

## An exceptionally dry and sunny December for most

<b>Rainfall</b>	Rainfall was below normal (50-79%) for virtually the entire country with well below normal (< 50%) rainfall recorded for the majority of the North Island, as well as parts of Nelson, Marlborough and Otago. Rainfall was near normal (within 20% of December normal) in parts of Southland and southern Canterbury.
<b>Sunshine</b>	A very sunny December with above (110-125%) to well above (>125%) normal sunshine experienced around the country. A number of locations observed record or near-record sunshine hours for December.
<b>Temperature</b>	December temperatures were largely near average (-0.50°C to +0.50°C) across New Zealand. Below average temperatures (-1.20°C to -0.51°C) were recorded along the east coast of the North Island from Gisborne through to south Wairarapa as well as north-eastern parts of the South Island.
<b>Soil Moisture</b>	As of 1 January 2016, soil moisture levels were below normal for the time of year for the entire country with the exception of the Auckland region and Coromandel. The driest soils when compared to normal exist throughout the Waikato and Taranaki regions as well as parts of the Bay of Plenty.

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### Overview

During December 2015, strong El Niño conditions continued in the Tropical Pacific. In New Zealand this contributed to the prevalence of high pressure over and to the west of the country while lower pressure than normal existed to the east of New Zealand. This pressure pattern resulted in more south-westerlies than normal over the South Island and more southerlies than normal over the North Island.

The dominance of high pressure throughout December meant that the month as a whole was very dry with several locations around the country observing record or near-record low December rainfall totals. Less than half of normal rainfall was observed for the majority of the North Island and below normal rainfall (50-79% of the December normal rainfall) was recorded across most of the South Island. No locations recorded above normal rainfall (120-149% of the December normal rainfall) and

the only places to observe near normal rainfall (within 20% of the December normal) were parts of Southland and southern Canterbury.

The lack of rainfall, following a dry November, meant soil moisture levels continued to deplete around the country throughout the month, particularly in the North Island. As of 1 January 2016, soil moisture levels were below normal for the time of year for the entire country with the exception of the Auckland region and Coromandel. The driest soils when compared to normal existed throughout the Waikato and Taranaki regions as well as parts of the Bay of Plenty.

Sunshine was abundant during December, with above normal (110-125% of the December normal) to well above (>125% of the December normal) normal sunshine experienced all around the country. A number of locations observed record or near-record sunshine hours.

The sunny skies contributed to December mean maximum temperatures generally staying above (+0.51°C to +1.20 °C above the December average) to well above average (> +1.20 °C above the December average), while the lack of cloud allowed for ideal night-time radiational cooling and thus mean minimum temperatures dipped below (-1.20°C to -0.51°C below the December average) to well below average (<-1.21°C below the December average). This diurnal pattern was largely balanced out with the resulting mean December temperatures being near average (within 0.50°C of the December average) for most parts of the country. The exception was along North Island's east coast from Gisborne through to south Wairarapa where mean temperatures were below average, aided by the prevalence of southerlies over the North Island. The end of December also saw strong north-westerlies bring record breaking daily maximum temperatures. The nation-wide average temperature in December 2015 was 15.6°C (equal to the 1981-2010 December average from NIWA's seven station temperature series which begins in 1909)<sup>1</sup>.

#### **Further Highlights:**

- The highest temperature was 36.4°C, observed at Leeston on 21 December.
- The lowest temperature was -0.7°C, observed at Hanmer Forest on 7 December.
- The highest 1-day rainfall was 161 mm, recorded at Milford Sound on 2 December.
- The highest wind gust was 176 km/hr, observed at South West Cape on 21 December.
- Of the six main centres in December 2015, Auckland was the warmest and driest, Dunedin was the coolest and sunniest, Christchurch was the wettest and Hamilton was the cloudiest.
- Of the available, regularly reporting sunshine observation sites, the sunniest four locations in 2015 (1 January to 31 December) were: Blenheim (2814 hours), Whakatane (2785 hours), Lake Tekapo (2737 hours) and Appleby (2731 hours).

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<sup>1</sup> Interim value

## Rainfall: A very dry month, particularly in the North Island

The prevalence of anticyclones over and to the west of New Zealand aided by continuing strong El Niño conditions during December added up to an exceptionally dry month. Less than half of normal rainfall was observed for the majority of the North Island as well as parts of Nelson, Marlborough and Otago. Below normal rainfall (50-79%) was recorded across the remainder of the South Island with the exception of parts of Southland and southern Canterbury where near normal rainfall (within 20% of normal) was observed. No locations recorded above normal rainfall (120-149%) during December.

The driest conditions were present across Northland and the Bay of Plenty where several stations observed record low or near record low December rainfall totals. Most notably, the station at Toenepi recorded only 2mm of rainfall for the month, just 2% of the December normal. Paeroa also recorded its lowest December rainfall total with records going back to 1914. Paeroa's 12mm rainfall total for the month took out the prior record of 19mm which occurred in 1994.

### Record<sup>2</sup> or near-record December rainfall totals were recorded at:

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
<b>High records or near-records</b>				
None observed				
<b>Low records or near-records</b>				
Toenepi	2	2	1951	Lowest
Paeroa	11	12	1914	Lowest
Wellington	15	23	1958	Lowest
Ohakune	19	15	1961	Lowest
Te Puke	20	14	1973	Lowest
Auckland (Pukekohe)	21	22	1944	Lowest
Rotorua	32	27	1963	Lowest
Stratford	38	23	1960	Lowest
Takaka	31	18	1976	2nd-lowest
Auckland (Mangere)	15	18	1959	2nd-lowest
Matamata	19	20	1951	2nd-lowest
Taupo	21	22	1949	2nd-lowest
Motu	40	22	1990	2nd-lowest
Paraparaumu	26	31	1945	2nd-lowest
Turangi	43	32	1968	2nd-lowest
Hicks Bay	6	6	1916	Equal 2nd-lowest
Whakatane	15	16	1952	3rd-lowest
Hawera	26	28	1977	3rd-lowest
South West Cape	56	53	1991	3rd-lowest
Martinborough	11	20	1924	Equal 3rd-lowest

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

Kaitaia	29	29	1985	4th-lowest
Kerikeri	33	31	1981	4th-lowest
Tauranga	18	19	1898	4th-lowest
Hamilton	33	31	1935	4th-lowest
Wanaka	14	22	1927	4th-lowest
Manapouri	44	42	1961	4th-lowest
Alexandra	11	22	1983	Equal 4th-lowest

## Sunshine: Sunny skies from top to bottom

While the rain was lacking during December, sunshine was certainly plentiful, with above (110-125%) to well above (>125%) normal sunshine hours recorded all around the country. No locations received below normal sunshine while several high sunshine records and near records were set. Of the available, regularly reporting sunshine observation sites, the sunniest four locations in 2015 (1 January to 31 December) were: Blenheim (2814 hours), Whakatane (2785 hours), Lake Tekapo (2737 hours) and Appleby (2731 hours).

### Record or near-record December sunshine hours were recorded at:

Location	Sunshine hours	Percentage of normal	Year records began	Comments
<b>High records or near-records</b>				
Turangi	260	132	1976	Highest
Dunedin (Musselburgh)	270	161	1980	Highest
Kaitaia	265	163	1985	2nd-highest
New Plymouth	296	139	1972	2nd-highest
Martinborough	257	130	1986	2nd-highest
Cheviot	267	135	1983	2nd-highest
Lake Tekapo	314	140	1928	2nd-highest
Stratford	265	136	1963	3rd-highest
Takaka	270	123	1985	3rd-highest
Dannevirke	232	120	1963	4th-highest
Greymouth	230	138	1947	4th-highest
<b>Low records or near-records</b>				
None observed				

## Temperature: Warm days and cool nights but near average as a whole

The higher than normal pressure across the country during December kept the skies less cloudy than usual which in turn had an impact on temperatures around the country. Plenty of cloud-free days and sunny skies meant that day time temperatures were generally warmer than average (including some notable extreme hot days - see *Highlights and extreme events* for further information), while the lack of insulation from the clouds overnight meant that minimum temperatures were often cooler than average. As a whole, this diurnal pattern was largely balanced out, with the resulting mean December temperatures being near average (-0.50°C to +0.50°C) for the majority of New Zealand (with the exception of coastal areas from Gisborne through to south Wairarapa and north-eastern parts of the

South Island, which recorded below average temperatures). Mean temperatures were above normal (+0.51°C to +1.2°C) in Central Otago and Dunedin. No record or near record (high or low) mean air temperatures were recorded for the month.

The cooler than average (-1.20°C to -0.51°C) mean temperatures along North Island's east coast from Gisborne through to south Wairarapa was aided by the prevalence of southerlies over the North Island during December. As for the rest of the country, the below average mean temperatures in these areas were largely driven by cooler than normal night time minimum temperatures – with several locations recording near-record low mean minimum temperatures.

The nation-wide average temperature in December 2015 was 15.6°C (equal to the 1981-2010 December average from NIWA's seven station temperature series which begins in 1909).

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

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
None observed				
<b>Low records or near-records</b>				
None observed				

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

Location	Mean maximum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
Leigh	24.8	3.7	1966	Highest
Kaikohe	22.8	1.7	1973	2nd-highest
Kerikeri	23.7	1.0	1981	3rd-highest
<b>Low records or near-records</b>				
None observed				

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

Location	Mean minimum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
None observed				
<b>Low records or near-records</b>				
Turangi	8.3	-2.0	1968	2nd-lowest
Martinborough	9.2	-2.2	1986	2nd-lowest
Waione	9.9	-2.1	1991	3rd-lowest
Hanmer Forest	5.5	-2.2	1906	3rd-lowest
Waiau School	8.7	-0.7	1974	3rd-lowest
Cheviot	8.2	-1.3	1982	3rd-lowest
Motu	8.1	-1.5	1990	4th-lowest
Appleby	8.9	-2.4	1932	4th-lowest

## December climate in the six main centres

December temperatures were near average for all of the main centres other than Dunedin where the mean temperature was above average. Dunedin was also the sunniest main centre and recorded its sunniest December on record. Christchurch was the only main centre to receive near normal rainfall with all other main centres receiving well below normal rainfall. In Auckland, only 18% of the normal December rainfall was recorded, the 2<sup>nd</sup> lowest December rainfall total on record. Of the six main centres in December 2015, Auckland was the warmest and driest, Dunedin was the coolest and sunniest, Christchurch was the wettest and Hamilton was the cloudiest.

### December 2015 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland <sup>a</sup>	18.7	+0.5	Near average
Tauranga <sup>b</sup>	18.3	+0.3	Near average
Hamilton <sup>c</sup>	16.7	-0.2	Near average
Wellington <sup>d</sup>	15.0	-0.4	Near average
Christchurch <sup>e</sup>	15.5	-0.3	Near average
Dunedin <sup>f</sup>	14.7	+0.9	Above average
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland <sup>a</sup>	15	18%	Well below normal – 2 <sup>nd</sup> lowest on record
Tauranga <sup>b</sup>	18	19%	Well below normal
Hamilton <sup>c</sup>	33	31%	Well below normal – 4 <sup>th</sup> lowest on record
Wellington <sup>d</sup>	36	43%	Well below normal
Christchurch <sup>e</sup>	48	103%	Near normal
Dunedin <sup>f</sup>	31	39%	Well below normal
Sunshine			
Location	Sunshine (hours)	% of normal	Comments
Auckland <sup>a</sup>	223	112%	Above normal
Tauranga <sup>b</sup>	228 <sup>3</sup>	98%	Near normal
Hamilton <sup>g</sup>	210	101%	Near normal
Wellington <sup>d</sup>	266	119%	Above normal
Christchurch <sup>e</sup>	247	112%	Above normal
Dunedin <sup>f</sup>	270	161%	Well above normal – Highest on record

<sup>a</sup> Mangere <sup>b</sup> Tauranga Airport <sup>c</sup> Hamilton Airport <sup>d</sup> Kelburn <sup>e</sup> Christchurch Airport <sup>f</sup> Musselburgh <sup>g</sup> Ruakura

<sup>3</sup> 4 days of missing data

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## Highlights and extreme events

### Wind

On 8 December strong westerly winds brought down a tree on SH 6 near Wanaka Airport. Traffic was delayed for 30 minutes while the road was cleared.

On 10 December a forest fire ignited in Marlborough and continued to burn for several days. Warm and dry north-westerly winds as well as prolonged dry conditions contributed to the spread of the fire which was the largest in the region in 15 years.

On 13 December several tornadoes were seen on the Canterbury Plains. One tornado lifted a silage wagon off the ground and threw it onto a nearby tractor in Carew.

The highest wind gust was 176 km/hr, observed at South West Cape on 21 December.

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

Location	Extreme wind gust (km/hr)	Date of extreme gust	Year records began	Comments
Cape Reinga	141	29th	1974	Highest
South West Cape	176	21st	1991	Highest
Kaukau	132	12th	1969	4th-highest
Castlepoint	148	22nd	1972	Equal 4th-highest

### Rain and slips

On 24 December thunderstorms caused localised downpours in the Auckland region. Several reports were received of flooded homes in Omaha. In Whangaparaoa, 59mm of rain was recorded, the 4<sup>th</sup> highest daily rainfall total for the location.

The highest 1-day rainfall was 161 mm, recorded at Milford Sound on 2 December.

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

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Comments
Auckland (Whangaparaoa)	59	24th	1946	4th-highest
Westport	80	1st	1944	4th-highest

## Temperatures

On 2 December a northerly airflow contributed to a hot day for eastern, central and southern parts of the South Island. Numerous locations recorded a maximum temperature in excess of 30°C, including Leeston where the temperature peaked at 34.7°C.

On 21 December north-easterly winds combined with the foehn effect brought high temperatures to eastern areas of the South Island. Record high December temperatures were experienced in Christchurch, Timaru and Dunedin as well as many other locations. The warm spell was short-lived with a southerly change (front) following through in the evening and overnight. Cheviot was located north of the front overnight and experienced its record highest December maximum and highest minimum temperatures.

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

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Comments
<b>High records or near-records</b>				
Leigh	30.2	22nd	1966	Highest
Cheviot	36.1	21st	1982	Highest
Christchurch	36.0	21st	1863	Highest
Orari Estate	35.4	21st	1972	Highest
Timaru	34.3	21st	1885	Highest
Dunedin (Musselburgh)	34.5	21st	1947	Highest
Lumsden	29.3	2nd	1982	Highest
Tiwai Point	29.0	2nd	1970	Highest
Nugget Point	30.7	21st	1970	Highest
Dunedin (Airport)	33.1	21st	1962	Highest
Kaikohe	28.1	27th	1973	Equal highest
Appleby	30.1	21st	1932	Equal highest
Oamaru	32.7	21st	1908	Equal highest
Whakatane	31.0	22nd	1975	2nd-highest
New Plymouth	27.8	31st	1944	2nd-highest
Motueka	29.8	21st	1956	2nd-highest
Waiau	33.9	21st	1974	2nd-highest
Ashburton	35.3	21st	1928	2nd-highest
Waipara West	33.3	21st	1973	2nd-highest
Lincoln	35.0	21st	1881	2nd-highest
Balclutha	31.4	21st	1964	2nd-highest
Tara Hills	31.7	27th	1949	Equal 2nd-highest
Kerikeri	27.9	21st	1981	3rd-highest
Motu	27.8	21st	1990	3rd-highest
Puysegur Point	24.1	2nd	1978	3rd-highest
Le Bons Bay	29.0	21st	1984	3rd-highest
Invercargill	29.3	2nd	1905	3rd-highest
Kaitaia	27.0	26th	1985	Equal 3rd-highest
Lake Tekapo	30.0	27th	1925	Equal 3rd-highest
Reefton	30.2	28th	1960	4th-highest



Ranfurly	31.0	27th	1975	4th-highest
Cromwell	33.2	28th	1949	4th-highest
<b>Low records or near-records</b>				
Campbell Island	6.9	7th	1991	2nd-lowest
Port Taharoa	16.6	17th	1974	Equal 4th-lowest

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

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Comments
<b>High records or near-records</b>				
Cheviot	21.4	22nd	1982	Highest
Le Bons Bay	19.1	3rd	1984	2nd-highest
Orari Estate	18.9	3rd	1972	2nd-highest
Ranfurly	18.0	3rd	1975	2nd-highest
Dunedin (Musselburgh)	18.0	3rd	1947	2nd-highest
Alexandra	17.8	3rd	1983	2nd-highest
Waiau	19.6	22nd	1974	3rd-highest
Waipara West	21.0	3rd	1973	Equal 3rd-highest
Dunedin (Airport)	17.5	3rd	1972	Equal 3rd-highest
Milford Sound	16.5	3rd	1935	4th-highest
<b>Low records or near-records</b>				
Martinborough	0.9	30th	1986	2nd-lowest
Mokohinau	12.8	18th	1994	3rd-lowest
Cheviot	0.7	14th	1982	3rd-lowest

### **Lightning and Hail**

On 13 December cool upper level temperatures combined with daytime heating led to the development of thunderstorms over Canterbury and North Otago. Hail was widely reported throughout the regions and lightning strikes caused a couple of fires.

On 16 December a hailstorm impacted the Motueka district, the Waimea Plains and its foothills. The hail caused significant damage to New Zealand's largest boysenberry grower. There was also damage to orchards, vines, glasshouses and vehicles reported around the region.

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**For further information, please contact:**

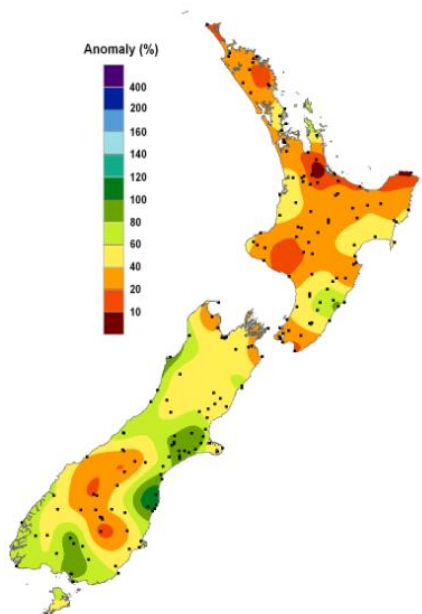
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*December 2015 total rainfall, expressed as a percentage the 1981-2010 normal.*

*Rainfall was below normal (50-79%) for virtually the entire country with well below normal (< 50%) rainfall recorded for the majority of the North Island, as well as parts of Nelson, Marlborough and Otago.*

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