

## Very wet in many parts and an extremely cold snap for the south.

<b>Rainfall</b>	Rainfall was above normal (120-149%) or well above normal (> 149%) for much of the Manawatu-Whanganui, Taranaki, Westland, Tasman, Nelson, Marlborough, Canterbury, Otago, and Southland regions. Rainfall was well below normal (< 50%) or below normal (50-79%) for parts of Northland, Auckland, Waikato, Bay of Plenty, Gisborne, Hawke's Bay, and north Canterbury.
<b>Temperature</b>	June temperatures were near average across much of the country (within 0.5°C of June average). Below average temperatures were recorded in inland Canterbury, Wairarapa, western Waikato (0.5-1.2°C below June average) and above average temperatures experienced in northern, eastern, and western parts of the North Island and northern, western, and south-central parts of the South Island (0.5-1.2°C above June average). A polar outbreak in late June led to the 4 <sup>th</sup> -lowest temperature ever recorded in New Zealand.
<b>Soil Moisture</b>	As of 1 July 2015, soil moisture levels were below normal for this time of year for East Cape, around and inland from Napier, coastal Wairarapa, coastal southern Marlborough and eastern parts of Canterbury north of Christchurch. It was especially dry about north Canterbury where soils were considerably drier than normal for this time of year.
<b>Sunshine</b>	Well above normal (>125%) or above normal (110-125%) sunshine was recorded in Northland, Auckland, western Waikato, Wellington, Marlborough, north Canterbury, and Central Otago. Near normal sunshine (within 10% of normal) was recorded elsewhere, except in Franz Josef and Tauranga where below normal sunshine was recorded.

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### Overview

Winter truly arrived in New Zealand in June 2015. The month as a whole was unsettled, with storm events affecting different parts of the country. Heavy rainfall and severe flooding affected the South Taranaki and Manawatu-Whanganui regions, as well as Hokitika, Dunedin, and parts of Southland. In late June, a significant snowfall event in the South Island was followed by the coldest temperatures recorded in New Zealand for over 20 years (and the fourth-lowest temperature ever recorded in New

Zealand), observed in the Mackenzie Country. For a full breakdown about the ‘big freeze’, refer to the *Highlights and Extreme Events* section.

Overall, the month was characterised by a strong south-westerly flow anomaly with higher than normal pressures over the North Island extending over the Tasman Sea, and lower than normal pressures over the South Island extending to the south and east of the island. This flow anomaly brought numerous storms to New Zealand during the month.

Rainfall was more than double the June normal (> 200% of June normal) in Whanganui, Palmerston North, Central Otago, and Dunedin (Dunedin recorded more than three times the normal rainfall total for June (> 300% of June normal)). Well above normal rainfall for June (more than 150% of June normal) was recorded in parts of Taranaki, Mt Ruapehu, Horowhenua, Hokitika, Timaru, Oamaru, and Gore. High rainfall caused significant flooding in Whanganui and surrounding areas – the worst flooding ever recorded there (see *Highlights and Extreme Events* section for more details). In contrast, it was a very dry month for eastern and northern areas of the North Island, as well as coastal northern Canterbury. Some areas in Northland, Auckland, Coromandel, Bay of Plenty, Gisborne, and Hawke’s Bay received less than half the normal June rainfall (< 50% of June normal rainfall), and surrounding areas received below normal rainfall for June (50-79% of June normal rainfall). Rainfall was near normal (within 20% of normal June rainfall) in the eastern Bay of Plenty, southern Waikato, Wellington, and parts of the northwest South Island.

The lack of rainfall in eastern parts of both Islands exacerbated concerns regarding soil moisture, levels, but particularly in northern Canterbury. As of 1 July 2015, soils were notably drier than normal for East Cape, around Napier, coastal Wairarapa, southern Marlborough and eastern parts of Canterbury north of Christchurch. Elsewhere, soil moisture levels were near normal, aside from around Dunedin and further inland, where soil moisture levels were wetter than normal for the time of year.

Mean temperatures were near average across most of the country (within 0.5°C of June average). There were patches of below average temperatures (0.5-1.2°C below June average) in parts of inland Canterbury, Wairarapa, and western Waikato, and patches of above average temperatures (0.5-1.2 °C above June average) in Auckland, Waikato and the Coromandel, eastern Bay of Plenty, Hawke’s Bay, Manawatu, Taranaki, Buller, Nelson, Marlborough, coastal Canterbury, Queenstown-Lakes, and Central Otago. A polar outbreak was experienced in late June which affected the whole country, but particularly Canterbury and Otago. Parts of inland Canterbury experienced the coldest temperatures recorded in New Zealand for more than 20 years, with the lowest temperature recorded being -21.0°C at Tara Hills, near Omarama in the Mackenzie Country – this temperature is the fourth-lowest temperature ever recorded in New Zealand (see *Highlights and Extreme Events* section for more details). The nationwide average temperature in June 2015 was 8.9°C (0.3°C above the 1981-2010 June average from NIWA’s seven station temperature series which begins in 1909)<sup>1</sup>.

Despite the rain for much of the country, it was a sunny month for parts of New Zealand. Well above normal sunshine (> 125% of June normal sunshine) was recorded in western Waikato and parts of Central Otago, and above normal sunshine (110-125% of June normal sunshine) was experienced in Northland, Auckland, Wellington, Marlborough, north Canterbury, and parts of Central Otago.

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<sup>1</sup> Interim value

Sunshine was near normal elsewhere (90-110% of June normal sunshine), except for Franz Josef and Tauranga which recorded below normal sunshine (75-89% of June normal sunshine).

**Further Highlights:**

- The highest temperature was 21.7°C, observed at Cheviot on 1 June.
- The lowest temperature was -21.0°C, observed at Tara Hills on 24 June.
- The highest 1-day rainfall was 454 mm, recorded at North Egmont on 19 June.
- The highest wind gust was 189 km/hr, observed at Cape Turnagain on 29 June.
- Of the six main centres in June 2015, Auckland was the warmest, Christchurch was the coolest, Tauranga was the driest, Dunedin was the wettest and cloudiest, and Hamilton was the sunniest.
- Of the available, regularly reporting sunshine observation sites, the sunniest four centres so far in 2015 (1 January to 30 June) are: Blenheim (1356 hours), Whakatane (1354 hours), Waipara West (1338 hours), and Appleby (1327 hours).

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**Rainfall: Extremely wet in parts, very dry in others**

June 2015 was a record wet June for Palmerston North and Lumsden – Palmerston North received nearly three times its normal June rainfall total (298% of June normal). Other high rainfalls of note for June were recorded in Dunedin (335% of June normal, 2<sup>nd</sup>-highest June rainfall on record) and Whanganui (260% of June normal, 3<sup>rd</sup>-highest June rainfall on record). Dunedin (Musselburgh) received 113 mm of its monthly total (194 mm) in just one day, causing significant flooding in the area.

In contrast, some places recorded well below normal rainfall (< 50% of June normal). Toenepi had its driest June on record, with only 28 mm of rain (27% of June normal). Other sites in Auckland, Northland, the Bay of Plenty, and Coromandel experienced near-record-low rainfall for June.

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

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
<b>High records or near-records</b>				
Palmerston North	274	298	1928	Highest
Lumsden	124	155	1982	Highest
Dannevirke	155	156	1951	2nd-highest

<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.

Hawera	211	177	1977	2nd-highest
Dunedin (Airport)	158	335	1962	2nd-highest
Dunedin (Musselburgh)	194	335	1918	2nd-highest
Lauder	85	271	1924	2nd-highest
Stratford	339	173	1960	3rd-highest
Wanganui (Airport)	237	260	1890	3rd-highest
Wanganui (Spriggens Park)	236	266	1890	4th-highest
Hokitika	457	167	1866	4th-highest
Balclutha	137	234	1964	4th-highest
<b>Low records or near-records</b>				
Toenepi	28	27	1951	Lowest
Mokohinau	29	27	1994	2nd-lowest
Leigh	41	35	1966	2nd-lowest
Cape Reinga	46	44	1919	3rd-lowest
Whangaparaoa	38	32	1946	3rd-lowest
Whitianga	86	42	1961	3rd-lowest
Mahia	65	47	1990	3rd-lowest
Tauranga	35	31	1898	Equal 3rd-lowest
Kaitaia	78	51	1985	4th-lowest
Kerikeri	69	39	1981	4th-lowest

## Temperature: Near average for most parts but extremely cold snap in late June for Canterbury and Otago

Relatively few locations observed record or near-record high mean temperatures for June, however this doesn't reveal the shorter periods of record or near-record warmth and bitter cold that occurred from time to time (see *Highlights and extreme events* for further details). A small number of locations in eastern Canterbury observed record high or near-record high mean maximum air temperatures for June, which may be primarily attributed to the foehn effect associated with the westerly flow anomaly observed across New Zealand at times during the month. The extremely cold snap in late June is covered in the *Highlights and extreme events* section. The nationwide average temperature in June 2015 was 8.9°C (0.3°C above the 1981-2010 June average from NIWA's seven station temperature series which begins in 1909).

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

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
Cheviot	7.3	0.6	1982	3rd-highest
Ranfurlly	4.1	1.3	1975	4th-highest
<b>Low records or near-records</b>				
None observed				

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

Location	Mean maximum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
Orari Estate	12.9	1.9	1972	Highest
Waiau School	13.2	1.6	1974	3rd-highest
Cheviot	13.8	1.3	1982	3rd-highest
Christchurch (Riccarton)	14.0	2.0	1863	3rd-highest
Whatawhata	15.4	1.3	1952	4th-highest
<b>Low records or near-records</b>				
South West Cape	9.1	-0.8	1991	4th-lowest

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

Location	Mean minimum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
<b>High records or near-records</b>				
Whatawhata	8.2	2.3	1952	4th-highest
Stratford	6.6	1.9	1960	4th-highest
Ranfurly	-1.0	1.2	1975	4th-highest
<b>Low records or near-records</b>				
Waiau School	-0.6	-0.4	1974	4th-lowest

## Sunshine: Very sunny for parts of the South Island

Despite the rain for much of the country, it was a sunny month for parts of New Zealand. This is because the high rainfall totals were mostly due to a few heavy rainfall events. Cromwell and Cheviot experienced their sunniest June on record, with three other South Island locations recording near-record sunshine hours for the month. Of the available, regularly reporting sunshine observation sites, the sunniest four centres so far in 2015 (1 January to 30 June) are: Blenheim (1356 hours), Whakatane (1354 hours), Waipara West (1338 hours), and Appleby (1327 hours).

**Record or near-record June sunshine hours were recorded at:**

Location	Sunshine hours	Percentage of normal	Year records began	Comments
<b>High records or near-records</b>				
Cromwell	144	161	1979	Highest
Cheviot	160	176	1983	Highest
Queenstown	135	188	1930	2nd-highest
Blenheim	174	118	1947	3rd-highest
Ashburton	153	132	1930	4th-highest
<b>Low records or near-records</b>				
None observed				

## June climate in the six main centres

June temperatures were above average for most of the North Island and near average for Wellington and the South Island main centres. Rainfall was mixed throughout the main centres, with Tauranga experiencing its equal-third-lowest June rainfall total in records that go back to 1898, and Dunedin experiencing its second-highest June rainfall total in records that go back to 1918, the latter experiencing significant flooding early in the month. Of the six main centres in June 2015, Auckland was the warmest, Christchurch was the coolest, Tauranga was the driest, Dunedin was the wettest and cloudiest, and Hamilton was the sunniest.

### June 2015 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland <sup>a</sup>	12.8	+1.0	Above average
Tauranga <sup>b</sup>	11.6	+0.6	Above average
Hamilton <sup>c</sup>	10.1	+0.7	Above average
Wellington <sup>d</sup>	9.8	+0.1	Near average
Christchurch <sup>e</sup>	6.7	+0.3	Near average
Dunedin <sup>f</sup>	7.2	-0.1	Near average
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland <sup>a</sup>	73	61%	Below normal
Tauranga <sup>b</sup>	35	31%	Equal 3 <sup>rd</sup> -lowest June rainfall total since 1898
Hamilton <sup>c</sup>	68	54%	Below normal
Wellington <sup>d</sup>	150	109%	Near normal
Christchurch <sup>e</sup>	80	139%	Above normal
Dunedin <sup>f</sup>	194	335%	2 <sup>nd</sup> -highest June rainfall total on record since 1918
Sunshine			
Location	Sunshine (hours)	% of normal	Comments
Auckland <sup>a</sup>	131	113%	Above normal
Tauranga <sup>b</sup>	115	85%	Below normal
Hamilton <sup>g</sup>	138	124%	Well above normal
Wellington <sup>d</sup>	116	117%	Above normal
Christchurch <sup>e</sup>	128 <sup>3</sup>	110%	Above normal
Dunedin <sup>f</sup>	99	104%	Near normal

<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> 1 day missing

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## Highlights and extreme events

### Rain and slips

On 3 June, Dunedin was inundated by very heavy and prolonged rainfall, which resulted in significant flooding, loss of electricity, evacuations and road closures throughout the city and nearby areas. The worst-hit areas included low lying coastal areas, Kaikorai Valley, Brighton, Mosgiel and North East Valley. The Dunedin City Council's Civil Defence bunker was activated in order to co-ordinate the emergency service response, however a state of emergency was not declared. Numerous slips were reported along Otago Peninsula, while New Zealand Army's Unimog trucks were involved in evacuating pupils from Abbotsford School. The normally placid Leith Stream was a raging torrent and proved popular with local kayakers. Dozens of road closures were enforced: most notably the southern motorway (SH1) was mostly down to one lane in each direction, with all northbound lanes closed from Abbotsford to Kaikorai Valley. Mosgiel's main street (SH 87) was also closed. The Fire Service responded to 345 events, with the vast majority of those in the South Dunedin area, and a Mayoral Fund was established to help flood-affected residents. Dunedin (Musselburgh) received 113 mm of rainfall in the 24 hours to 9 am on 4 June – its second-highest 1-day rainfall total for June on record. Farther north, heavy overnight rain resulted in flooding of many paddocks in rural Nelson.

On 4 June, heavy rain and blocked drains combined to cause surface flooding in parts of Christchurch. The worst-affected areas were Beckenham, Sydenham, St Martins and New Brighton. There were no reports of flooded homes, however a number of sports grounds across Christchurch were out of action due to surface flooding.

On 15 June, surface flooding and slips affected parts of Otago, including West Otago, Pomahaka, Popotunoa, Clinton and the Catlins.

On 18 June, SH 94 at Mossburn, SH 6 at Dipton, and SH 8 from Roxburgh to Ettrick were affected by surface flooding and caution was advised to motorists. Heavy rain fell in Wanaka, causing surface flooding on low-lying streets.

Overnight on 18-19 June, torrential rain in Hokitika caused significant flooding and many people, including 20 retirement home residents, were evacuated. 211 mm of rain fell in Hokitika in the 24 hours to 9 am on 19 June – its highest 1-day rainfall total for June on record, in records which began in 1866. Caution was advised due to surface flooding on SH 6 from Harihari to Fox Glacier.

On 19 June, caution was advised due to flooding on SH 6 at Okaramio, SH 94 in Mossburn, SH 94 from Riversdale to Mandeville, and SH 1 from Otaki to Levin. A slip reduced the road to one lane on SH 6 between Wanaka and Makarora. A teenage girl was trapped in her car in a flash flood in Levin, and was rescued by the fire service. Farmland in the Horowhenua District was underwater, and stock had to be moved to high ground.

The worst flood on record for Whanganui occurred over 20-21 June, and a state of emergency was declared. On 20 June, heavy rain continued for the Kapiti Coast, Wairarapa, Manawatu and Whanganui areas, causing widespread slips, flooding, and road closures. Highways closed due to flooding included: SH 1 between Bulls and Hunterville, SH 56 at Opiki, SH 3 at the Manawatu Gorge, SH 53 at Waihenga Bridge (Featherston to Martinborough), SH 1 at Waikawa Stream Bridge, Manakau (due to floodwaters undermining the bridge supports), SH 3 from Hawera to Patea, SH 54 at Vinegar Hill, SH 4 from

Wanganui and Raetihi, SH 3 from Mt Messenger Tunnel to Urunui, SH 43 from Stratford to Taumurunui, and SH 3 from Bulls to Wanganui. Because parts of SH 1 and SH 3 were closed, motorists travelling to and from Wellington needed to drive through the Wairarapa region. In Feilding, wastewater systems were overloaded due to flooding. In the South Island, caution was advised on the following roads due to slips and/or flooding: SH 6 from Makarora to Wanaka, SH 6 at Okaramio, SH 94 at Mossburn, and SH 94 from Riversdale to Mandeville. More than 100 households in Whanganui were evacuated on the 20<sup>th</sup>, mostly on the eastern banks of the Whanganui River, with hundreds more self-evacuating. The Whanganui River breached its banks around midnight on the 20<sup>th</sup>, spilling floodwaters into Whanganui's CBD. All bridges over the river were closed except for Cobham Bridge. SH 3, both north and south of the city, and SH 4 were closed. There were power outages in some parts of the city, and outages to about half of the 24 pump stations.

On 21 June, Whanganui was cut off by road. A state of emergency was also declared in Rangitikei and Taranaki after heavy rainfall and flooding in those regions. In the South Taranaki township of Waitotara, sixty households were evacuated, as well as four families from Waitotara Valley. The Army evacuated the isolated village of Koitiata in Rangitikei. Residents of Turakina Beach were trapped due to floodwaters, as were a number of people in Whangaehu. Roads still closed on 21 June included: SH 3 at Kaitoke, SH 3 from Whanganui to Turakina, SH 3 from Whanganui to Bulls, SH 1 from Bulls to Hunterville, SH 56 at Opiki, SH 3 from Hawera to Waitotara, SH 3 at the Manawatu Gorge, SH 43 from Stratford to Taumurunui, SH 54 at Vinegar Hill, and SH 4 from Raetihi to Whanganui. Caution was advised on many other highways due to slips and flooding.

On 22 June, over 300 people in the Taranaki and Whanganui regions remained evacuees from the floods. States of emergency remained in place in the regions.

The highest 1-day rainfall was 454 mm, recorded at North Egmont on 19 June.

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

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Comments
Levin	63	19th	1949	Highest
Wanganui (Airport)	79	19th	1937	Highest
Hokitika	211	18th	1866	Highest
Dunedin (Airport)	87	3rd	1962	Highest
Lumsden	29	3rd	1982	Highest
Dannevirke	70	20th	1951	2nd-highest
Palmerston North	90	20th	1928	2nd-highest
Stratford	127	19th	1960	2nd-highest
Wanganui (Spriggens Park)	78	19th	1937	2nd-highest
Hokitika	184	18th	1866	2nd-highest
Dunedin (Musselburgh)	113	3rd	1918	2nd-highest
Nugget Point	50	3rd	1930	2nd-highest
Greymouth	144	18th	1947	3rd-highest
Lauder	34	3rd	1924	3rd-highest



Balclutha	54	3rd	1964	3rd-highest
Waione	41	20th	1991	4th-highest
Palmerston North	58	19th	1928	4th-highest
Hawera	45	19th	1977	4th-highest
Ohakune	53	19th	1961	4th-highest
Waipara West	47	18th	1973	4th-highest
Ranfurly	31	3rd	1943	4th-highest

## Temperatures

On 8 and 9 June, a strong northwest airflow covered the South Island and resulted in very high temperatures for the time of year in many locations. On 9 June, Cromwell and Lauder reached a maximum temperature of 21.0°C – their highest June temperatures on record. For further context, Cromwell’s mean daily maximum temperature in March, on average, is 21.3°C. Dunedin reached a maximum temperature of 20.6°C, 1.7°C higher than its January mean daily maximum temperature.

During the nights and early mornings of 23-26 June, record-low temperatures for New Zealand were recorded. A high pressure system combined clear skies with a southerly flow, resulting in very cold temperatures for many parts of the country. In particular, sites in the Mackenzie Country and Central Otago dropped to well below freezing. In the early morning of 23 June, Lake Pukaki recorded -19.8°C. A number of other sites also recorded temperatures below -10°C. New Zealand’s coldest temperature on record is -25.6°C, recorded in Ranfurly, Central Otago, on 17 July 1903. During the second night of very cold temperatures on 24 June, Tara Hills, a climate station near Omarama, recorded a low temperature of -21.0°C, which is the lowest temperature officially recorded in New Zealand in 20 years (excluding high altitude stations). This temperature is also the fourth-lowest temperature ever recorded in New Zealand (excluding high altitude stations). During the day on the 24<sup>th</sup> of June, Tara Hills reached a maximum temperature of a chilly -9.0°C, its lowest maximum temperature on record. Overnight on 24-25 June, for the third night in a row, temperatures in the central South Island plunged to well below freezing. Tara Hills recorded -19.7°C and Lake Pukaki observed -16.3°C. Temperatures remained well below freezing for the central South Island overnight on 25-26 June. Omarama recorded -15°C and Pukaki recorded -12°C.

During this period, three out of the 10 lowest temperatures ever recorded in New Zealand were experienced (excluding high elevation alpine sites).

Due to the cold temperatures in the central South Island, outdoor ice skating rinks such as the one in Fairlie were opened. The ice base is the best in years, according to locals.

The highest daily maximum temperature for the country was 21.7°C, observed at Cheviot on 1 June. This was followed by 21.5°C in Pakuranga, Auckland on 2 June and also in Napier on 20 June.

The lowest daily minimum temperature for the country was -21.0°C, observed at Tara Hills on 24 June. This was followed by -19.8°C recorded at Lake Pukaki on 23 June, and -19.7°C on 25 June, again at Tara Hills.

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

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Comments
<b>High records or near-records</b>				
Kaitaia	20.8	2nd	1985	Highest
Paraparaumu	20.0	2nd	1953	Highest
Reefton	19.0	2nd	1960	Highest
Haast	17.7	2nd	1949	Highest
Ranfurlly	18.6	9th	1975	Highest
Lumsden	18.8	9th	1982	Highest
Cromwell	21.0	9th	1949	Highest
Lauder	21.0	9th	1924	Highest
Tiwai Point	17.8	9th	1970	Highest
Dunedin (Musselburgh)	20.6	9th	1947	Equal highest
Auckland (Whenuapai)	21.1	2nd	1945	2nd-highest
Paraparaumu	19.9	2nd	1953	2nd-highest
Wanaka	17.7	9th	1955	2nd-highest
Queenstown	19.4	9th	1871	2nd-highest
Alexandra	21.2	9th	1983	2nd-highest
Gore	18.2	9th	1971	2nd-highest
Nugget Point	18.2	9th	1970	2nd-highest
Cheviot	21.7	1st	1982	3rd-highest
Waipawa	20.8	19th	1945	4th-highest
Greymouth	17.4	2nd	1947	4th-highest
Auckland (Henderson)	21.3	2nd	1948	Equal 4th-highest
Auckland (Mangere)	20.7	2nd	1959	Equal 4th-highest
Port Taharoa	19.6	2nd	1973	Equal 4th-highest
Wanganui	21.1	1st	1937	Equal 4th-highest
Balclutha	18.4	9th	1964	Equal 4th-highest
<b>Low records or near-records</b>				
Tara Hills	-9.0	24th	1949	Lowest
Wanaka	-1.0	24th	1972	Lowest
Dunedin (Musselburgh)	3.9	22nd	1947	Equal lowest
Dargaville	9.7	23rd	1951	2nd-lowest
Motu	4.8	23rd	1990	2nd-lowest
Hicks Bay	9.5	23rd	1972	2nd-lowest
Wallaceville	5.6	22nd	1972	2nd-lowest
Lake Tekapo	-4.1	23rd	1928	2nd-lowest
Palmerston North	6.2	23rd	1940	Equal 3rd-lowest
Kaitaia	12.0	23rd	1985	4th-lowest
Kaitaia	11.5	23rd	1971	4th-lowest
Whangaparaoa	10.2	23rd	1982	4th-lowest
Waione	7.8	23rd	1993	4th-lowest
Cheviot	4.8	22nd	1982	4th-lowest
Le Bons Bay	4.3	22nd	1984	4th-lowest
Castlepoint	7	22nd	1972	Equal 4th-lowest

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

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Comments
<b>High records or near-records</b>				
Masterton	13.8	20th	1992	Highest
Stratford	13.4	20th	1972	Highest
Reefton	11.2	10th	1972	Highest
Puysegur Point	13.2	9th	1978	Highest
Wanaka	10.9	9th	1972	Highest
Ranfurlly	10.7	9th	1975	Highest
Hastings	15.1	20th	1972	2nd-highest
Blenheim	14.8	10th	1972	2nd-highest
Cromwell	12.6	9th	1949	2nd-highest
Wellington (Airport)	14.5	10th	1972	3rd-highest
Blenheim (Airport)	14.0	10th	1947	3rd-highest
Manapouri	10.3	9th	1973	3rd-highest
Lumsden	9.4	9th	1982	3rd-highest
Lauder	11.6	9th	1924	3rd-highest
Invercargill	10.4	9th	1905	3rd-highest
Whangarei	16.2	20th	1967	Equal 3rd-highest
Whangaparaoa	15.0	20th	1982	Equal 3rd-highest
Napier	15.3	20th	1940	Equal 3rd-highest
Kaikoura	12.9	10th	1972	Equal 3rd-highest
Dargaville	15.7	20th	1951	4th-highest
Paeroa	15.4	20th	1971	4th-highest
Takapau Plains	12.4	20th	1972	4th-highest
Waipawa	13	20th	1945	4th-highest
Culverden	12.4	10th	1930	4th-highest
Waipara West	13.4	10th	1973	4th-highest
Wairoa	14	20th	1972	Equal 4th-highest
<b>Low records or near-records</b>				
Appleby	-11.0	24th	1932	Lowest
Tara Hills	-21.0	24th	1949	Lowest
Whangaparaoa	4.9	24th	1982	2nd-lowest
Port Taharoa	1.0	25th	1973	2nd-lowest
Te Kuiti	-4.2	23rd	1959	2nd-lowest
Taumarunui	-5.9	25th	1947	2nd-lowest
Lake Tekapo	-15.0	24th	1925	2nd-lowest
Timaru	-7.7	24th	1885	2nd-lowest
Turangi	-5.8	17th	1968	Equal 3rd-lowest
Nugget Point	-1.2	23rd	1970	Equal 3rd-lowest
Ashburton	-6.5	24th	1928	4th-lowest
Orari Estate	-6.1	24th	1972	4th-lowest
Queenstown	-7.4	24th	1871	4th-lowest
Alexandra	-8.4	24th	1983	4th-lowest
Mt Cook	-10.4	24th	1929	Equal 4th-lowest

## The Mackenzie Country's big freeze - June 2015

Gregor Macara – Climate Scientist, NIWA Wellington

As we entered the second half of June 2015 the perfect sequence of weather conditions occurred which enabled Mackenzie Basin temperatures to plummet to record and near-record lows. This weather sequence can be broken down into three phases, with each phase making an important contribution to the resulting extremely low temperatures:

**Phase One: Heavy snowfall.** On 18 and 19 June, heavy snow fell throughout the South Island. This was a *warm-advection* snowfall event, whereby moisture-laden warm air arriving from the northwest was undercut by much cooler air from the south, enabling prolonged heavy snowfall to relatively low elevations. Snow depths varied throughout the Mackenzie Country, with reports of at least 10 cm in southern parts and up to 50 cm or more in remaining areas.

**Phase Two: Cold-air injection.** On 21 June, the broad area of low pressure which brought the heavy snow drew away to the east of the South Island. This established a southerly airflow over the South Island which injected even colder air than that which contributed to the heavy snowfall. Snow flurries were reported to near sea-level in eastern parts of the South Island, and while little or no new snow was reported in the Mackenzie Country, this colder air did manage to penetrate into the inland basins. The southerly flow persisted to 22 June, but eased with the approach of a high pressure system.

**Phase Three: High pressure system.** On 22 June skies gradually cleared over the South Island with the arrival of a strong high pressure system (anticyclone). Cold air from the southerly outbreak lingered, and effectively became trapped in the inland basins by the anticyclone. The combination of clear skies and cold air saw temperatures fall rapidly: parts of Mackenzie Country were already below  $-10^{\circ}\text{C}$  by 7 pm on 22 June.

The anticyclone became established over the South Island on 22 June and remained in place for around four days. Anticyclones are typically associated with pleasant weather however in this case it contributed to decidedly unpleasant conditions in the Mackenzie Country. Clear skies meant that any heat from the sun was lost rapidly at night (as opposed to the presence of cloud cover, which acts like a blanket and traps heat in the atmosphere). As it was near winter solstice this overnight cooling was prolonged by the length of time between sunset and sunrise. Light winds meant that the cold air remained undisturbed in inland parts. Cold air has a higher density than warm air, so the lack of wind enabled this cold air to pool in the basins, resulting in an inversion (i.e. temperature increases with increasing elevation). Finally, snow cover on the ground reflects a considerable proportion of the sun's energy, which would otherwise contribute to an increase in air temperature.

Notably, a very similar sequence of weather events was reported in July 1903, when Ranfurly observed New Zealand's lowest temperature on record ( $-25.6^{\circ}\text{C}$  on 17 July 1903). In this case, heavy snowfall occurred throughout the South Island on 10 July 1903, which was followed by an anticyclone which persisted for at least seven days.

## Wind

On 9 June, extra caution was required by motorists travelling on the Rimutaka Hill Road (SH 2) and on SH 73 from Springfield to Arthur's Pass due to strong winds. Strong winds toppled trees and affected flights in and out of Queenstown Airport. In Wellington, strong winds caused two shipping containers to fall into the harbour, one of which later washed up at Oriental Bay Beach. Power was cut to nearly 2000 homes in Wellington due to high winds. In north Canterbury, a wildfire covering approximately 50 hectares was fanned by strong winds, making it difficult for fire services to control.

On 10 June, extra caution was required by motorists travelling on the Rimutaka Hill Road (SH 2) and SH 73 from Arthur's Pass to Otira due to strong winds. A mini tornado and high winds caused power outages in the small West Coast town of Granity.

On 11 June, extra caution was required by motorists travelling on the Rimutaka Hill Road (SH 2) due to strong winds.

On 14 and 15 June, massive waves slammed into Wellington's south coast, washing debris over roads and inundating properties at Lyall Bay and trapping people in their car at Cape Palliser. The large waves, up to 4m in size, were a product of a low pressure system sitting east of New Zealand that had pushed a strong southwest flow up the country. In Dunedin, large waves washed away supporting poles of the ramp down to St Clair Beach, and claimed the life of a Jack Russell dog.

On 18 June, wind warnings were in place on SH 8 between Pukaki and Fairlie and SH 2 at the Rimutaka Hill Road. At Mt Hutt Skifield, a small stone picked up by high winds smashed a hole through a double glazed window.

On 19 June, wind warnings were in place on SH 2 from Mount Bruce to Takapau and SH 2 at the Rimutaka Hill Road. Gale force winds knocked over the back section of a truck trailer near Pahiatua, and a small yacht washed onto rocks at Evans Bay in Wellington. Wellington's East by West ferries were operating a restricted afternoon service. Some barrier railings blew loose on the Wainuiomata Hill Road.

On 29 June, severe gale warnings were in place for coastal Southland, eastern Otago, Canterbury, northwest Nelson, Wairarapa and the Hawke's Bay. Numerous South Island ski fields were closed due to the wind forecast, and drivers of high-sided vehicles and motorcycles were warned about the strong winds on various highways.

On 30 June, severe wind warnings were lifted for most places except for eastern Southland, where motorists of high-sided vehicles and motorcycles were warned about strong winds on multiple highways.

The highest wind gust was 178 km/hr, observed at Cape Turnagain on 13 May.

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

Location	Extreme wind gust (km/hr)	Date of extreme gust	Year records began	Comments
South West Cape	167	9th	1991	Highest

Palmerston North	89	12th	1991	2nd-highest
Puysegur Point	148	9th	1986	2nd-highest
Blenheim	102	29th	1972	2nd-highest
Tara Hills	95	18th	1985	2nd-highest
Wanaka	76	9th	1992	2nd-highest
Turangi	95	13th	1973	Equal 2nd-highest
Oamaru	78	12th	1984	Equal 2nd-highest
Wanganui	98	12th	1977	3rd-highest
Dannevirke	95	20th	1961	Equal 3rd-highest
Manapouri	70	9th	1991	Equal 3rd-highest
Levin	91	12th	1971	4th-highest
Kaukau Top	150	10th	1969	4th-highest
Secretary Island	122	12th	1994	4th-highest
Lyttelton Harbour	91	4th	1980	4th-highest
Milford Sound	119	9th	1974	Equal 4th-highest

## Snow and ice

On 10 June, SH 94 between Hollyford and Milford Sound was closed due to snow.

On 11 June, SH 94 between Te Anau and Milford Sound remained closed due to snow. Other roads affected by snow were SH 90 from Rae's Junction to McNab, SH 1 at Gore, SH 7 from Springs Junction to Reefton, SH 93 from Clinton to Mataura, SH 7 from Hanmer Turnoff to Springs Junction (Lewis Pass) and SH 73 from Arthur's Pass to Otira. These roads were closed to towing vehicles and chains were essential.

On 16 June, SH 1 at the Desert Road was closed due to snow, and caution was advised on SH 5 from Napier to Taupo due to winter driving conditions. Ice warnings were in place for SH 7 from Springs Junction to Reefton and SH 7 at Lewis Pass.

On 17 June, snow warnings were in place for SH 94 from Te Anau to Milford Sound.

On 18 June, heavy snow fell across Otago and inland Canterbury. SH 94 from Te Anau to Milford Sound was closed due to snow. Caution was advised on SH 6 between Kingston and Five Rivers due to snow. Some schools in Queenstown and across the Central Otago region were closed due to the weather conditions. The Remarkables ski field in Queenstown postponed its opening day as the bad weather meant that contractors were unable to carry out work ahead of the opening day. Some flights in and out of Queenstown airport were delayed or cancelled due to the weather. A number of roads were closed overnight from 18-19 June, including SH 73 from Springfield to Arthur's Pass (Porter's Pass), SH 6 from Haast to Makarora, SH 8 from Tarras to Omarama (Lindis Pass), SH 6 from Fox Glacier to Haast, SH 94 from Te Anau to Milford Sound, SH 8 from Omarama to Fairlie, SH 80 on the Mt Cook Highway, and SH 79 from Geraldine to Fairlie. Vehicle restrictions and cautions were in place for SH 85 from Palmerston to Kyeburn, SH 85 from Kyeburn to Ranfurly, SH 6 from Queenstown to Cromwell, SH 77 from Darfield to Methven, and SH 83 from Kurow to Omarama.

On 19 June, the snow storm was still affecting Canterbury, with Mt Hutt ski field closed due to very high avalanche risk (they reported 1.2 m of new snow over two days), schools closed around Geraldine, Fairlie and Pleasant Point, and power out to over 4500 homes in the region (including the

townships of Darfield, Horarata, Coalgate, Sheffield, Springfield, Lake Coleridge, Kirwee and Glentunnel). Two Spark cellphone towers in Fairlie also lost power. The Hermitage Hotel in Mt Cook Village lost power, and around 1 m of snow was reported in Mt Cook Village. In the afternoon of the 19<sup>th</sup>, SH 8 from Tekapo to Twizel and SH 80 on the Mt Cook Highway were still closed due to snow. Vehicle restrictions were in place (no towing and chains essential) for many State Highways in Canterbury and Otago.

On 20 June, chains were essential on SH 80 at the Mt Cook Highway due to snow. Caution due to snow was advised on SH 6 from Haast to Makarora, SH 8 from Tarras to Omarama (Lindis Pass), SH 8 from Twizel to Fairlie, SH 8 from Omarama to Twizel, SH 79 from Geraldine to Fairlie, and SH 83 from Kurow to Omarama. In the evening of 20 June, SH 94 from Te Anau to Milford Sound was closed due to snow.

On 21 June, SH 94 from Te Anau to Milford Sound remained closed due to snow. Roads closed on 20 June were opened but a caution to motorists remained in place due to ice and snow on the roads.

On 22 June, SH 94 from Te Anau to Milford Sound remained closed due to snow. Ice and snow were present on many other highways in Otago, Canterbury and Southland, and cautions were in place for motorists. Snow fell in Dunedin as well as on Banks Peninsula and the Port Hills above Christchurch. Some schools in Dunedin started at 10 am for the day due to the weather.

On 23 June, extremely cold temperatures caused black ice and dangerous driving conditions. Motorists were warned about black ice and snow on many South Island highways. Numerous crashes, along with one fatal crash, were caused by the black ice.

On 24 June, another night of very cold temperatures caused warnings for black ice and snow on many South Island highways to remain in place.

On 25 June, black ice created treacherous conditions on Central Otago roads, closing SH 6 from Cromwell to Frankton and causing warnings to remain in place for motorists on other roads. Six people were injured in a vehicle accident in Southland, in which ice was believed to be a factor. Ice on the runway at Queenstown airport forced the suspension of all flights.

On 28 June, a horse float flipped on its side in a crash on icy roads near Oamaru.

On 29 June, a car containing two Brazilian tourists slid on ice and rolled down a bank near Twizel. The tourists sustained minor injuries.

### **Lightning and hail**

On 2 June, a lightning strike knocked out the power supply to the Kai Iwi district north of Whanganui. The lightning strike was one of 89 that were recorded in the Whanganui district in the 24-hours to 10 a.m. on 3 June. Farther north, ongoing thunderstorms resulted in frequent lightning strikes across Auckland and the Waitakere Ranges. Hailstones greater than the size of a \$2 coin were observed at Clarks Beach, with considerable downpours of rain throughout the city. A lightning strike set-off fire alarms and shattered two windows at Dargaville Hospital.

On 3 June, another band of thunderstorms passed over Auckland, resulting in further lightning strikes, heavy rain, and a downed tree blocking the main road in Hunua.

On 11 June, a lightning strike closed a Rutherford Intermediate School in Whanganui after it caused the loss of power and phone service to the school.

### Cloud and fog

On 6 June, fog caused flight delays and diversions at Auckland Airport.

On 8 June, a car accident in Hamilton was partly attributed to foggy conditions. One flight due to arrive at Hamilton Airport was diverted because of the fog.

On 9 June, heavy fog caused traffic delays on Auckland's roads and motorways. Auckland's ferry services were also delayed by the fog.

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### For further information, please contact:

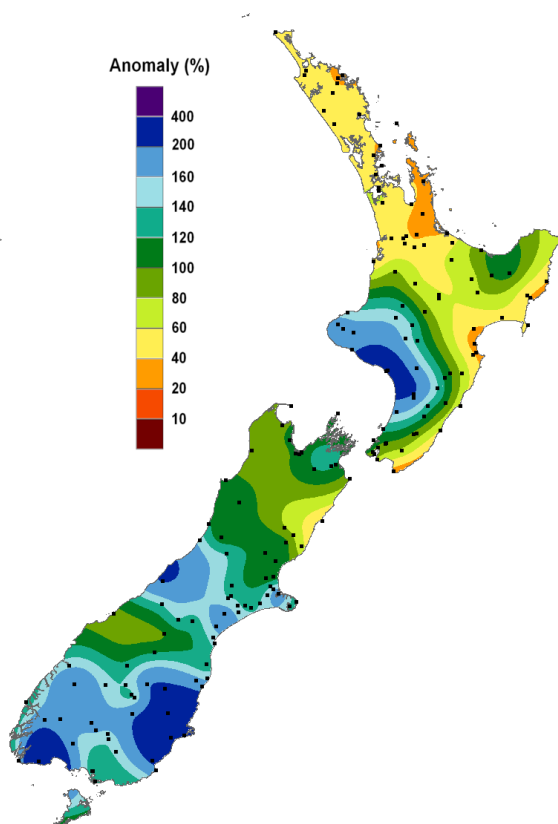
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*June 2015 total rainfall, expressed as a percentage of the 1981-2010 normal (%).*

*Rainfall was above normal (120-149% of the June normal) or well above normal (> 149% of the June normal) in the south-west North Island and most of the lower South Island as indicated by the teal and blue shades. In contrast, it was a very dry month for the north and east of the North Island and Wairarapa, as well as eastern parts of Canterbury, as indicated by the yellow, orange and red shades. Here, rainfall was typically well below normal (< 50% of the June normal).*

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