

## NEW ZEALAND WEATHER

### BRIEF REVIEW OF THE WEATHER WINTER 1991 (Fig. 1)

#### CONTRASTING RAINFALL, COLD IN THE SOUTH-WEST OF THE SOUTH ISLAND

An El Nino event (negative phase of the southern oscillation), contributed to persistent south-west winds over New Zealand, and an extended period of low rainfall along the West Coast and in the southern lakes through June and July. This was accompanied by high power demand during several weeks of extremely cold weather. By mid July, South Island hydro lake levels had fallen to their lowest levels since the 1950s with the possibility of power restrictions if conditions didn't improve. However, much rain occurred later on the West Coast, with a break in the El Nino pattern and a change to more normal westerly weather patterns at the beginning of August. Rainfall and melting snow soon caused the lake levels to rise and power restrictions were not necessary.

Heavy snow contributed to frequent avalanches on major ski fields during winter, and caused the loss of a life on Mt Ruapehu. The Milford Road was closed for two weeks from 6 through 20 August, due to avalanche and avalanche risk. This resulted in the loss of thousands of dollars to the tourist industry.

Record high winter (June through August) rainfall of 1213 mm was recorded at the Hermitage, Mt Cook (63% above normal), which was the highest since 1930, and 134 mm at Alexandra (127% above normal), being the highest since 1922. Rainfall was also above average in Auckland, the North Island Central Plateau, South Westland and Fiordland. Contrasting conditions occurred in Gisborne and Hawkes Bay where it was exceptionally dry. Rainfall at Napier Airport of 103 mm (38% of average) was the lowest since 1950. Rainfall was also below average in eastern Bay of Plenty, Wairarapa and Nelson.

The winter was very cold in Central Otago and inland South Canterbury, with temperatures were as much as 1.5°C below average. They were 0.5°C below average in Southland and Fiordland. However, they were 0.5°C above average in places in Northland, Auckland, Gisborne, Manawatu, Wellington and coastal areas of Marlborough.

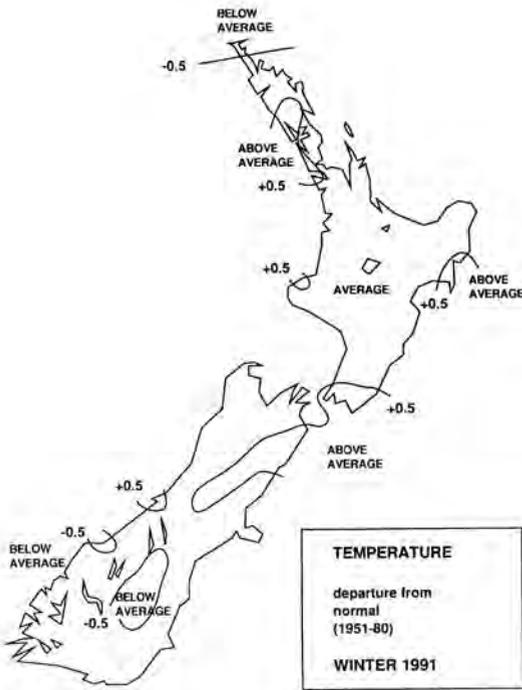
Hours of bright sunshine were 10 percent above average in Taranaki, Gisborne, Canterbury and Southland. Skies were cloudier than usual in Auckland and along the South Island West Coast (hours of bright sunshine up to 15 percent below average).

### MONTHLY HIGHLIGHTS JUNE - AUGUST 1991

June's weather was colder than usual over much of New Zealand. This was due to depressions near the Chatham Islands which brought persistent south to south-west airstreams, with showery weather on the south of the North Island and east of the South Island. These gave drier than average conditions over the rest of the country.

Exceptionally cold weather, accompanied by showers of hail and snow, prevailed in southern and eastern regions on the 20th. A clearance in the weather was followed by severe frost in Nelson, inland South Canterbury and Central Otago. A grass minimum of -11.3°C occurred at Nelson Airport on the 22nd (equal to the previous low recorded there in June 1945) and minimum air temperatures as low as -11°C were recorded later in the month at Lake Tekapo (26th and 30th), and Lauder (30th).

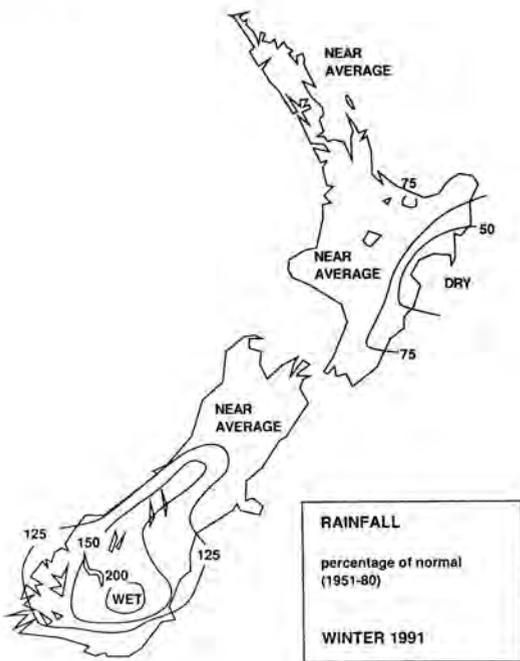
Mean temperatures in June were the lowest in many places since 1976, with a national average temperature of 7.7°C (0.5°C below average). They were as much as 1.5°C below average in Fiordland, Central Otago and Southland, and up to 1°C below average over the remainder of the South Island. However, temperatures were closer to average over much of the North Island.



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**Fig. 1: Winter 1991.** Rainfall map based on observations from 46 stations; temperature departure map based on observations from 40 stations; sunshine based on observations from 17 stations.

Rainfall was particularly low at Nelson (30% of average), Napier and Whangarei (45% of average). The frequent south to south-westerly conditions contributed to above average rainfall in the east of the South Island, with more than twice average at both Christchurch and Alexandra. Rainfall was also above average in Wellington, and over the North Island central plateau.

Hours of bright sunshine were 20 percent above average in Rotorua, Bay of Plenty and Nelson. It was also sunnier than usual in Nelson and Southland. Skies were cloudier than usual in Northland, Auckland, Wellington and Manawatu, with sunshine hours as much as 15 percent below average.

July's weather was marked by exceptionally low temperatures, with more severe frosts in Central Otago and inland South Canterbury. The month began with an unofficial minimum air temperature of  $-21.6^{\circ}\text{C}$  recorded at Moa Creek (Central Otago) on the 1st. This was

lower than the official record low of  $-19.7^{\circ}\text{C}$  at Ophir (also Central Otago) in July 1943. Temperatures over the first half of July were as much as  $10^{\circ}\text{C}$  below average. The continuation of very low temperatures for several weeks was very unusual. Air temperatures plummeted to minus  $15^{\circ}\text{C}$  at Lauder, and minus  $13^{\circ}\text{C}$  at Twizel. The last time temperatures were as low as Twizel was in July 1975, when  $-15^{\circ}\text{C}$  was recorded. On the 18th the Shotover River (Queenstown) froze over for the first time this century.

Napier City recorded its driest August since 1931, while Gisborne had the driest August in over half a century of measurements there. Rainfall was less than 10 percent of average along the Kaikoura Coast, and less 25 percent of average in North Canterbury and Hawkes Bay. Near or record low rainfall for August was recorded at:

Location	Rainfall amount (mm)	Percent of average	Rank	Year records began
Gisborne Airport	24	19	1st equal	1937
Napier City	18	22	3rd	1900
Hastings	16	23	1st equal	1892
Kaikoura	8	9	3rd	1949
Christchurch Airport	12	22	2nd	1943

The average temperature for New Zealand was  $9.8^{\circ}\text{C}$  ( $1.2^{\circ}\text{C}$  above average). This was the 5th highest in August since records began in 1853.

The persistent westerlies caused mean temperatures to be as much as  $2.1^{\circ}\text{C}$  above average along the Kaikoura Coast, and  $1.5^{\circ}\text{C}$  to  $2.0^{\circ}\text{C}$  above average in Gisborne, Canterbury and Marlborough. At Wellington they were  $10.4^{\circ}\text{C}$  ( $1.3^{\circ}\text{C}$  above average), which was the second highest for August in records which began in 1853. Only 1987 was higher with  $10.9^{\circ}\text{C}$ .

Mean daily maximum temperatures at Gisborne Airport ( $16.5^{\circ}\text{C}$ ) were the highest for August since records began in 1937, and mean daily minimum temperatures at Rotorua ( $6.3^{\circ}\text{C}$ ) were the highest for August since records began in 1927. Temperatures were close to average in Fiordland, and elsewhere they were about a degree above average.

Hours of bright sunshine were 30 percent above average in Gisborne and more than 10 percent above average in other eastern regions of the North Island. Skies were much cloudier than usual along the South Island

West Coast, especially at Hokitika (43% below average). Sunshine was 10 to 20 percent below average in Auckland, Bay of Plenty, Rotorua and in coastal areas of Otago.

The month was windier than usual, particularly over the first three weeks. High winds, attributed to tornadoes, occurred in the Motueka area during the morning of the 17th and later at New Plymouth on the 18th. Roofs were blown off homes in New Plymouth (7 properties were severely damaged), where the winds left a 2 km long trail of destruction. Damage was estimated at \$1 million.

The unusually low temperatures during the first half of July were due to considerable snow cover over these areas since late June, together with many calm nights (caused by intense anticyclones over southern New Zealand). Troughs of low pressure, with especially cold west to south-west winds prevailed for the second half of the month.

For the month mean temperatures were as much as  $3.5^{\circ}\text{C}$  below average in the Mackenzie Basin and Central Otago. Mean daily maximum and minimum temperatures at Alexandra ( $3.1^{\circ}\text{C}$  and  $-5.2^{\circ}\text{C}$ ) were the lowest for July since records began in 1929. At Tekapo maximum temperatures ( $3.2^{\circ}\text{C}$ ) were the lowest since 1927, while minimum temperatures ( $-6.2^{\circ}\text{C}$ ) were the lowest since 1938 ( $-6.3^{\circ}\text{C}$ ). Temperatures were near average in most other regions of New Zealand.

Rainfall was down to 40 or 50 percent of average in Gisborne, Napier, Wellington and Dunedin. It was also drier than usual in the Mackenzie Basin. Twice the average rainfall was recorded in coastal areas of South Canterbury, with wetter than usual conditions also in Waikato and Wanganui.

Cold south-west winds brought heavy snow to high country areas of Canterbury and Otago on the 23rd and 25th, with as much as 65cm of fresh snow measured at some ski fields.

Hours of bright sunshine were almost 40 percent above average in Southland and more than 20 percent above average in Wellington, Canterbury, Otago and Fiordland. Skies were cloudier than usual in Bay of Plenty and Auckland. Rotorua was one of the cloudiest centres, with 104 hours of bright sunshine (26 percent below average).

August was marked by record high rainfall in Fiordland and the Southern Lakes area of the South Island, and very low rainfall, ac-

accompanied by well above average temperatures in most eastern regions from Gisborne to Canterbury. These conditions were caused by persistent, but mild, westerly winds over New Zealand throughout most of the month.

The persistent westerlies contributed to almost five times the average August rainfall at Queenstown. The Mackenzie Basin and Fiordland received up to three times their average rainfall for August. Highest-ever rainfall for August was recorded at:

Location	Rainfall amount (mm)	Percent of average	Year records began
Queenstown	216	480	1890
The Hermitage	926	334	1930
Lake Tekapo	145	269	1925
Milford Sound	999	247	1930

## BRIEF REVIEW OF THE WEATHER SPRING 1991 (Fig. 2)

### EL NINO AGAIN!

A return to an El Nino weather pattern, from October, brought cool unstable south-westerly airstreams over New Zealand.

The national average temperature of 11.8°C (0.3°C below average) was the lowest for spring (September through November) since 1984, which had 11.6°C. Mean temperatures were as much as 1.3°C below average over the North Island Central Plateau and in Central Otago. However, they were near average in Nelson. In fact, over much of New Zealand, late spring temperatures were barely higher than those experienced during September.

Two depressions (one at the end of October, the other at the beginning of November) brought over 150 percent of average rainfall to Hawkes Bay. Rainfall was also above average in Gisborne. The rainfall eased the regions from the serious dry conditions, that they were facing prior to the end of October.

A lack of moist north-westerlies, typical for spring, meant that rainfall was below average (by up to 25%) in Taranaki, Buller and north Westland. Rainfall was as much as 40 percent below average in the southern lakes district of the South Island.

Coastal Southland, which is exposed to the south-westerlies, had 20 percent more than

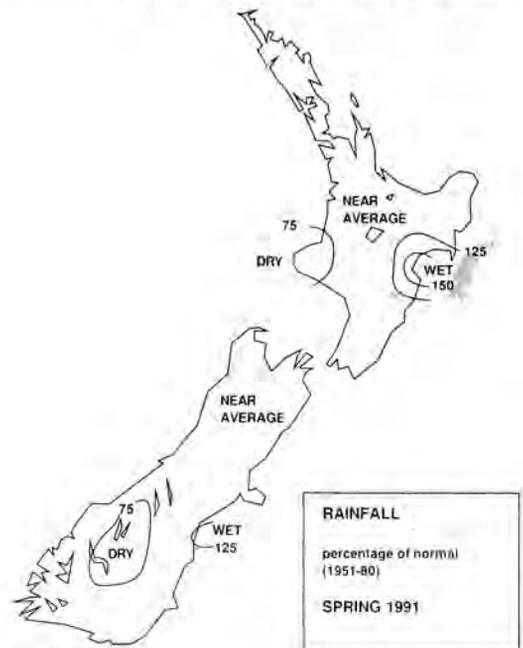
average rainfall. Rainfall was 25 percent above average in Timaru.

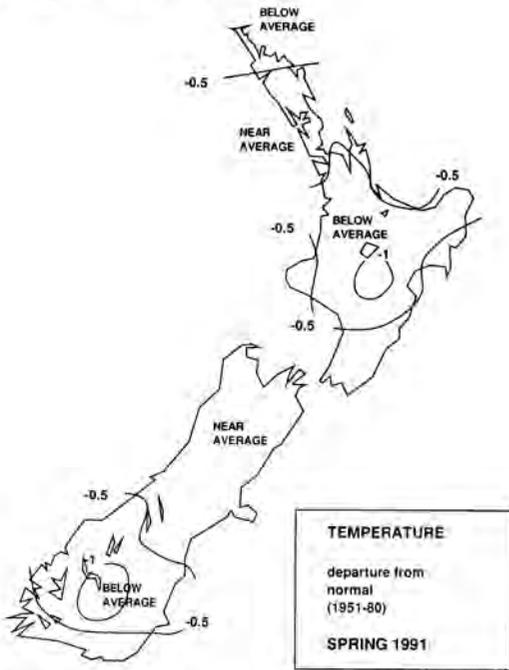
Sunshine was near average in many places. However, south Taranaki, Manawatu and east coast regions of the South Island had 10 percent less than average.

## MONTHLY HIGHLIGHTS SEPTEMBER - NOVEMBER 1991

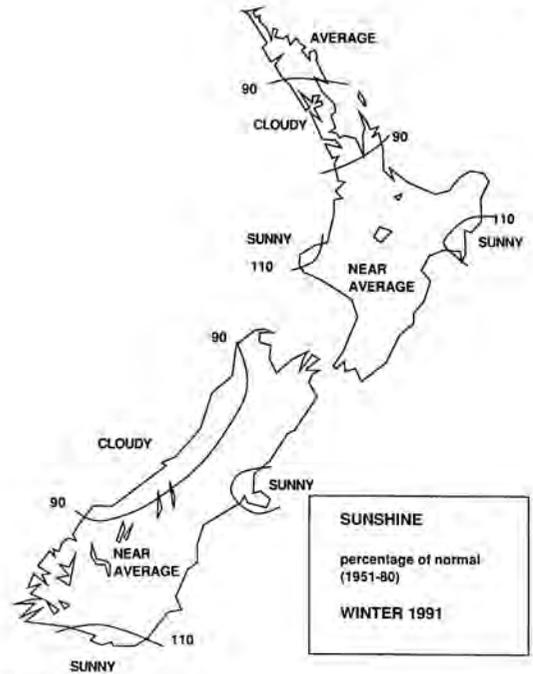
During September persistent north-westerly winds caused very dry conditions to continue in Gisborne. It was also very dry in the southern lakes area of the South Island. However, the north-westerly winds were interrupted by troughs and depressions. These brought much wetter than usual conditions to Bay of Plenty, Rotorua, Nelson, South Westland and inland South Canterbury. Temperatures were above average in most places.

Rainfall at Gisborne (25mm) was a quarter of the average, continuing the trend of drier than usual weather that began there back in June. Dry weather also prevailed in the southern lakes area of the South Island. Rainfall at Queenstown (29mm) was half average. Rain-





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fall was also below average along the Kairouria Coast and in Southland (50 to 70 percent of average).

The troughs and depressions contributed to almost twice the average September rainfall in Bay of Plenty, Nelson, South Westland and inland South Canterbury. September was the wettest at Rotorua since 1969, with 234mm. Rainfall was also above average in Northland, Waikato, Wellington, Buller, Marlborough and Coastal Otago.

The last two weeks of September were particularly wet, with rain almost every day in northern and western regions of the North Island from 13 September.

The frequent north-west winds kept temperatures above average in most places, with the average for New Zealand being 11.1°C (0.7°C above average). In Wellington they were 1.2°C above average and in Northland, Auckland and Marlborough they were 1.0°C above average. However, temperatures 1.0°C below average occurred in some areas in Central Otago.

Hours of bright sunshine were 10 percent above average in Gisborne. However, skies

**Fig. 2: Spring 1991. Rainfall map based on observations from 46 stations; temperature departure map based on observations from 40 stations; sunshine based on observations from 17 stations.**

were cloudier than usual (hours of bright sunshine as much as 35 percent below average) in south Taranaki, and in many areas of the South Island (south of a line from Hokitika to Timaru).

On 1 October the Cook Strait ferry Aratika was buffeted by high waves and southerly winds (with gusts to 130 km/h) during its voyage from Picton to Wellington. The rough conditions through the Strait caused the ferry to turn back and shelter for some hours in Cloudy Bay (near Blenheim). The ferry eventually made a safe passage to Wellington, as the storm abated, arriving during the morning on the 2nd.

Persistent westerly winds during the month created very dry conditions, with little rainfall, in northern and eastern regions of the South Island. Oamaru Airport recorded its fourth driest October in the last 50 years. The month's rainfall of 10mm was a quarter of average. Rainfall was also about 25 percent of

average in Nelson and inland areas of Canterbury, and less than half average in many other eastern South Island areas from Marlborough south.

Unusually dry conditions which had persisted in Gisborne and Hawkes Bay since June were interrupted by substantial amounts of rainfall (of about 50mm) when a depression passed over the area during the last few days (28th and 29th). The dry conditions were attributed to an El Nino phase of the southern oscillation.

Rainfall was also below average for October over much of the north and west of the North Island, Buller and North Westland.

Temperatures were below average (by 0.5°C to 1°C) over the North Island central plateau, south Westland, Fiordland and Southland. They were also about 1°C below average in Northland and Otago. Milder conditions prevailed in eastern Bay of Plenty, along the Kaikoura coast, and in Canterbury, with temperatures 0.5°C above average.

Hours of bright sunshine were 10 percent above average in Buller and Taranaki. Skies were cloudier than usual (hours of bright sunshine as much as 15 percent below average) along the east coast of the South Island from Marlborough to South Canterbury.

In November, typical El Nino weather prevailed for the third month running. There were more depressions near the Chatham Islands and cool unstable south-westerly airstreams over New Zealand.

Thunderstorms occurred, along the east coast of the South Island on the 11th, with

large hail (some 30mm in diameter). Late spring snow fell in Fiordland toward the end of the month.

The national average temperature of 12.4°C (1.4°C below average) was the lowest for November since 1946, which had 10.7°C. Mean temperatures were 2°C below average in the North Island central plateau and South Canterbury. Frosts were twice as frequent from Canterbury to Otago.

Typical south-west conditions meant that rainfall was below average in Nelson, Marlborough and Westland. Totals were 45 percent of average in Westland, and 60 percent of average over the remainder of the West Coast, and in Nelson and Marlborough.

The month commenced with a period of south-easterlies and high rainfall in Hawkes Bay and Gisborne. November's rainfall was three and a half times average in Hawkes Bay, and twice average in Gisborne. Nearly all of this occurred from the 2nd to the 5th. Napier's November rainfall was the highest since 1952. The rainfall eased the regions from the serious dry conditions, that they were facing prior to the end of October.

Sunshine was near average in most places. However, Buller had 20 percent more than average and Manawatu had 20 percent less than average.

Many thanks are due to the New Zealand Meteorological Service for providing the climatological information from which this summary was compiled.

**Stuart M. Burgess**