

An exceptionally dry and sunny December for most

| | |
|----------------------|---|
| Rainfall | 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. |
| Sunshine | 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. |
| Temperature | 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. |
| Soil Moisture | 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)¹.

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 (2803 hours), Whakatane (2785 hours), Lake Tekapo (2737 hours) and Appleby (2731 hours).

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¹ 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.

Record² or near-record December rainfall totals were recorded at:

| Location | Rainfall total (mm) | Percentage of normal | Year records began | Comments |
|-------------------------------------|---------------------|----------------------|--------------------|------------------|
| High records or near-records | | | | |
| None observed | | | | |
| Low records or near-records | | | | |
| 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 |

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.

| | | | | |
|-----------|----|----|------|------------------|
| 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 (2803 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 |
|-------------------------------------|----------------|----------------------|--------------------|-------------|
| High records or near-records | | | | |
| 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 |
| Low records or near-records | | | | |
| 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 |
|-------------------------------------|---------------------|----------------------------|--------------------|----------|
| High records or near-records | | | | |
| None observed | | | | |
| Low records or near-records | | | | |
| 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 |
|-------------------------------------|-----------------------------|----------------------------|--------------------|-------------|
| High records or near-records | | | | |
| Leigh | 24.8 | 3.7 | 1966 | Highest |
| Kaikohe | 22.8 | 1.7 | 1973 | 2nd-highest |
| Kerikeri | 23.7 | 1.0 | 1981 | 3rd-highest |
| Low records or near-records | | | | |
| 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 |
|-------------------------------------|-----------------------------|----------------------------|--------------------|------------|
| High records or near-records | | | | |
| None observed | | | | |
| Low records or near-records | | | | |
| 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 2nd 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 ^a | 18.7 | +0.5 | Near average |
| Tauranga ^b | 18.3 | +0.3 | Near average |
| Hamilton ^c | 16.7 | -0.2 | Near average |
| Wellington ^d | 15.0 | -0.4 | Near average |
| Christchurch ^e | 15.5 | -0.3 | Near average |
| Dunedin ^f | 14.7 | +0.9 | Above average |
| Rainfall | | | |
| Location | Rainfall (mm) | % of normal | Comments |
| Auckland ^a | 15 | 18% | Well below normal – 2 nd lowest on record |
| Tauranga ^b | 18 | 19% | Well below normal |
| Hamilton ^c | 33 | 31% | Well below normal – 4 th lowest on record |
| Wellington ^d | 36 | 43% | Well below normal |
| Christchurch ^e | 48 | 103% | Near normal |
| Dunedin ^f | 31 | 39% | Well below normal |
| Sunshine | | | |
| Location | Sunshine (hours) | % of normal | Comments |
| Auckland ^a | 223 | 112% | Above normal |
| Tauranga ^b | 228 ³ | 98% | Near normal |
| Hamilton ^g | 210 | 101% | Near normal |
| Wellington ^d | 266 | 119% | Above normal |
| Christchurch ^e | 247 | 112% | Above normal |
| Dunedin ^f | 270 | 161% | Well above normal – Highest on record |

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

³ 4 days of missing data

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 4th 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 |
|-------------------------------------|----------------------|-----------------------------|--------------------|-------------------|
| High records or near-records | | | | |
| 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 |
| Low records or near-records | | | | |
| 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 |
|-------------------------------------|----------------------|-----------------------------|--------------------|-------------------|
| High records or near-records | | | | |
| 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 |
| Low records or near-records | | | | |
| 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.

For further information, please contact:

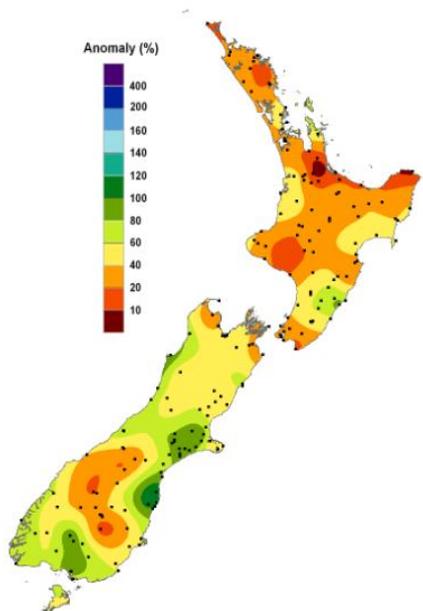
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December 2015 total rainfall, expressed as a percentage the 1981-2010 normal.

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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