

Heavy downpours and unseasonable warmth

Rainfall	Large areas of well above normal rainfall (>149% of normal) were observed over Marlborough, Nelson, Tasman, West Coast, Canterbury High Country and inland Otago. Patches of above normal rainfall (120-149% of normal) were seen in coastal northern Northland, inland Bay of Plenty, Wellington and the Kāpiti Coast. Below normal rainfall (50-79% of normal) was observed for western Northland, Auckland, much of Waikato, coastal Taranaki, coastal Manawatū-Whanganui, much of the Wairarapa, parts of the upper and lower Canterbury plains, and southern Otago. Well below normal rainfall (<50% of normal) was seen for the eastern North Island extending from Gisborne to the eastern Wairarapa hills, as well as coastal Canterbury from Selwyn to Kaikōura.
Temperature	Temperatures were above average (0.51-1.20°C above average) or well above average (>1.20°C above average) for most of the country. The exception was in parts of Auckland, Bay of Plenty, parts of Waikato, inland parts of Manawatū-Whanganui, northern Hawke's Bay, Nelson, as well as patches along the eastern coastal fringe of the South Island, where near average temperatures (±0.50°C of average) were observed.
Soil Moisture	At the end of July, soil moisture levels were near normal for most of New Zealand. The only region of lower than normal soil moisture was an area extending from Central Hawke's Bay into the Tararua district.

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Overview

Although July started with a ridge of high pressure, this quickly abated and the month became defined by mobile weather systems and fronts. These fronts frequently drew sub-tropical moisture and warmth from the lower latitudes in northerly-component airstreams, resulting in bursts of heavy rain to the western South Island and rain and thunderstorms to the North Island. The stand-out rain event occurred between 15-18 July and brought over 690 mm of rain to parts of the West Coast in under 72 hours. The Buller River swelled in response to the rain, and flood flows on the Buller River were the largest of any river in Aotearoa New Zealand in almost 100 years¹.

¹ See "Highlights and extreme events" for more information.

The variability in weather systems was also reflected in the Southern Annual Mode (SAM), which transitioned from positive to negative at the beginning of July, in contrast to June where it remained largely positive. The phase and magnitude of the SAM is a proxy for the strength and position of the belt of westerly winds that span zonally across the Southern Ocean. In its negative phase, the SAM usually results in lower than normal air pressure around New Zealand, reflecting the increased risk for unsettled weather conditions.

Additionally, the Bureau of Meteorology in Australia (BOM) declared a negative Indian Ocean Dipole (IOD) event was underway during July, which may have allowed for more tropical moisture to become available to passing weather systems.

Finally, convective forcing due to the Madden-Julian Oscillation (MJO) was active over Africa and the Indian Ocean early in the month before moving into the western Pacific. In association with this, several plumes of deep, tropical moisture stretched from the eastern Indian Ocean to New Zealand, including one that caused extreme flooding in the Buller District. This likely also had some connection to the IOD event.

There were significant spatial differences in the observed rainfall over the country in July. Large areas of well above normal rainfall (>149% of normal) were observed over Marlborough, Nelson, Tasman, West Coast, Canterbury high country and northern Otago. Patches of above normal rainfall (120-149% of normal) were seen in coastal northern Northland, inland Bay of Plenty and around Wellington central and the Kāpiti Coast. Near normal rainfall (80-119% of normal) was observed across eastern Northland, inland Taranaki, inland Manawatū, inland Waikato, Bay of Plenty and up to East Cape, as well as parts of Southland and the foothills of the Canterbury and eastern Marlborough ranges. Below normal rainfall (50-79% of normal) was observed for western Northland, Auckland, much of Waikato, coastal Taranaki, coastal Manawatū-Whanganui, much of the Wairarapa, parts of the upper and lower Canterbury plains, and southern Otago. Well below normal rainfall (<50% of normal) was seen for the eastern North Island extending from Gisborne to the eastern Wairarapa hills, as well as coastal Canterbury from Akaroa to Kaikōura.

Near average temperatures ($\pm 0.50^\circ\text{C}$ of average) were observed for parts of Auckland, Bay of Plenty, parts of Waikato, inland parts of Manawatū-Whanganui, northern Hawke's Bay, Nelson, as well as patches along the eastern coastal fringe of the South Island. Temperatures were above average ($0.51\text{--}1.20^\circ\text{C}$ above average) or well above average ($>1.20^\circ\text{C}$ above average) for the remainder of New Zealand.

July 2021 was the 6th-equal warmest July on record. Six out the seven warmest Julys on record have occurred since the year 2000. The mean temperature for July 2021 was 8.9°C which is 1.1°C warmer than average (1981-2010).

Further Highlights:

- The highest temperature was 21.0°C , observed at Whanganui on 30 July.
- The lowest temperature was -8.4°C , observed at Hanmer Forest on 4 July.
- The highest 1-day rainfall was 210 mm, recorded at Arthurs Pass on 16 July.
- The highest wind gust was 185 km/h, observed at Cape Turnagain on 18 July.
- Of the six main centres in July 2021, Auckland was the warmest and sunniest, Wellington was the wettest, Christchurch was the driest and coolest, and Dunedin was the least sunny.

- Of the available, regularly reporting sunshine observation sites, the sunniest four locations so far in 2021 are Taranaki (1511 hours), Bay of Plenty (1481 hours), Marlborough (1477 hours), and Hawke’s Bay (1446 hours)

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Rainfall: Exceptionally wet for the western South Island

Several significant rainfall events hit the South Island in July, with two of these occurring within a week of each other and impacting a similar location (upper South Island). Pockets of rainfall observations of over 200% of the monthly normal were seen in Nelson, Tasman, Marlborough, West Coast, the Canterbury High Country and the Central Otago district.

Both the North and South Islands shared a similar west-east divide of rainfall patterns; where eastern areas were in general much drier than western regions. Parts of Hawke’s Bay received well below normal rainfall, while the eastern Bay of Plenty received near or just above normal rainfall just over the central divide.

Record^{2,3} or near-record July rainfall totals were recorded at:

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
High records or near-records				
Reefton	355	211	1960	2nd-highest
Campbell Island	166	157	1992	3rd-highest
Mt Ruapehu Chateau	370	140	2000	4th-highest
Tākaka	342	174	1976	4th-highest
Motueka	273	209	1943	4th-highest
Blenheim	162	215	1927	4th-highest
Low records or near-records				
Takapau Plains	32	28	1962	2nd-lowest
Wairoa	38	28	1964	2nd-lowest
Dannevirke	30	29	1951	3rd-lowest
Castlepoint	20	17	1902	3rd-lowest

² 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.

³ All values in this climate summary are compared to the 1981-2010 climate normals.

Temperature: Persistent daytime and nighttime warmth

Most of New Zealand experienced above average temperatures, although near average temperatures were found in the central North Island and along the eastern coastal fringe of the South Island. Both minimum and maximum temperatures were warmer than average for many areas, with 33 locations recording within their top-4 warmest mean July maximum temperatures and 11 locations recording within their top-4 warmest mean July minimum temperatures.

July 2021 was the 6th-equal warmest July on record. Six out the seven warmest Julys on record have occurred since the year 2000. The nationwide average temperature in July 2021 was 8.9°C. This was 1.1°C above the 1981-2010 average .

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

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
Hokitika	8.9	+1.5	1866	2nd-highest
Motueka	8.4	+1.5	1956	2nd-highest
Te Anau	6.2	+2.0	1963	2nd-highest
South West Cape	9.0	+1.5	1991	2nd-highest
Leigh	13.8	+1.3	1966	3rd-highest
Porirua	9.6	+0.7	1968	4th-highest
Hāwera	9.7	+1.3	1977	4th-highest
Hokitika	8.9	+1.5	1866	4th-highest
Haast	9.0	+1.3	1949	4th-highest
Puysegur Point	9.5	+1.3	1978	4th-highest
Brothers Island	11.4	+1.2	1997	4th-highest
Medbury	6.5	+1.6	1927	4th-highest
Akaroa	9.3	+1.9	1978	4th-highest
Roxburgh	6.9	+2.5	1950	4th-highest
Low records or near-records				
None observed				

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

Location	Mean maximum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
Hanmer Forest	13.5	+3.4	1906	Highest
Matamata	15.0	+1.5	1999	2nd-highest
Taupō	13.2	+2.2	1949	2nd-highest
Waipawa	14.4	+2.0	1945	2nd-highest
Palmerston North	14.6	+1.9	1928	2nd-highest
Porirua	14.2	+1.8	1968	2nd-highest
Medbury	13.6	+2.9	1927	2nd-highest
Manapouri Airport	10.5	+2.6	1963	2nd-highest

Motu	11.8	+1.8	1990	3rd-highest
Taumarunui	13.7	+1.2	1947	3rd-highest
Martinborough	14.2	+1.8	1986	3rd-highest
Ngawi	14.5	+1.9	1972	3rd-highest
Ohakune	11.8	+2.5	1962	3rd-highest
Tākaka	14.8	+1.5	1978	3rd-highest
Waiau	13.8	+2.8	1974	3rd-highest
Lake Tekapo	8.8	+2.6	1927	3rd-highest
South West Cape	10.8	+1.4	1991	3rd-highest
Whangārei	16.9	+1.4	1967	4th-highest
Leigh	16.9	+1.8	1966	4th-highest
Auckland (Whenuapai)	15.5	+0.9	1945	4th-highest
Whitianga	16.3	+1.5	1962	4th-highest
Auckland (Māngere)	15.7	+1.3	1959	4th-highest
Dannevirke	13.4	+1.7	1951	4th-highest
Gisborne	15.6	+1.4	1905	4th-highest
Levin	14.2	+1.5	1895	4th-highest
Wellington Airport	13.5	+1.2	1962	4th-highest
Stratford	12.6	+1.2	1960	4th-highest
Hāwera	13.4	+1.4	1977	4th-highest
Whanganui	14.7	+1.4	1937	4th-highest
Secretary Island	12.4	+0.6	1985	4th-highest
Waipara West	13.7	+1.7	1973	4th-highest
Akaroa	13.8	+2.0	1978	4th-highest
Manapouri (West Arm Jetty)	7.7	+2.3	1971	4th-highest
Low records or near-records				
None observed				

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

Location	Mean minimum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
South West Cape	7.2	+1.6	1991	2nd-highest
Hokitika	5.0	+2.1	1866	3rd-highest
Puysegur Point	7.4	+1.6	1978	3rd-highest
Kaitaia	10.1	+1.6	1948	4th-highest
Brothers Island	9.7	+1.1	1997	4th-highest
Te Anau	2.7	+2.5	1963	4th-highest
Five Rivers	0.8	+1.5	1982	4th-highest
Roxburgh	3.4	+3.6	1950	4th-highest
Gore	2.5	+1.7	1907	4th-highest
Invercargill	3.1	+2.1	1905	4th-highest
Hicks Bay	9.4	+1.1	1969	Equal 4th-highest
Low records or near-records				
None observed				

July climate in the six main centres

July rainfall was well below normal in Christchurch, below normal in Auckland and Dunedin, near normal in Tauranga and Hamilton, and well above normal in Wellington. Temperatures were near average in Tauranga and Hamilton, and above average in Auckland, Wellington, Christchurch and Dunedin.

Of the six main centres in July 2021, Auckland was the warmest and sunniest, Wellington was the wettest, Christchurch was the driest and coolest, and Dunedin was the least sunny.

July 2021 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland ^a	11.7	+0.8	Above average
Tauranga ^b	10.8	+0.5	Near average
Hamilton ^c	8.9	+0.2	Near average
Wellington ^d	9.9	+1.0	Above average
Christchurch ^e	6.7	+0.9	Above average
Dunedin ^f	7.7	+1.2	Above average
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland ^a	88	64	Below normal
Tauranga ^b	122	95	Near normal
Hamilton ^c	104	81	Near normal
Wellington ^d	233	162	Well above normal
Christchurch ^e	25	39	Well below normal
Dunedin ^f	42	73	Below normal
Sunshine			
Location	Sunshine (hours)		
Auckland ^a	175		
Tauranga ^b	175		
Hamilton ^e	144		
Wellington ^d	148		
Christchurch ^e	167		
Dunedin ^f	113		

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

Highlights and extreme events

Rain and slips

The highest 1-day rainfall was 210 mm, recorded at Arthurs Pass on 16 July.

During the evening of 6 July, heavy rain caused slips on SH54 near Vinegar Hill (Rangitikei District), forcing the road to close between lower Pakihikura Rd and SH1. Milford Sound recorded 118 mm of rain in a 24-hour period.

From 15 July to 18 July, a pulse of tropical air deriving from the Indian Ocean combined with an upper level trough and front to direct a humid and gusty northerly flow to the central and northern South Island. Within a 72-hour period, Ivory Glacier recorded 697 mm, Arthurs Pass recorded 413 mm and Motueka recorded 105 mm. In response to this persistent heavy rain, the Buller River swelled. Flood levels measured at the Buller River reached the highest they had been since 1926. Floodwaters cut off areas of the Marlborough and nearly 1000 people had to evacuate. Residents in parts of Westport were also forced to evacuate as the Buller River burst its banks, leaving waist-high water in many areas. A State of Emergency was declared by the local council. In the aftermath of the flood, at least 200 homes in Westport were deemed uninhabitable and the army was brought in to help clean the damage. At least 1000 stock were lost due to the floods. The Ministry for Primary Industries (MPI) declared a medium-scale adverse event, unlocking funds to help flood affected farmers and growers.



Photo 1: Buller River swing bridge on 17 July.

Wellington also experienced pockets of flooding and slips on 17 July, with parts of SH1 impacted by a burst wastewater main. Fire and Emergency services responded to more than 60 calls within 30 minutes relating to flooding and property damage.

The following weekend, another heavy rainfall event hit the top of the South Island, with Motueka recording an additional 88 mm in a 48-hour period. Tākaka Hill Road was closed due to a large slip, and several other roads were closed due to flooding.



Photo 2: Slips and debris on the road in the Tasman region after heavy rain on 25 July. Credit: Tasman District Council @tasmandc

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

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Comments
Mt Ruapehu Chateau	93	17th	2000	2nd-highest
Arapito	82	15th	1978	2nd-highest
Reefton	95	16th	1960	2nd-highest
Lauder	28	6th	1924	2nd-highest
Wellington Airport	55	17th	1958	3rd-highest
Haast	114	6th	1943	3rd-highest
Secretary Island	66	25th	1985	3rd-highest
Tākaka	120	16th	1976	4th-highest
Cromwell	27	6th	1949	4th-highest
South West Cape	30	5th	1991	4th-highest

Temperatures

The highest temperature was 21.0°C, observed at Whanganui on 30 July.

The lowest temperature was -8.4°C, observed at Hanmer Forest on 4 July.

On 5 July, low cloud and fog persisted throughout the day over inland parts of Waikato, Bay of Plenty and Manawatū-Whanganui. The lack of sunshine contributed to low daytime temperatures, with Hamilton, Whatawhata, Rotorua and Taumarunui near-record low daily maximum temperatures for July, respectively.

From 16-18 July, humid and windy conditions led to a string of mild nights for many areas in the South Island and parts of the lower North Island. During this period, Hokitika, Motueka, Reefton and Porirua recording their warmest July daily minimum temperature on record, with 18 other locations across the North Island and South Island recording near-record warm July minimums.

Unseasonal warmth persisted well into July. Clear skies and northerly winds contributed to a warm day for parts of the central and southern North Island on 30 and 31 July, leading to six locations observing record or near-record July daily maximum temperatures.

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

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Comments
High records or near-records				
Porirua	18.3	31st	1968	Highest
Greymouth	18.1	31st	1947	Highest
South West Cape	16.3	29th	1991	Highest
Whangārei	20.8	18th	1967	2nd-highest
Auckland Airport	19.1	18th	1959	2nd-highest
Farewell Spit	19.5	30th	1971	2nd-highest
Manapouri Airport	16.1	25th	1963	2nd-highest
Whitianga	19.7	29th	1962	3rd-highest
Taupō	16.7	29th	1949	3rd-highest
Mt Ruapehu Chateau	12.1	5th	2000	3rd-highest
Hanmer Forest	19.8	30th	1906	3rd-highest
Manapouri (West Arm Jetty)	12.8	5th	1971	3rd-highest
Martinborough	18.6	30th	1986	4th-highest
Mahia	18.7	18th	1990	4th-highest
Levin	18.8	30th	1895	4th-highest
Ohakune	16.5	30th	1962	4th-highest
Windsor	18.9	6th	2000	4th-highest
Auckland (Whenuapai)	19.3	18th	1945	Equal 2nd-highest
Dannevirke	20.4	17th	1951	Equal 2nd-highest
Leigh	20.0	18th	1966	Equal 3rd-highest
New Plymouth	17.7	31st	1944	Equal 3rd-highest
Auckland (Māngere)	18.9	18th	1959	Equal 4th-highest
Hokitika	18.7	31st	1866	Equal 4th-highest
Cheviot	20.3	6th	1982	Equal 4th-highest
Te Anau	15.5	25th	1963	Equal 4th-highest
Middlemarch	18.2	6th	2000	Equal highest
Low records or near-records				

Mokohinau	9.8	8th	1994	Lowest
Whatawhata	6.3	5th	1952	2nd-lowest
Taumarunui	4.8	5th	1947	2nd-lowest
Rotorua	6.5	5th	1972	3rd-lowest
Hamilton	6.3	5th	1946	3rd-lowest
Taumarunui	5.3	5th	1947	3rd-lowest

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

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Comments
High records or near-records				
Porirua	13.2	16th	1972	Highest
Hokitika	12.3	17th	1866	Highest
Reefton	11.5	17th	1972	Highest
Motueka	13.2	17th	1972	Highest
Te Anau	9.7	6th	1973	Highest
South West Cape	12.8	30th	1991	Highest
Dannevirke	13.5	17th	1951	2nd-highest
Martinborough	13.2	17th	1986	2nd-highest
Arapito	12.4	17th	1978	2nd-highest
Nelson	13.0	17th	1862	2nd-highest
Blenheim	13.8	17th	1947	2nd-highest
Manapouri Airport	9.5	6th	1973	2nd-highest
Mokohinau	15.1	31st	1994	3rd-highest
Leigh	14.9	17th	1966	3rd-highest
Paraparaumu	13.3	18th	1972	3rd-highest
Wellington Airport	13.4	18th	1972	3rd-highest
Tākaka	12.0	17th	1978	3rd-highest
Milford Sound	10.4	6th	1935	3rd-highest
Secretary Island	12.0	30th	1988	3rd-highest
Greymouth	11.4	17th	1972	4th-highest
Haast	12.0	31st	1949	4th-highest
Puysegur Point	11.7	5th	1978	4th-highest
Waiau	10.3	7th	1974	4th-highest
Akaroa	11.6	6th	1978	4th-highest
Campbell Island	8.4	3rd	1991	4th-highest
Franz Josef	11.1	17th	1953	Equal 2nd-highest
Cape Reinga	14.6	17th	1971	Equal 3rd-highest
Mahia	13.1	18th	1990	Equal 3rd-highest
Levin	13.0	18th	1950	Equal 3rd-highest
Brothers Island	12.7	16th	1997	Equal 3rd-highest
Dargaville	14.3	18th	1951	Equal 4th-highest
Wellington (Kelburn)	12.2	16th	1931	Equal 4th-highest
Low records or near-records				
Cheviot	-6.3	5th	1982	Lowest
Mokohinau	6.5	7th	1994	2nd-lowest

Masterton	-5.5	5th	1906	3rd-lowest
Ohakune	-6.8	5th	1962	4th-lowest

Wind

The highest wind gust was 185 km/h, observed at Cape Turnagain on 18 July.

On 7 July, strong winds fanned a scrub fire north of Clarence. Large plumes of smoke reportedly spread from the fire to the nearby SH1 and railway line, causing the SH1 to be temporarily closed.

The same front that caused the flooding to the Buller district in the South Island also brought powerful winds. Wellington recorded a 122 km/h wind gust on 18 July, while Castlepoint recorded a 111 km/h wind gust and Whanganui a 104 km/h gust on 17 July.

On 27 July, motorists heading over the Auckland Harbour Bridge were warned to take extra care due to strong wind gusts. Whenuapai recorded a maximum gust of 72 km/h.

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

Location	Extreme wind gust (km/h)	Date of extreme gust	Year records began	Comments
Secretary Island	146	25th	1994	Highest
Mokohinau	130	17th	1994	2nd-highest
Upper Hutt (Trentham)	96	18th	1999	2nd-highest
South West Cape	156	5th	1991	3rd-highest
Hicks Bay	128	17th	1975	4th-highest
Whanganui	104	17th	1977	4th-highest
Motu	102	17th	1991	Equal 3rd-highest
Clyde	74	10th	1983	Equal 3rd-highest
Puysegur Point	148	5th	1986	Equal 4th-highest
Mt Cook Airport	120	6th	2000	Equal 4th-highest
Palmerston North	95	17th	1991	Equal highest
Reefton	70	7th	1999	Equal highest

Lightning and hail

A front brought thunderstorms to western areas of the North Island on 18 July. Over 1200 lightning strikes were detected in under three hours.

Thunderstorms hit Northland, Auckland, Waikato and Bay of Plenty on 26 July. Over 200 strikes were detected. Leigh recorded over 30 mm of rain in a hour.

Snow and ice

On the morning of 14 July, trains travelling from Waikanae to Wellington were cancelled due to ice on the overhead power lines.

On 16 July, snow fell and settled to the valley floor around Lake Ōhau. The snowfall was somewhat unexpected, given the prevailing warm northerly airmass over the South Island. This was a warm advection snowfall, where cold air near the ground surface enables snow to fall to much lower elevations than the free air freezing levels of the prevailing northerly airmass. In this case, cold air trapped in the Lake Ōhau basin (a localised inversion) enabled the snowfall. It was a particularly isolated event, which was notable as New Zealand's warm advection snowfalls are typically more widespread, and due to a southerly front undercutting a warm and moist airmass. The local ski area *Ōhau Snow Fields* reported 50 cm fresh snow.

Cloud and fog

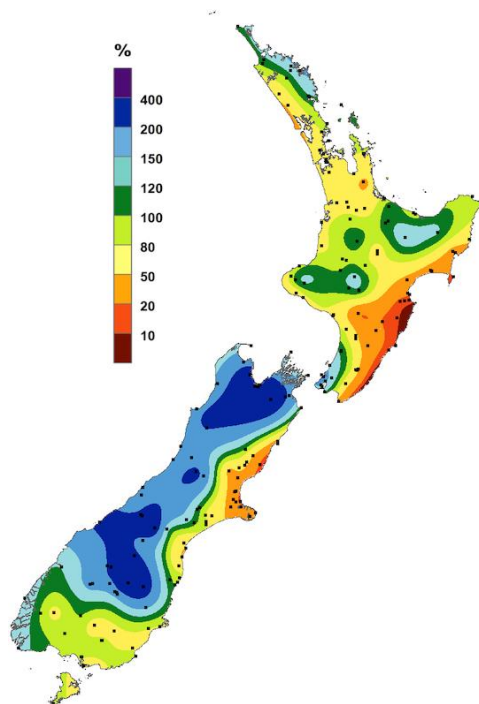
On 24 July, heavy fog caused significant delays at Auckland Airport. Twenty-six domestic flights were cancelled.

For further information, please contact:

Tristan Meyers

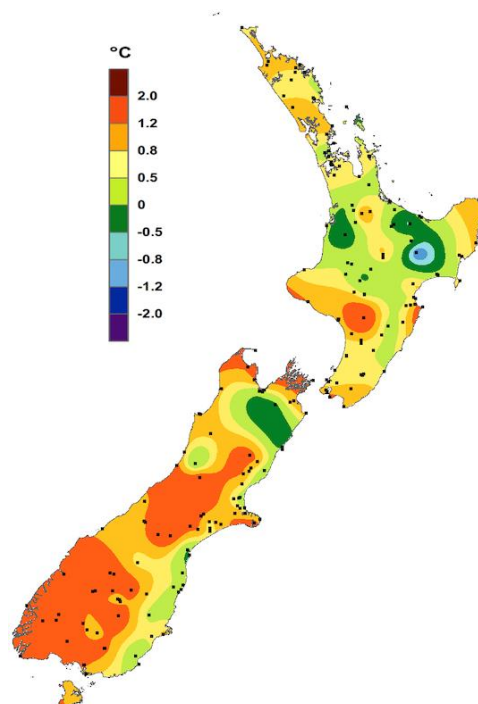
Meteorologist, NIWA Auckland

Tel. 09 375 4508



July rainfall

Expressed as a percentage of the 1981-2010 normal.



July temperature

Expressed as a departure from the 1981-2010 average in degrees Celsius.

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

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