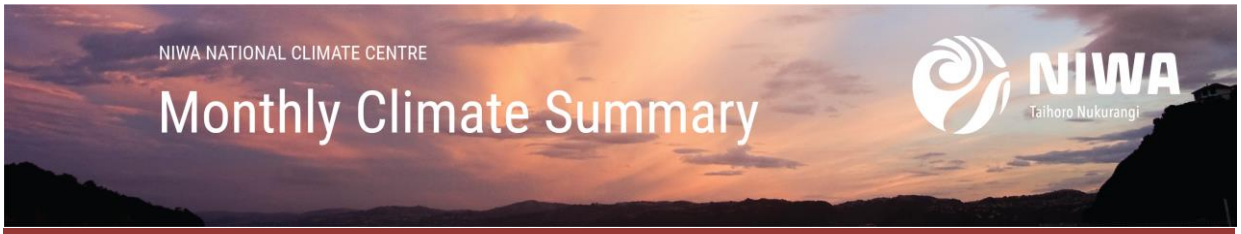

New Zealand Climate Summary: **September 2019** Issued: 3 October 2019

Average temperatures overall with variable rainfall patterns

Temperature	Temperatures were average (-0.50 to +0.50°C of average) for much of the country despite several cold snaps. Below average temperatures (0.51°C to 1.2°C below average) were observed in a few parts of the South Island including northern Tasman, much of Marlborough, Takaka, and eastern locations between Rakaia and Dunedin. Few isolated locations experienced above normal temperature (0.51°C to 1.2°C above average), mostly in the North Island.
Rainfall	Rainfall was below normal (50% to 79% of normal) over much of the southern portion of both islands (with a few exceptions) with well below normal rainfall (<50% of normal) observed in parts of the Wellington region and for southern West Coast, southwest Canterbury and northwest Otago in the South Island. Above normal (120% to 149% of normal) or well above normal (>149% of normal) rainfall levels were less widely observed, occurring in the Far North, locations between Kaipara and Hamilton (including Auckland), the Coromandel Peninsula, Nelson, and in parts of Otago, Tasman and Marlborough.
Soil Moisture	As of 1 October, soil moisture was near normal for most of New Zealand. Soils were drier than normal for coastal parts of the Gisborne and Wellington regions, and for inland Otago, southwest Canterbury, and a small part of north Canterbury near Culverdon. Wetter than normal soil moisture levels were restricted to very small patches along the east coast of the South Island near Kaikoura, Christchurch and Dunedin.

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

Overview

September 2019 was characterised by lower than normal mean sea level pressure over and to the southeast of New Zealand with above normal pressure to the west. This pressure set up resulted in a southwest airflow anomaly across the country (i.e. more southwesterly winds than normal). Weather was highly variable throughout the month however with both warm subtropical winds and cool southerlies causing temperatures to transition from warm to cold at times. Additionally, cool temperatures were contributed to by the continued influence of a sudden stratospheric warming event (and associated polar jet stream) which started to unfold in the polar stratosphere during late August and peaked in mid-September (see Highlights and extreme events section for further details). Throughout the month, a few stretches of high pressure brought periods of calm conditions to much of New Zealand although several low pressure systems and associated fronts also brought unsettled

weather to the country resulting in thunderstorms, high winds, and snowfall in various locations (see Highlights and extreme events section for further details).

Temperatures were largely near average for the month as a whole. The nationwide average temperature in September 2019 was 10.5°C (0.1°C below the 1981-2010 September average from NIWA's seven station temperature series which begins in 1909). The September 2019 temperature anomaly of -0.1˚C (i.e. weakly negative) is the greatest negative deviation from the 1981-2010 average of any month in the last two years (excluding April 2019 which was also -0.1˚C cooler than average). Additionally, September 2019 was the 4th coldest September this century, outranked by three much colder years with seven station temperature anomalies of -0.7°C in 2004 and -0.8°C in 2011 and 2015. It has now been 32 consecutive months since New Zealand experienced a nationwide average temperature that was below average (at least 0.51˚C below the 1981-2010 average).

Temperatures were below average (0.51°C to 1.2°C below average) for a few South Island locations including northern Tasman, much of Marlborough, Takaka, and in eastern locations between Rakaia and Dunedin where some temperatures were well below average (<1.2°C below average). A handful of isolated locations observed above average temperatures (0.51°C to 1.2°C above average) including Coromandel to East Auckland, Matamata, and Napier in the North Island as well as Cheviot in the South Island. Most of the country however experienced near average September temperatures (-0.50 to +0.50°C of average).

September rainfall was below normal (50% to 79% of normal) for much of the southern half of the North Island (excluding southern Hawke's Bay) with parts of the Wellington region observing well below normal (<50% of normal) rainfall totals. Below or well below normal rainfall totals were also experienced in the western half of the South Island (south of Hokitaka) and in some eastern locations including southeast Otago, central Canterbury, and coastal north Canterbury. Above normal (120% to 149% of normal) or well above normal (>149% of normal) rainfall levels were less widely observed during September, occurring in the Far North, between Kaipara and Hamilton (including Auckland), Coromandel Peninsula, Nelson, and in parts of Otago, Tasman and Marlborough. Remaining locations experienced near normal (80 to 119% of normal) rainfall amounts.

Further Highlights:

- The highest temperature was 25.8°C, observed at Christchurch on 29 September.
- The lowest temperature was -8.0°C, observed at Middlemarch on 10 September.
- The highest 1-day rainfall was 128 mm, recorded at Whitianga (Airport) on 9 September.
- The highest wind gust was 167 km/h, observed at Akitio on 13 September.
- Of the six main centres in September 2019, Auckland was the warmest, Hamilton was the wettest, Christchurch was the sunniest, and Dunedin was the coldest, driest and least sunny.
- Of the available, regularly reporting sunshine observation sites, the sunniest four regions in 2019 so far are Wider Nelson (2027 hours), Marlborough (2003 hours), Hawke's Bay (1951 hours), and Bay of Plenty (1912 hours).

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Temperature: Near average overall for most of the country

The nationwide average temperature in September 2019 was 10.5°C (0.1°C below the 1981-2010 September average from NIWA's seven station temperature series which begins in 1909). Despite a near average seven station temperature anomaly, September 2019 was the 4th coldest September this century. The three colder 21st century years which outrank September 2019 were much cooler however, with seven station temperature anomalies of -0.7°C in 2004 and -0.8°C in 2011 and 2015.

Only a handful of locations observed near-record mean maximum or mean minimum temperatures (see following three tables), but it was an unremarkable month overall in terms of mean temperature records.

Record[1] or near-record mean air temperatures for September were recorded at:

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
None recorded				
Low records or near-records				
None recorded				

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

Location	Mean maximum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
Whangarei	18.3	0.8	1967	4th-highest
Low records or near-records				
None recorded				

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

Location	Mean minimum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
None recorded				
Low records or near-records				
Dunedin (Airport)	1.7	-1.3	1962	3rd-lowest
Takaka	3.6	-1.2	1978	4th-lowest
Clyde	0.9	-1.7	1978	4th-lowest

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

Rainfall: Mixed but mostly near or below normal

Rainfall patterns were variable during September, with higher than normal rainfall mostly restricted to the Far North, locations between Kaipara and Hamilton (including Auckland), the Coromandel Peninsula, Nelson, and in parts of Otago, Tasman and Marlborough. Elsewhere rainfall was near to below normal, with well below normal levels occurring in parts of the Wellington region and for the area covering southern West Coast, southwest Canterbury and northwest Otago.

Whitianga was the only location to receive near-record September rainfall levels. The monthly total there was 308 mm (182% of normal), which is the 3rd-highest September rainfall total since records began there in 1961. Despite several locations receiving well below normal rainfall for the month, no record or near-record lows were set.

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

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
High records or near-records				
Whitianga (Airport)	308	182	1961	3rd-highest
Low records or near-records				
None recorded				

September climate in the six main centres

September temperatures were near average for all main centres. Rainfall was below normal in Wellington, near normal in Auckland, Tauranga and Dunedin, and above normal in Hamilton. Of the six main centres in September 2019, Auckland was the warmest, Hamilton was the wettest (beating Auckland by only 1 mm of rain), Christchurch was the sunniest, and Dunedin was the coldest, driest and least sunny.

September 2019 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland[a]	13.4	+0.4	Near average
Tauranga[b]	12.8	+0.4	Near average
Hamilton[c]	11.5	+0.2	Near average
Wellington[d]	10.8	0.0	Near average
Christchurch[e]	9.4	0.0	Near average
Dunedin[f]	9.1	-0.4	Near average
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland[a]	123	119	Near normal
Tauranga[b]	97	115	Near normal
Hamilton[c]	124	123	Above normal
Wellington[d]	78	79	Below normal
Christchurch[e]	55	135	Above normal
Dunedin[f]	39	80	Near normal
Sunshine			
Location	Sunshine (hours)		
Auckland[a]	179		
Tauranga[b]	174		
Hamilton[g]	143		
Wellington[d]	167		
Christchurch[e]	185		
Dunedin[f]	135		

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

Highlights and extreme events

Rain and slips

On 3 September, heavy rain caused motorway flooding in Auckland. Surface water blocked the right lane on the northern motorway just past the upper harbour highway on-ramp.

On 4 September, a slip in the Whangapoua Hill area, east of Coromandel town, partially blocked lanes of SH 25.

On 5 September, flooding in the Te Hauke area of Hastings caused disruption at night on parts of SH 2 between Te Aute and Te Hauke.

On 10 September, heavy rain in the Coromandel Peninsula caused closures for sections of SH 25 from Coromandel to Whitianga, Tairua to Whitianga and Tairua to Hikuai. Kuaotunu bore the brunt of the storm's damage and a large slip just south of Cemetery Rd in Kuaotunu caused a road closure until 12 September. Several local roads in Kuaotunu were also affected by flooding and slips, while garages, backyards and paddocks were fully submerged. Several people in Kuaotunu were displaced by flooding with some on standby to be evacuated. A small flock of sheep drowned in their paddock while and resident found his missing herd of cows on the beach (where they had been washed out). A golf course in Whangamata was also flooded. Kuaotunu River Bridge was closed to traffic more than a week later due to damage from the adverse weather and set to remain closed for repairs over the following five weeks.

Also on 10 September, SH 32, in Waihaha, was closed after a slip and subsequent dirt dropout. The road reopened under a 24/7 stop/go on 18 September.

On 13 September, heavy rain overnight caused surface flooding on SH 8 between Ettrick and Roxburgh.

On 24 September, flooding affected the eastbound lane on SH 23 (Whatawhata Rd) near Newcastle Rd in the Dinsdale area, Hamilton.

On 30 September, SH 6 between Ross and Franz Josef was closed due to flooding.

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

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Comments
Whitianga (Airport)	128	9th	1961	2nd-highest
Mokohinau	25	3rd	1994	4th-highest
Oamaru	32	30th	1950	4th-highest
Manapouri (West Arm Jetty)	98	12th	1971	4th-highest

Temperatures

On 25 September, temperatures in Christchurch (Riccarton) reached 25.8°C during the afternoon, the highest daytime temperature recorded during the month.

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

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Comments
High records or near-records				
Ohakune	21.1	4th	1962	Highest
Hawera	19.5	4th	1977	3rd-highest
Low records or near-records				
Taupo	7.2	9th	1950	Lowest
Akaroa	6.1	8th	1978	Lowest
Hawera	8.3	8th	1977	Equal lowest
Hastings	8.9	8th	1972	2nd-lowest
Takaka	9.1	8th	1978	2nd-lowest
Farewell Spit	9.8	8th	1972	2nd-lowest
Paeroa	10.8	10th	1971	Equal 2nd-lowest
Wanganui (Spriggens Park)	9.0	8th	1972	Equal 2nd-lowest
Timaru	5.1	8th	1885	3rd-lowest
Turangi	7.6	9th	1968	Equal 3rd-lowest
Napier (Airport)	9.0	8th	1940	Equal 3rd-lowest
Napier (Nelson Park)	9.0	9th	1940	Equal 3rd-lowest
Rangiora	6.7	8th	1972	4th-lowest
Whitianga	11.6	10th	1971	Equal 4th-lowest
Te Puke	10.7	10th	1973	Equal 4th-lowest
Motu	6.0	10th	1990	Equal 4th-lowest
Takapau Plains	6.4	8th	1972	Equal 4th-lowest
Mahia	9.0	9th	1990	Equal 4th-lowest

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

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Comments
High records or near-records				
Cheviot	13.3	13th	1982	Highest
Porirua (Elsdon Park)	12.9	30th	1972	Equal 3rd-highest
Rotorua (Airport)	13.1	5th	1972	4th-highest
Kaikoura	13.2	30th	1972	4th-highest
Whakatane (Airport & Coastlands)	14.6	5th	1975	Equal 4th-highest
Ngawi	15	30th	1972	Equal 4th-highest
Low records or near-records				
Timaru (Airport)	-5.3	10th	1885	Lowest
Upper Hutt (Trentham)	-4.4	11th	1939	2nd-lowest
Puysegur Point	1.6	9th	1978	2nd-lowest
Mt Cook (Airport)	-7.2	10th	1929	2nd-lowest
Balclutha (Telford)	-3.7	10th	1964	2nd-lowest
Manapouri (Airport)	-5.7	9th	1963	Equal 2nd-lowest
Five Rivers	-4.5	10th	1982	3rd-lowest
Lumsden	-4.5	9th	1982	3rd-lowest
Clyde	-5.9	10th	1978	3rd-lowest
Orari Estate	-3.3	10th	1972	Equal 3rd-lowest
Christchurch (Airport)	-4.2	8th	1863	Equal 4th-lowest

Wind

On the night of 3-4 September, heavy winds hit Auckland. In West Auckland, trees blocked the road at the intersection of Scenic Drive and Mountain Rd. Trees were also toppled on Woodlands Rd in Titirangi, and on Muriwai Rd in Muriwai. A power cut forced parents to keep their kids home for the morning after Riverhead School in northwest Auckland had no electricity. Fire and Emergency NZ crews responded to reports of power lines arcing onto SH 16. A large tree fell across Wellesley St in central Auckland, blocking the left westbound lane near the Hobson St intersection. Fire and Emergency NZ crews responded to trees coming down in Cooks Beach and Highbury Bypass, Birkenhead. Powerlines had been downed on East Coast Rd, Redvale, about 11 pm and Lauderdale Rd, Birkenhead.

On 3 September, a power pole fell at Pakotai, about 45km west of Whangārei, dropping wires across the road.

On 7 September, residents of three beachfront households at Wainui Beach, Gisborne, had been evacuated after king tides coupled with large swells washed away gabion baskets and dunes in front of their properties. Some sections in the area were reportedly eroded by 4-5 m. A retaining wall and some concrete stairs were claimed.

Between 25 and 26 September, wild weather had caused trees to fall in Auckland, brought down power lines and sent a trampoline flying. One large tree damaged a rock wall in Epsom while also taking out the power and bringing down a few palm trees. Fire crews were reportedly called to eight

weather-related incidents between Wellsford and Hamilton overnight as trees fell and powerlines were damaged in the wild weather.

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

Location	Extreme wind gust (km/h)	Date of extreme gust	Year records began	Comments
Secretary Island	139	26th	1994	Highest
Whitianga	87	26th	1991	2nd-highest
Taupo	82	25th	1982	Equal 2nd-highest
Mokohinau	119	24th	1994	3rd-highest
Auckland (Whenuapai)	98	25th	1972	Equal 3rd-highest
Wanganui	93	25th	1977	Equal 3rd-highest
Farewell Spit	98	25th	1973	Equal 3rd-highest
Clyde	69	12th	1983	4th-highest

Lightning and hail

On 6 September, 70 lightning strikes were recorded in an hour in the Northland region.

On 8 September, more than 800 lightning strikes had occurred over the upper North Island in the morning, with more than 10000 over the surrounding water.

On 9 September, more than 800 lightning strikes were recorded across the upper North Island and offshore, with more than 300 occurring around Northland between 1 and 2 pm. During a similar period, lightning was averaging almost 7 strikes per minute in the Auckland region and offshore.

On 9 September, a property in Whangarei was pelted with hailstones the size of golf balls which punctured holes in its clear plastic roofing.

On 25 September, 832 strikes recorded over both land and sea during the 24-hour period starting at 8:15 am. Of those, 368 had occurred over land.

On 26 September, Waikato had reportedly recorded 55 lightning strikes over the past 24 hours.

Also on 26 September, hail pelted many parts of north Canterbury. Nets were ripped and plants damaged by falling hail at a plant nursery on the outskirts of Amberley.

Snow and ice

On 8 September, SH 1 Desert Road was briefly closed from Rangipo to Waiouru due to snow.

On 16 September, SH 94 Te Anau to Milford was closed due to snow. It reopened the following day but closed again until 18 September due to forecast snow.

On 25 September, SH 1 Desert Road was closed overnight due to snow. A section of SH 73 between Arthurs Pass and Otira had vehicle restrictions in place and was closed to towing vehicles, sections of SH 7 were closed between the Hanmer Turnoff to Springs Junction (Lewis Pass), and Springs Junction to Reefton (Rahu).

On 26 September, parts of the South Island, particularly around Queenstown, had received a dusting of snow overnight with reports stating snow had fallen down to 100-200 m in some locations. Several road closures were in place including SH 87 Outram to Kyeburn and SH 94 Te Anau to Milford. The latter was also closed several times over the following days due to forecast snow.

Also on 26 September, SH1 from Dunedin to Waitati reopened after closure due to black ice.

Cloud and fog

On 5 September, morning fog caused reduced visibility on SH 2, particularly between Maoribank and Totara Park and on SH 1 between Churton Park and Ngauranga Gorge (greater Wellington area).

On 14 September, a long white cloud from a frontal system blanketed northern parts of the South Island and central New Zealand stretching from northwest of Cape Reinga almost as far as the Chatham Islands.

Sudden Stratospheric Warming

A major Sudden Stratospheric Warming (SSW) event, or rapid warming of stratospheric temperatures (>25˚C) in a week or less AND a reversal of the stratospheric zonal mean winds at 60˚S from westerly to easterly, occurred during September 2019. This was the Southern Hemisphere's strongest SSW on record and just the 2nd major event on record (September 2002 had a major SSW). The event was associated with a weakening and displacement of the stratospheric polar vortex toward Patagonia. Meanwhile, an area of stratospheric high pressure formed in eastern Antarctica. While the stratosphere did not couple, or directly connect, with the troposphere (where we live) as it did in 2002, an anomaly associated with the tropospheric polar vortex was located to the east of Argentina. This displacement caused impacts to surface weather patterns across the Southern Hemisphere mid-latitudes, allowing very cold air masses to sweep northward. Parts of Chile, Argentina, Uruguay, New Zealand, and southern Australia all experienced colder than average temperatures during September.

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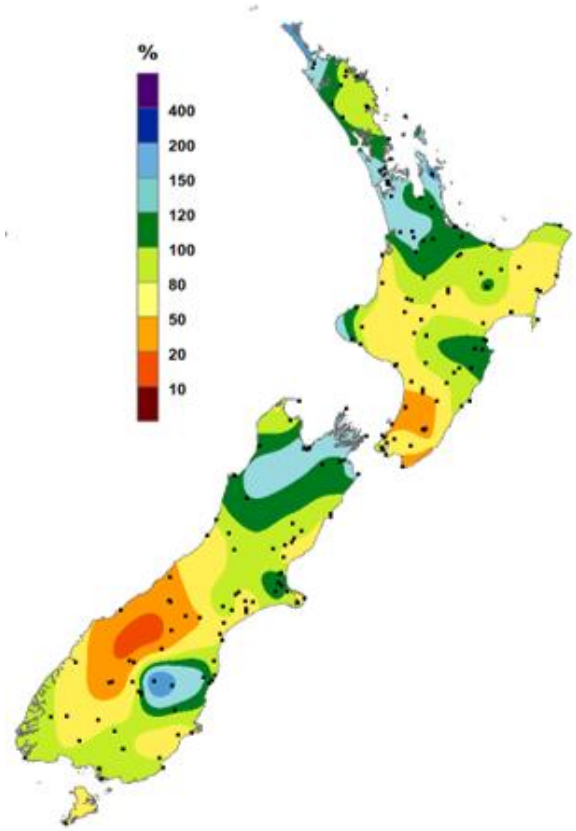

September rainfall, expressed as a percentage of the 1981-2010 normal.

Rainfall patterns were variable during September, with higher than normal rainfall mostly restricted to northern parts of both islands as well as a small portion of north Otago-central Canterbury.

Elsewhere rainfall was near normal (green colours), below normal (yellow), or well below normal (oranges and reds).

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