0	1973	Highest
Rotorua	13.7	1.0	1964	Highest
Hamilton (Ruakura)	14.9	1.1	1906	Highest
New Plymouth	14.6	0.9	1944	Highest
Lower Retaruke	13.5	1.0	1966	Highest
Masterton	14.4	2.0	1906	Highest
Ngawi	15.3	0.8	1972	Highest
Gisborne	15.9	1.6	1905	Highest
Hastings	14.9	1.1	1965	Highest
Wairoa	15.5	1.2	1964	Highest
Paraparaumu	14.2	1.1	1953	Highest
Palmerston North	14.4	1.2	1928	Highest
Levin	14.2	1.1	1895	Highest
Wellington (Kelburn)	13.9	1.0	1927	Highest
Hawera	13.7	1.1	1977	Highest
Ohakune	11.3	0.9	1962	Highest
Whanganui	15.0	1.1	1937	Highest
Farewell Spit	14.9	1.0	1971	Highest
Franz Josef	12.2	1.2	1953	Highest
Blenheim	13.9	0.8	1941	Highest
Kaikoura	13.5	1.1	1963	Highest
Waiau	12.6	1.2	1974	Highest

³ The rankings (1st, 2nd, 3rd....etc) in Tables 1 to 12 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.

Cheviot	12.5	1.0	1982	Highest
Rangiora	12.7	1.2	1965	Highest
Tara Hills	10.6	1.1	1949	Highest
Wanaka	11.7	1.2	1955	Highest
Te Anau	10.6	1.0	1963	Highest
Roxburgh	12.1	1.4	1950	Highest
Cape Reinga	16.3	0.5	1951	2nd-highest
Kaitia	16.7	1.0	1948	2nd-highest
Whangarei	16.9	1.1	1967	2nd-highest
Leigh	17.3	1.2	1966	2nd-highest
Whitianga	15.7	1.0	1962	2nd-highest
Paeroa	15.5	0.8	1947	2nd-highest
Taupo	13.0	1.3	1949	2nd-highest
Auckland (Mangere)	16.6	1.2	1959	2nd-highest
Dannevirke	13.6	1.1	1951	2nd-highest
Mahia	14.9	0.8	1990	2nd-highest
Wellington (Airport)	14.5	0.7	1962	2nd-highest
Arapito	13.6	0.9	1978	2nd-highest
Reefton	12.5	1.1	1960	2nd-highest
Puysegur Point	11.9	0.9	1978	2nd-highest
Motueka	13.5	1.0	1956	2nd-highest
Medbury	11.8	0.4	1927	2nd-highest
Waipara West	13.2	0.7	1973	2nd-highest
Lincoln	12.6	0.9	1881	2nd-highest
Akaroa	13.9	1.4	1978	2nd-highest
Le Bons Bay	12.0	0.6	1984	2nd-highest
Lake Tekapo	9.9	1.1	1927	2nd-highest
Ranfurly Ews	9.9	1.0	1897	2nd-highest
Oamaru	11.6	0.5	1967	2nd-highest
Dunedin (Musselburgh)	11.8	0.7	1947	2nd-highest
Lumsden	10.5	0.9	1982	2nd-highest
Cromwell	12.1	1.2	1949	2nd-highest
Dargaville	16.0	0.8	1943	3rd-highest
Auckland (Airport)	16.3	0.8	1959	3rd-highest
Pukekohe	15.3	0.8	1969	3rd-highest
Taumarunui	13.8	1.0	1947	3rd-highest
Upper Hutt (Trentham)	13.2	0.7	1939	3rd-highest
Stratford	12.6	0.8	1960	3rd-highest
Waiouru	9.8	0.8	1962	3rd-highest
Five Rivers	10.4	0.8	1982	3rd-highest
Auckland (North Shore)	16.6	0.8	1994	4th-highest
Auckland (Henderson)	16.1	0.8	1948	4th-highest
Whakatane	15.1	1.1	1974	4th-highest
Westport	13.3	0.7	1937	4th-highest
Milford Sound	11.3	0.8	1934	4th-highest
Hanmer Forest	11.0	0.7	1906	4th-highest
Oamaru	11.4	0.6	1967	4th-highest
South West Cape	10.8	0.6	1991	4th-highest

Mean maximum temperature				
Kaikohe	19.9	1.6	1973	Highest
Whangarei	21.0	1.1	1967	Highest
Rotorua	18.2	1.2	1964	Highest
Auckland (Mangere)	20.1	1.2	1959	Highest
Masterton	20.4	2.0	1906	Highest
Ngawi	18.5	0.9	1972	Highest
Hicks Bay	19.3	1.3	1969	Highest
Gisborne	21.1	1.6	1905	Highest
Hastings	20.6	1.6	1965	Highest
Wairoa	20.9	1.6	1964	Highest
Paraparaumu	17.9	1.0	1953	Highest
Wellington (Kelburn)	16.8	0.9	1927	Highest
Hawera	17.6	1.2	1977	Highest
Whanganui	19.5	1.7	1937	Highest
Farewell Spit	18.2	0.6	1971	Highest
Puysegur Point	14.4	1.0	1978	Highest
Hanmer Forest	18.6	1.6	1906	Highest
Dunedin (Musselburgh)	15.7	1.0	1947	Highest
Cromwell	18.5	1.5	1949	Highest
Whangaparaoa	19.6	0.8	1982	2nd-highest
Auckland (Whenuapai)	19.8	0.7	1945	2nd-highest
Wellington (Airport)	17.4	0.7	1962	2nd-highest
Franz Josef	16.9	1.3	1953	2nd-highest
Waiau	19.0	1.3	1974	2nd-highest
Cheviot	18.5	1.1	1982	2nd-highest
Rangiora	18.4	1.4	1965	2nd-highest
Akaroa	18.3	0.8	1978	2nd-highest
Le Bons Bay	15.1	0.6	1984	2nd-highest
Lake Tekapo	15.7	1.1	1927	2nd-highest
Dunedin (Airport)	17.1	1.1	1962	2nd-highest
Lumsden	16.0	1.1	1982	2nd-highest
Leigh	20.9	2.0	1966	3rd-highest
Te Puke	19.5	0.5	1973	3rd-highest
Dannevirke	17.9	0.9	1951	3rd-highest
Napier	20.3	1.4	1870	3rd-highest
Mahia	18.0	0.9	1990	3rd-highest
Palmerston North	18.8	1.1	1928	3rd-highest
Ohakune	16.0	0.9	1962	3rd-highest
Arapito	18.0	0.8	1978	3rd-highest
Reefton	17.7	1.0	1960	3rd-highest
Motueka	19.5	1.4	1956	3rd-highest
Blenheim	19.2	0.8	1932	3rd-highest
Kaikoura	16.9	1.1	1963	3rd-highest
Tara Hills	16.8	1.0	1949	3rd-highest
Oamaru	15.9	0.4	1967	3rd-highest
Five Rivers	15.8	0.9	1982	3rd-highest
Clyde	18.2	1.4	1978	3rd-highest

Invercargill	15.7	1.3	1905	3rd-highest
Auckland (Airport)	19.8	0.8	1959	4th-highest
Milford Sound	15.4	0.8	1934	4th-highest
Lincoln	17.8	1.1	1881	4th-highest
Ranfurly	16.1	1.0	1897	4th-highest
Oamaru	15.8	0.5	1967	4th-highest
South West Cape	13.1	0.4	1991	4th-highest
Mean minimum temperature				
Kerikeri	11.5	0.8	1945	Highest
Kaikohe	12.6	1.4	1973	Highest
Auckland (Whenuapai)	11.5	1.2	1945	Highest
Whitianga	11.4	1.3	1962	Highest
Te Puke	10.4	1.5	1973	Highest
Taupo	8.4	1.6	1949	Highest
Taumarunui	8.7	1.4	1947	Highest
New Plymouth	10.9	0.9	1944	Highest
Lower Retaruke	8.5	1.4	1966	Highest
Masterton	8.4	2.0	1906	Highest
Dannevirke	9.3	1.2	1951	Highest
Ngawi	12.1	0.8	1972	Highest
Gisborne	10.7	1.6	1905	Highest
Paraparaumu	10.5	1.2	1953	Highest
Palmerston North	10.0	1.4	1928	Highest
Levin	10.1	1.2	1895	Highest
Wellington (Kelburn)	11.0	1.1	1927	Highest
Hawera	9.9	1.1	1977	Highest
Ohakune	6.6	0.9	1962	Highest
Reefton	7.3	1.2	1960	Highest
Cape Campbell	11.4	0.7	1953	Highest
Kaikoura	10.0	0.8	1963	Highest
Cheviot	6.4	0.8	1982	Highest
Waipara West	8.1	1.1	1973	Highest
Rangiora	7.0	1.1	1965	Highest
Tara Hills	4.5	1.2	1949	Highest
Te Anau	6.5	2.0	1963	Highest
Cape Reinga	13.9	0.8	1951	2nd-highest
Kaitia	12.9	1.0	1948	2nd-highest
Whangarei	13.0	1.2	1967	2nd-highest
Auckland (Henderson)	12.4	1.8	1948	2nd-highest
Paeroa	11.0	1.3	1947	2nd-highest
Tauranga	11.9	1.2	1913	2nd-highest
Auckland (Mangere)	13.0	1.2	1959	2nd-highest
Pukekohe	11.3	0.9	1969	2nd-highest
Hamilton (Ruakura)	10.0	1.3	1906	2nd-highest
Te Kuiti	9.2	0.8	1959	2nd-highest
Hastings	9.3	0.6	1965	2nd-highest
Wairoa	10.1	0.8	1964	2nd-highest
Mahia	11.9	0.8	1990	2nd-highest

Upper Hutt (Trentham)	8.6	0.8	1939	2nd-highest
Stratford	8.4	0.9	1960	2nd-highest
Whanganui	10.9	1.0	1937	2nd-highest
Farewell Spit	11.6	1.4	1971	2nd-highest
Arapito	9.2	1.0	1978	2nd-highest
Hokitika	8.7	1.0	1866	2nd-highest
Franz Josef	7.6	1.2	1953	2nd-highest
Puysegur Point	9.3	0.8	1978	2nd-highest
Blenheim	8.7	1.0	1941	2nd-highest
Culverden	6.4	1.3	1928	2nd-highest
Medbury	6.0	0.7	1927	2nd-highest
Lincoln	7.5	0.9	1881	2nd-highest
Akaroa	9.5	2.0	1978	2nd-highest
Le Bons Bay	8.9	0.7	1984	2nd-highest
Oamaru	7.2	0.4	1967	2nd-highest
Roxburgh	7.0	2.3	1950	2nd-highest
South West Cape	8.5	0.8	1991	2nd-highest
Dargaville	12.4	0.8	1943	3rd-highest
Rotorua	9.2	1.1	1964	3rd-highest
Castlepoint	11.6	0.7	1972	3rd-highest
Wellington (Airport)	11.6	0.8	1962	3rd-highest
Motueka	7.5	0.7	1956	3rd-highest
Wanaka	6.4	1.5	1955	3rd-highest
Ranfury	3.7	1.0	1897	3rd-highest
Auckland (North Shore)	13.5	1.4	1994	4th-highest
Auckland (Airport)	12.8	0.8	1959	4th-highest
Milford Sound	7.3	1.3	1934	4th-highest
Five Rivers	5.1	0.7	1982	4th-highest

During 2016 a number of record and near-record extreme temperatures occurred. Many more high maximum and minimum temperature extremes were observed compared to low maximum and minimum extremes.

Table 2: Near-record or record high or low annual temperature extremes for 2016.

Location	Temperature (°C)	Date of occurrence	Year records began	Comments
Highest extreme maximum temperatures				
South West Cape	25.9	Feb-03rd	1991	2nd-highest
Five Rivers	29.5	Feb-03rd	1982	3rd-highest
Auckland (Mangere)	29.3	Jan-24th	1959	Equal 3rd-highest
Levin	30.5	Feb-03rd	1895	4th-highest
Lowest extreme maximum temperatures				
South West Cape	4.9	Aug-04th	1991	3rd-lowest
Arapito	7.3	Jul-31st	1978	4th-lowest

Highest extreme minimum temperatures				
Cape Reinga	20.7	Feb-28th	1971	Highest
Whangaparaoa	20.9	Feb-29th	1982	Highest
Ngawi	23.4	Jan-24th	1972	Highest
Farewell Spit	19.7	Feb-03rd	1972	Highest
South West Cape	16.7	Feb-04th	1991	Highest
Wanaka	20.3	Feb-26th	1972	Equal highest
Whangarei	22.0	Feb-29th	1967	2nd-highest
Franz Josef	18.0	Mar-20th	1953	2nd-highest
Waiau	20.6	Feb-26th	1974	2nd-highest
Waipara West	22.4	Jan-25th	1973	2nd-highest
Te Anau	17.8	Feb-04th	1973	Equal 2nd-highest
Kaitia	22.0	Feb-28th	1948	3rd-highest
Whakatane	21.7	Jan-27th	1975	3rd-highest
Rangiora	20.0	Dec-15th	1972	3rd-highest
Westport	19.5	Jan-26th	1966	Equal 3rd-highest
Tara Hills	19.5	Feb-26th	1949	Equal 3rd-highest
Auckland (Whenuapai)	21.2	Feb-29th	1951	4th-highest
Wairoa	23.0	Feb-29th	1972	4th-highest
Upper Hutt (Trentham)	19.3	Feb-26th	1972	4th-highest
Hawera	19.1	Mar-24th	1977	4th-highest
Balclutha	15.0	Feb-25th	1972	4th-highest
Auckland (Mangere)	21.9	Feb-29th	1961	Equal 4th-highest
Lowest extreme minimum temperatures				
Appleby	-5.7	Aug-11th	1932	Equal 2nd-lowest
Whangarei	-1.1	Jul-03rd	1967	4th-lowest
Warkworth	-1.8	Jul-03rd	1966	4th-lowest
Five Rivers	-7.3	Aug-07th	1982	Equal 4th-lowest

Section 6: Annual Rainfall – Near normal in many parts

2016 annual rainfall totals were near normal (within 20% of the annual average) for many parts of the country. Two locations observed record or near-record high annual rainfall totals, while no record or near-record low rainfall totals were observed this year. Milford Sound is renowned for its abundant rainfall however this year was exceptional: the annual total of 9259 mm is its highest annual rainfall total in records that began in 1929.

The driest rainfall recording locations (based on data available at time of writing) were: Cromwell with 338 mm of rainfall recorded for the year, followed by Clyde with 352 mm, then Alexandra with 377 mm. Of the regularly reporting gauges the wettest locations in 2016 were: Cropp River (West Coast, 975 metres above sea level) with 11921 mm, Tuke River (West Coast, 975 metres above sea level) with 11373 mm, and Doon River (West Coast, 1211 metres above sea level) with 9892 mm. Of the regularly reporting gauges the wettest locations in 2016 *excluding* high elevation stations were: Milford Sound with 9259 mm, Franz Josef with 5235 mm, and Haast with 4131 mm.

Table 3: Record or near-record annual rainfall totals for the year 2016.

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
High records or near-records				
Milford Sound	9259	138	1929	Highest
South West Cape	1545	118	1991	2nd-highest
Low records or near-records				
None observed				

The top three 1-day rainfall totals from regularly reporting gauges in 2016 were 350 mm at North Egmont on 17 February, 316 mm at Collingwood on 23 March and 314 mm observed at Upper Takaka on 23 March. It is notable that these rainfalls are approximately equivalent to the total *annual* rainfall recorded in parts of Central Otago during 2016. Three locations recorded their record or near-record highest 1-day extreme rainfall in 2016.

Table 4: Record or near-record high extreme 1-day rainfall totals that occurred in 2016.

Location	1-day extreme rainfall (mm)	Date	Year records began	Comments
Appleby	126	Feb-17th	1932	Highest
Takaka	304	Mar-23rd	1976	2nd-highest
Motueka	193	Mar-23rd	1956	2nd-highest

Section 7: Annual Sunshine – Mostly near normal

Richmond was the sunniest location in 2016, recording 2840 sunshine hours. This is New Zealand's highest annual sunshine total on record, surpassing the previous highest total of 2814 hours recorded in Blenheim in 2015. Blenheim (2582 hours) and Takaka (2534 hours) were New Zealand's second-sunniest and third-sunniest locations in 2016 respectively.

Note on Richmond sunshine: *Richmond Ews* climate station was opened in 2015, and sunshine data records at this site begin in April 2015. As a result there is only one year of complete records, so the location does not feature in the following table.

Table 5: Near-record or record sunshine hours for the year 2016.

Location	Sunshine (hours)	Percent of normal	Year records began	Comments
High records or near-records				
Takaka	2534	105	1985	Highest

Masterton	2282	114	1930	2nd-highest
Appleby	2669	105	1995	2nd-highest
New Plymouth	2503	114	1972	3rd-highest
Low records or near-records				
Rotorua	1972	92	1976	2nd-lowest
Tauranga	2020	86	1932	2nd-lowest

Section 8: 2016 climate in the six main centres

All six main centres observed above average temperatures, with Tauranga and Wellington each recording their warmest year on record. Of the six main centres, for 2016 as a whole, Auckland was the warmest, Christchurch was the driest, Wellington was the wettest, and Dunedin was the coldest.

Table 6: 2016 climate in the six main centres.

Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland ^a	1143	102%	Near normal
Tauranga ^b	1250	105%	Near normal
Hamilton ^c	1163	97%	Near normal
Wellington ^d	1360	112%	Near normal
Christchurch ^e	577	97%	Near normal
Dunedin ^f	705	96%	Near normal
Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland ^a	16.6	+1.2	Above average (2nd-highest on record)
Tauranga ^b	15.9	+1.0	Above average (Highest on record)
Hamilton ^c	14.5	+0.9	Above average
Wellington ^d	13.9	+1.0	Above average (Highest on record)
Christchurch ^e	12.4	+0.8	Above average
Dunedin ^f	11.8	+0.7	Above average (2nd-highest on record)
Sunshine			
Location	Sunshine (hours)	% of normal	Comments
Auckland ^a	2033	100%	Near normal
Tauranga ^b	2020 ⁴	86%	Below normal (2nd-lowest on record)
Hamilton ^g	1835	91%	Near normal
Wellington ^d	1962 ⁴	93%	Near normal
Christchurch ^e	2018 ⁵	94%	Near normal
Dunedin ^f	1824 ⁶	-	-

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

⁴ Missing 1 day of data

⁵ Missing 11 days of data

⁶ Missing 33 days of data

Section 9: Significant weather and climate events in 2016

This section contains information pertaining to some of the more significant weather and climate events that occurred in 2016. Note that a more detailed list of significant weather events for 2016 can be found in the *Highlights and extreme events* section of NIWA's Monthly Climate Summaries. These summaries are available online at <http://www.niwa.co.nz/climate/summaries>.

Drought and low rainfall

In June 2016, the Ministry for Primary Industries extended the drought classification for the east coast of the South Island until the end of December 2016. This South Island drought was classified as a medium-scale adverse event, and regions included were Marlborough, Canterbury and parts of Otago (Central Otago, Dunedin, and Waitaki). These regions were initially classified as in drought on 12 February 2015, making it the longest period of time a classification of this type had lasted for. Some wells in Canterbury showed groundwater at record low levels during the drought.

Floods and high rainfall

On 19 January, heavy rain fell in south Canterbury, including the towns of Timaru, Geraldine and Temuka, blocking stormwater drains and causing surface flooding. A number of roads were closed for a time by the flooding. Timaru recorded its highest 1-day rainfall total for January of 81 mm in records that began in 1881.

Early on 24 March, a state of emergency was declared on the South Island's west coast after strong winds and heavy rain pummelled the area. The Waiho River in Franz Josef breached its banks, forcing nearly 200 people to evacuate from the town's Scenic Circle Hotel, Top 10 Holiday Park and Westwood Lodge. The Mueller Hotel in Franz Josef bore the brunt of the flood, with silt coating every floor and water marks 1.5 m up the walls, and the river was still flowing through the hotel days later. SH6 around Franz Josef was closed for a time due to flooding. The area from Motueka to Collingwood in Tasman District was inundated by very heavy rain in the early hours of the morning, causing major flooding and river breaches. The flooding closed SH60 from Riwaka to Collingwood as well as numerous local roads, and caused around 12 households to be evacuated. Many orchards in the area were flooded, affecting crops and machinery in the middle of harvesting season. Some beaches around Nelson experienced sewage overflows, and tourists who were trapped in their campervan by rising water in Motueka were rescued by a farmer. Takaka experienced its highest 1-day rainfall on record for March (304 mm, records began 1976).

On 15 November, a very heavy rain event caused flooding around Wellington, resulting in the closure of SH1 and SH2 for a time during the afternoon. Upper Hutt and Lower Hutt observed the equivalent of their normal November rainfall (whole month) in less than 24 hours with each location receiving more than 90 mm rain. About 500 homes in Pukerua and the Porirua suburb of Camborne were without power for some time due to a flood-related slip. The flooding also closed schools and disrupted NCEA exams in the region. Earlier in the day, the heavy rain impacted Marlborough causing the highway between Blenheim and Nelson to close due to flooding in Canvastown. Pelorus River breached its banks and evacuations were planned in the area. The steady rain had also

triggered flood alerts in Otago as well as hampering earthquake recovery efforts around the Kaikoura and Wellington areas.

Table 7: Record high monthly extreme 1-day rainfall totals were recorded in 2016 at:

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Ranking
January				
Wairoa	101	28th	1967	Highest
Mahia	63	28th	1990	Highest
Timaru	81	19th	1881	Highest
February				
Motu	127	18th	1990	Highest
Appleby	126	17th	1932	Highest (Highest)
March				
Takaka	304	23rd	1976	Highest (2nd-highest)
Farewell Spit	101	23rd	1882	Highest
Reefton	82	23rd	1960	Highest
Motueka	193	23rd	1956	Highest (2nd-highest)
Appleby	116	23rd	1932	Highest
Nelson	145	23rd	1941	Highest
April				
None observed				
May				
None observed				
June				
Motu	126	22nd	1990	Highest
July				
None observed				
August				
None observed				
September				
Martinborough	73	17th	1924	Highest
October				
None observed				
November				
Palmerston North	50	7th	1928	Highest
December				
None observed				

Note that rainfall rankings in brackets are all-month rankings

Temperature extremes

In late January, much of New Zealand sweltered under high temperatures and high humidity, resulting from air masses of tropical origin travelling over New Zealand, some of these from ex-Tropical Cyclone Victor. Daytime temperatures in Auckland reached almost 30°C for about a week.

Northerly airflows in early April resulted in unseasonable warmth for many parts of the country. On 2 April, Auckland (Mangere), Whangarei and Kaikohe observed their highest April temperature on record.

On 23 November, a foehn wind sent temperatures soaring across the eastern part of both the North and South Islands. For the first time since March, or in 8 months, the 30°C mark was officially eclipsed in New Zealand. Gisborne had its hottest November day on record, reaching 34.8°C. This was the second-hottest temperature ever recorded in New Zealand during the month of November. Wairoa also had its hottest November day on record, reaching 34.1°C and making it the fourth-warmest November temperature ever recorded in New Zealand. Several other locations also observed their record highest November temperature on this day.

Table 8: Extremes of high daily maximum temperature in 2016 were recorded at:

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Ranking
January				
Masterton	34.1	26th	1992	Highest
February				
Masterton	34.2	26th	1992	Highest
Paraparaumu	30.0	6th	1953	Highest (Highest)
Puysegur Point	26.0	3rd	1978	Highest
March				
Motu	27.6	8th	1990	Highest
Martinborough	30.7	6th	1986	Highest
Ngawi	30.6	6th	1972	Highest
Napier	33.1	8th	1868	Highest
Hastings	33.1	8th	1965	Highest
Takaka	30.5	7th	1978	Highest
Farewell Spit	27.5	7th	1971	Highest
Motueka	31.4	6th	1956	Highest
Nelson	29.4	7th	1943	Highest
Appleby	29.6	6th	1932	Highest
Le Bons Bay	28.7	10th	1984	Highest
April				
Kaikohe	27.5	2nd	1973	Highest
Whangarei	27.3	2nd	1967	Highest
Auckland (Mangere)	26.7	2nd	1959	Highest
Takaka	26.0	3rd	1978	Highest

May				
Kaitaia	24.2	6th	1948	Highest
Kaikohe	23.3	3rd	1973	Highest
Mokohinau	22.7	3rd	1994	Highest
Whangaparaoa	22.5	3rd	1982	Highest
Taupo	21.5	6th	1949	Highest
Whatawhata	23.3	9th	1952	Highest
Masterton	25.3	3rd	1906	Highest
Hicks Bay	23.0	4th	1969	Highest
Hawera	21.3	4th	1977	Highest
Hanmer Forest	25.9	11th	1906	Highest
Dunedin (Airport)	26.5	4th	1962	Highest
Dunedin (Musselburgh)	25.7	11th	1947	Highest
Lumsden	22.0	7th	1982	Highest
Lauder	24.0	4th	1924	Highest
Gore	22.2	7th	1971	Highest
Nugget Point	22.2	11th	1970	Highest
Kerikeri	24.6	3rd	1981	Equal highest
Nelson	22.8	5th	1943	Equal highest
Ranfurly	22.0	4th	1975	Equal highest
June				
Gisborne	23.2	10th	1905	Highest
Napier	25.1	10th	1868	Highest
Wairoa	24.2	10th	1964	Highest
Hanmer Forest	21.7	9th	1906	Highest
Christchurch (Riccarton)	23.1	10th	1863	Highest
Manapouri	18.2	9th	1963	Highest
South West Cape	18.0	21st	1991	Highest
July				
Hawera	18.2	23rd	1977	Highest
Waiau	21.8	23rd	1974	Highest
Kaikohe	19.1	4th	1973	Equal highest
August				
None observed				
September				
None observed				
October				
None observed				
November				
Gisborne	34.8	23rd	1905	Highest
Napier	33.4	23rd	1868	Highest
Hastings	32.7	23rd	1965	Highest
Whakatu	31.9	23rd	1868	Highest
Wairoa	34.1	23rd	1964	Highest
Mahia	27.7	23rd	1990	Equal highest
December				
None observed				

Note that temperature rankings in brackets are all-month rankings

Table 9: Extremes of low daily maximum temperature in 2016 were recorded at:

Location	Extreme low maximum (°C)	Date of extreme temperature	Year records began	Ranking
January				
South West Cape	10.1	28th	1991	Equal lowest
February				
None observed				
March				
Cheviot	10.1	16th	1982	Lowest
Le Bons Bay	9.5	16th	1984	Lowest
April				
None observed				
May				
None observed				
June				
None observed				
July				
None observed				
August				
Takaka	6.4	5th	1978	Lowest (2nd-lowest)
Farewell Spit	8.4	5th	1972	Lowest
Turangi	5.8	6th	1968	Equal lowest
Whanganui	7.5	5th	1972	Equal lowest
September				
Dargaville	10.8	8th	1951	Lowest
Whangaparaoa	11.0	8th	1982	Lowest
Auckland (North Shore)	11.1	8th	1995	Lowest
Whitianga	9.8	8th	1971	Lowest
Paeroa	10.0	8th	1971	Lowest
Stratford	7.0	8th	1972	Lowest
Appleby	8.5	8th	1941	Lowest
Arthurs Pass	-0.3	8th	1973	Lowest
October				
None observed				
November				
None observed				
December				
None observed				

Note that temperature rankings in brackets are all-month rankings

Table 10: Extremes of low daily minimum temperature in 2016 were recorded at:

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Ranking
January				
Turangi	0.6	5th	1968	Lowest
Queenstown	0.3	4th	1871	Lowest
Lumsden	-0.4	4th	1982	Lowest
Milford Sound	3.5	7th	1934	Equal lowest
February				
None observed				
March				
None observed				
April				
None observed				
May				
None observed				
June				
None observed				
July				
Motu	-8.4	3rd	1990	Lowest
Te Puke	-2.1	2nd	1973	Equal lowest
August				
Whanganui	-1.8	10th	1937	Lowest
Takaka	-4.3	7th	1978	Lowest
Mt Cook Village	-9.3	7th	1929	Lowest
Dunedin (Musselburgh)	-3.7	7th	1947	Lowest
Lumsden	-7.2	7th	1982	Lowest
Puysegur Point	0.1	7th	1978	Equal lowest
September				
Takaka	-4.3	9th	1978	Lowest
October				
None observed				
November				
None observed				
December				
None observed				

Note that temperature rankings in brackets are all-month rankings

Table 11: Extremes of high daily minimum temperature in 2016 were recorded at:

Location	Extreme high minimum (°C)	Date of extreme temperature	Year records began	Ranking
January				
Whakatane	21.7	27th	1975	Highest (3rd-highest)
Motu	18.2	27th	1990	Highest
Ngawi	23.4	24th	1972	Highest (Highest)
Westport	19.5	26th	1966	Highest (Equal 3rd-highest)
Reefton	18.1	26th	1972	Highest
Motueka	19.8	27th	1972	Highest
Waipara West	22.4	25th	1973	Highest (2nd-highest)
February				
Kerikeri	22.0	28th	1981	Highest
Mokohinau	21.5	19th	1994	Highest
Whangaparaoa	20.9	29th	1982	Highest (Highest)
Whitianga	22.5	29th	1971	Highest
Masterton	20.4	29th	1992	Highest
Milford Sound	18.2	4th	1935	Highest
Secretary Island	18.1	4th	1988	Highest
Puysegur Point	19.5	4th	1978	Highest
Cheviot	21.5	27th	1982	Highest
South West Cape	16.7	4th	1991	Highest (Highest)
March				
Secretary Island	17.8	20th	1988	Highest
Nelson	20.5	7th	1943	Highest
Waipara West	21.5	21st	1973	Highest
Le Bons Bay	19.3	22nd	1984	Highest
Lake Tekapo	17.7	8th	1928	Highest
Gore	16.9	20th	1972	Highest
Nugget Point	16.2	20th	1972	Highest
Whangaparaoa	20.0	24th	1982	Equal highest
Waione	18.4	6th	1993	Equal highest
April				
None observed				
May				
Mokohinau	19.0	6th	1994	Highest
Port Taharoa	17.3	12th	1974	Highest
New Plymouth	18.0	5th	1944	Highest
Waione	17.9	4th	1993	Highest
Martinborough	17.9	4th	1986	Highest
Ngawi	18.1	4th	1972	Highest
Paraparaumu	17.5	4th	1972	Highest
Wellington	18.0	4th	1972	Highest
Farewell Spit	17.5	5th	1972	Highest

Westport	16.0	5th	1966	Highest
Milford Sound	13.2	9th	1935	Highest
Secretary Island	15.1	8th	1988	Highest
Kaikoura	16.6	3rd	1972	Highest
Culverden	17.0	3rd	1930	Highest
Mt Cook Village	12.6	2nd	1929	Highest
Wanaka	13.5	2nd	1972	Highest
Manapouri	13.3	2nd	1973	Highest
South West Cape	13.9	2nd	1991	Highest
Masterton	17.2	12th	1992	Equal highest
Le Bons Bay	15.4	3rd	1984	Equal highest
June				
Whangaparaoa	15.8	10th	1982	Highest
Auckland (Whenuapai)	16.4	10th	1951	Highest
Auckland (Lincoln Rd)	16.4	10th	1971	Highest
Whitianga	16.4	10th	1971	Highest
Paeroa	16.9	10th	1971	Highest
Tauranga	16.5	10th	1941	Highest
Te Puke	15.8	10th	1973	Highest
Whakatane	16.3	10th	1975	Highest
Port Taharoa	15.6	10th	1974	Highest
Masterton	14.6	23rd	1992	Highest
Waione	14.6	11th	1993	Highest
Reefton	11.7	23rd	1972	Highest
South West Cape	11.7	10th	1991	Highest
Farewell Spit	14.0	22nd	1972	Equal highest
July				
Auckland (Whenuapai)	14.6	24th	1951	Highest
Waipawa	12.4	24th	1945	Highest
Wairoa	15.8	24th	1972	Highest
August				
Kerikeri	15.8	26th	1981	Highest
Kaikohe	15.3	26th	1973	Highest
September				
Dannevirke	15.9	17th	1951	Highest
Waione	15.9	17th	1993	Highest
Hawera	14.0	17th	1977	Highest
Kaikoura	14.1	17th	1972	Highest
October				
Balclutha	13.1	17th	1972	Highest
November				
Ranfurlly	16.1	23rd	1897	Highest
December				
None observed				

Note that temperature rankings in brackets are all-month rankings

Strong winds

For ‘central New Zealand’ for the year as a whole (and the 60 km/hr threshold), 2016 equalled the 1981-2010 climatological average (Figure 3⁷), with 39 days exceeding 60 km/hr average 9 a.m. wind speed between Auckland and Christchurch. April 2016 experienced no days with wind above this threshold, and February, March, June and August each experienced only one day above the threshold. These five ‘calm’ months were counteracted by the two very windy months of May and August, both characterised by pressures more than 10 hPa below normal to the southwest of New Zealand and strong north-westerly airflow across the country. The four windiest years in this record are: 1988 (1st, 65 days), 2002 (2nd, 55 days), 1982 (3rd, 54 days), and 2014 (4th, 53 days).

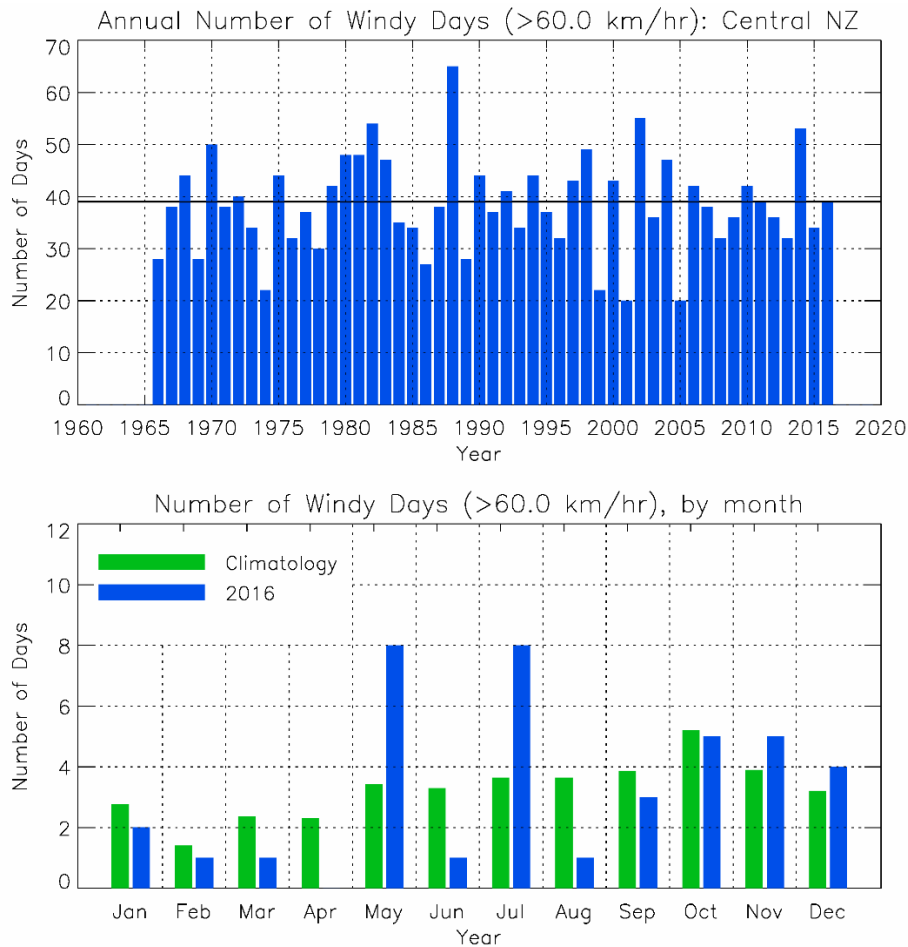


Figure 3: (Top) Annual number of ‘windy days’ for central New Zealand, 1966 to 2016, with horizontal line indicating the 1981-2010 average (39.0 days); (Bottom) Number of ‘windy days’ by month, comparing the months of 2016 (blue histogram) with the 1981-2010 average (green).

⁷ In these graphs, a ‘windy day’ is defined as one where the daily 9am pressure difference corresponds to a geostrophic wind speed exceeding a specified threshold (either westerly or easterly). Thus, it is a broad measure, and won’t capture short-lived southerlies or local wind enhancements. The threshold selected is 60 km/hr. (Note: On the Beaufort wind scale, a mean speed of 62 km/hr or greater corresponds to Gale Force or greater). The wind index used is: Z1 (Auckland minus Christchurch), referred to as “Central NZ” in the Figure 3.

On 10 March, high winds affected much of the South Island. All flights in and out of Dunedin and Invercargill were cancelled for a time, and downed trees blocked roads in coastal Otago. The winds also caused damage to power lines, leading to power outages in many parts of Otago and Southland. Dunedin Airport also lost power for a short time and had to rely on its generator. In Canterbury, the high winds fanned numerous out-of-control bush and scrub fires, particularly near Darfield and Mt Somers. On a bridge over the Pukaki-Ohau canal, a truck trailer flipped in the high winds. Wind-driven waves crashed over coastal roads and the high tide flooded the Otepunui Garden area in Invercargill.

On 23-24 March, strong winds battered northern and western parts of the country. Almost 18,000 homes in Auckland and Northland were without power, trees fell on powerlines and trampolines were blown onto roofs. Wind warnings were in place for the Auckland Harbour Bridge and SH1 at the Desert Road. Auckland ferry services were cancelled or delayed due to the rough seas.

On 7-8 September, a significant storm struck most of New Zealand bringing strong southerly winds, low temperatures, and snow to much of the central and eastern South Island and Wellington regions. Wind gusts of up to 160 km/hr affected Banks Peninsula overnight on 7 September, and thousands of homes were without power in Otago, Canterbury, and Wellington due to wind-blown trees and debris damaging power lines. Two people were injured after a tree toppled onto their car near Tai Tapu, south of Christchurch. Cook Strait ferries and Wellington Harbour ferries were cancelled due to high seas and strong winds.

Table 12. Maximum wind gust extremes in 2016 were recorded at:

Location	Maximum wind gust (km/hr)	Date of maximum wind gust	Year records began	Ranking
January				
Motu	95	8th	1991	Highest
February				
Hawera	91	17th	1986	Highest
Nelson	95	17th	1972	Highest
March				
Manapouri	106	10th	1991	Highest
April				
None observed				
May				
Motu	93	24th	1991	Highest
Cape Reinga	159	21st	1974	Equal highest
June				
None observed				
July				
Paraparaumu	122	24th	1972	Highest
Whanganui	109	24th	1977	Highest (Equal 2nd-highest)
Taupo	91	8th	1982	Equal highest

Castlepoint	145	28th	1972	Equal highest
August				
Auckland (North Shore)	80	26th	1994	Highest
Napier	104	27th	1973	Highest
September				
Hawera	102	8th	1986	Highest
Auckland (North Shore)	74	28th	1994	Equal highest
October				
None observed				
November				
Waiouru	143.0	15th	1970	Highest
Westport	106.0	27th	1973	Highest
December				
None observed				

Note that rankings in brackets are all-month rankings

Snow

On 22 May overnight snow caused disruptions in several parts of the country. 38 people who were four-wheel-driving on the Old Man Range near Roxburgh (Central Otago) were hit by a sudden snowstorm and were trapped in their vehicles overnight. Continued bad weather slowed down rescue efforts and snow banks of up to 2 m prevented a land-based rescue. Snow on the Crown Range near Queenstown also led to 12 vehicles sliding off the road and a further 20 vehicles were stranded before the pass was eventually closed.

From 5-8 August, a significant snow event impacted the central and eastern North Island. Major highways were closed, including SH1 at the Desert Road, SH5 from Napier to Taupo, as well as minor roads in the region. Trucks were stranded for several days and motorists faced detours of up to five hours. More than 100,000 people were without power in Hawke's Bay, particularly in Napier and Hastings, as well as in rural areas around Taupo, after snow overloaded transmission lines. The wild weather brought down 200 power poles across the region.

On 7-8 September, a significant snow event affected the South Island and lower North Island. Snow settled in the hill suburbs around Wellington, with snowfall reported to near sea level around the Wellington region for the first time in five years. Heavy snow fell in parts of Otago and Canterbury, and in the central North Island. The Remarkables ski area reported 55 cm of new snow overnight on 7 September and Mt Hutt ski field reported up to 1 m of new snow in places. Snow settled on Mt Pirongia in the Waikato region. Meanwhile, more than 80 people, including pupils from St Bernard's Primary School in Wellington and Wellington High School, were stranded at Tukino Ski Field on Mt Ruapehu because of poor weather and snow blocking the access road. They were able to leave the ski field lodge on 10 September.

Tornadoes and waterspouts

On 12 May, small tornadoes were reported on the West Coast. One tornado blew a 2000-litre water tank off its stand. State Highway 6 was closed at Haast Pass due to fallen trees but no detour was available.

On 7 November, several small tornadoes were reported across the Bay of Plenty region. A small tornado touched down in Ohope. Trees were uprooted, roofs lifted, windows smashed and trampolines went flying. Another tornado was reported in Katikati earlier in the day while a kiwifruit orchard in Opotiki was also reportedly struck by a mini tornado.

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Note for editors:

Climate measurements have been made in New Zealand for about 150 years, with reasonable coverage of reliable data from at least 1900. NIWA makes its raw climate data publicly available for free on-line. 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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