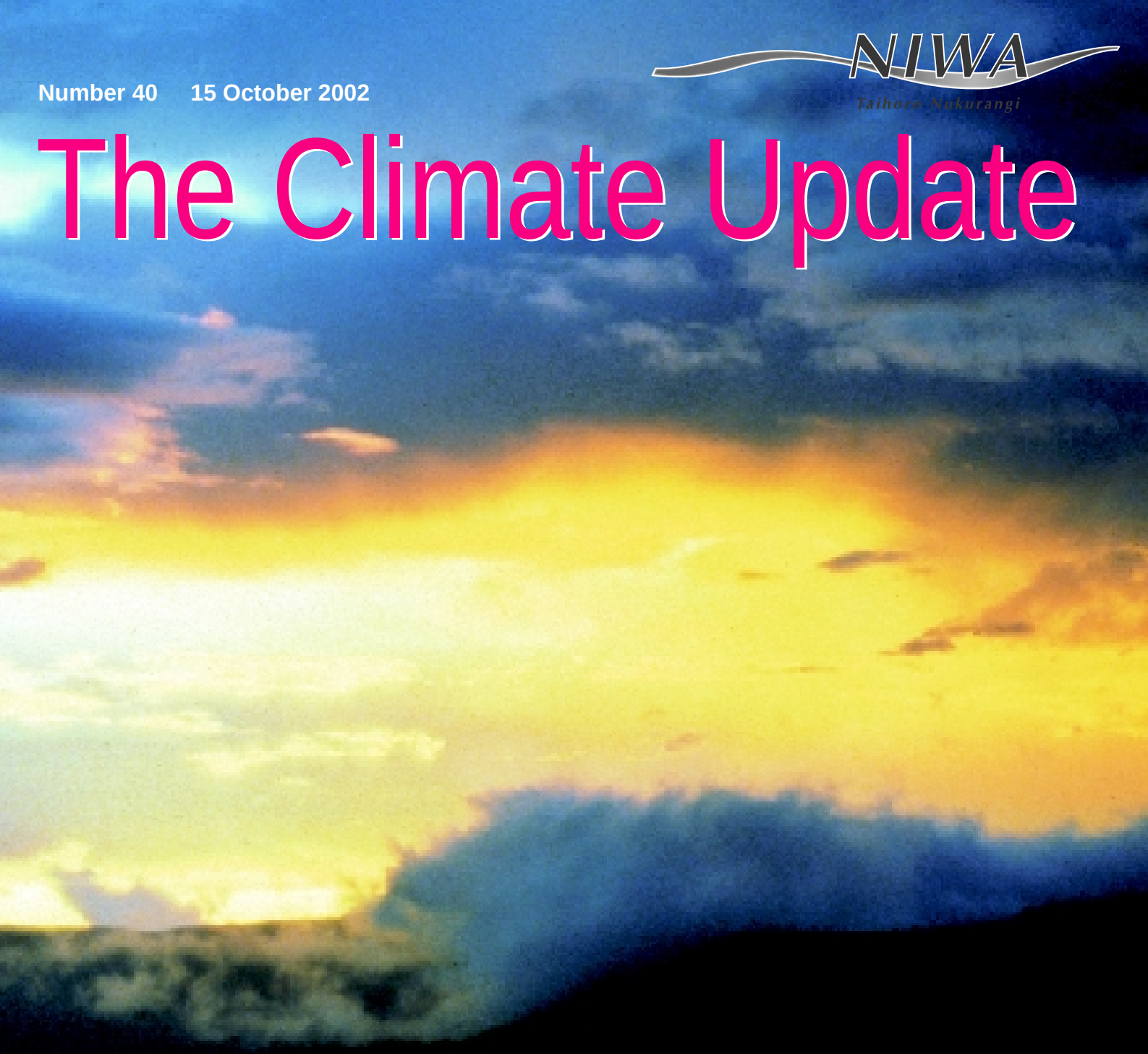
Number 40 15 October 2002

NIWA
Taihoro Nukurangi

The Climate Update



September 2002: Mild; dry in the east and wet in the west; windy

It was drier than normal in Marlborough and north Canterbury for the third consecutive month ... *page 2*

Outlook

Warmer than normal in the North Island and the east of the South Island ... *page 3*

Teleconnections

Linkages between disconnected climate anomalies ... *page 4*

New Zealand climate in September 2002

Air temperature and rainfall

Warm in the east

Daytime maximum temperatures were between 2.0 and 3.0 °C above normal in many eastern areas from Hawke's Bay to Otago. The mean maximum temperature at Napier was 19.7 °C, which is the highest recorded since records began in 1870. Christchurch Botanical Garden reached 18.1°C, and was the highest since 1864. Records for September were also set at Kaikoura, Timaru, and Dunedin.

Dry in the east and wet in the west

Rainfall from Marlborough to north Canterbury was below average for the third consecutive month. It was also below average in eastern Northland, Waikato, other eastern areas from western Bay of Plenty to Otago, and isolated areas of inland Southland. In contrast, it was unsettled with above average rainfall in all South Island Alpine regions, Fiordland, coastal Southland, Southern Lakes and parts of Buller and Westland, as well as Taranaki and King Country.

Sunny in the east, cloudy in the west

Sunshine and solar radiation totals were above average in eastern regions from Gisborne to Southland. In many western areas from Taranaki to Fiordland it was cloudier than usual.

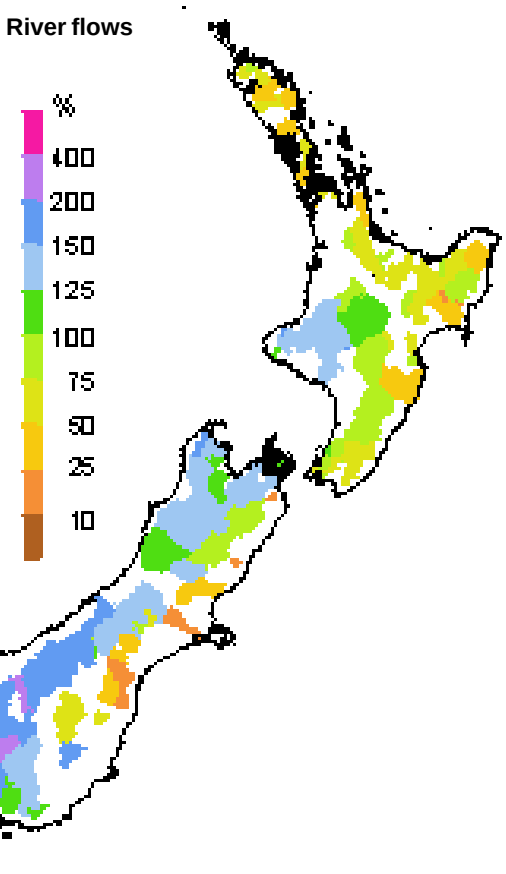
A wild start to spring

On 12 September a heavy hailstorm in Wellington's eastern suburbs at about 7 am closed the airport temporarily. Later the same day heavy hail fell in Takaka. Severe northwest gales buffeted Canterbury on 22 September, with wind gusts to 117 km/h at Rangiora and 115 km/h at Darfield.

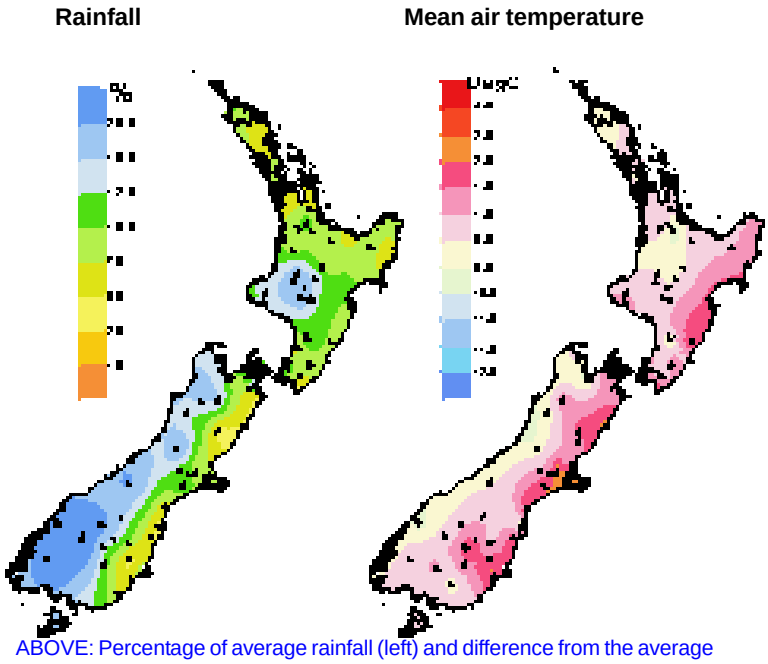
River and streamflows

September streamflows varied

September flows were below normal for the north and east of the North Island and the east of the South Island. They were above average in Taranaki and the north, west, and south of the South Island.



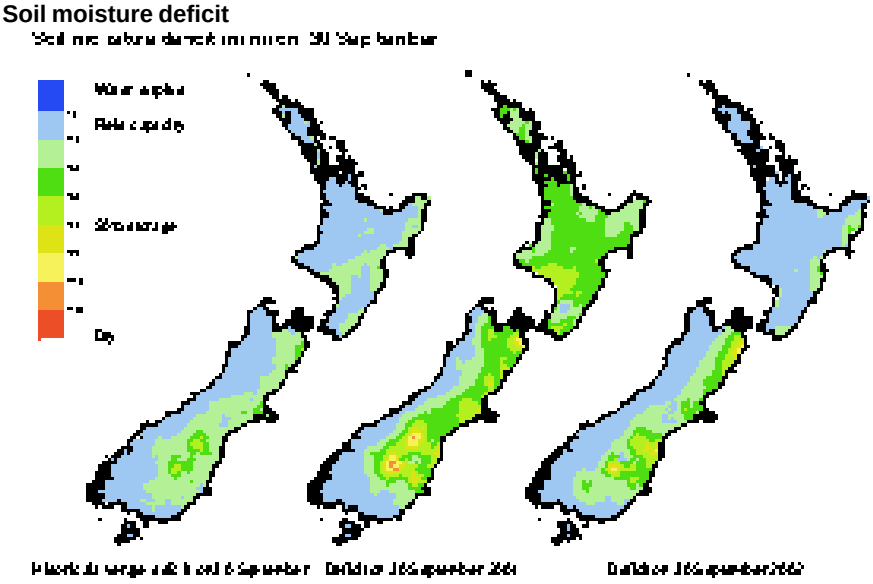
ABOVE: Percentage of average September streamflows for rivers monitored in national and regional networks. The contributing catchment area above each monitoring location is shaded. NIWA field teams, regional and district councils, and hydro-power companies are thanked for providing this information.



ABOVE: Percentage of average rainfall (left) and difference from the average air temperature in degrees Celsius (right). Dots indicate recording sites.

Soil moisture

Conditions in the North Island were near normal at the end of September, with most areas at field capacity. The area of soil moisture deficit in eastern and northern South Island regions has shrunk slightly, but Marlborough, Canterbury, and Otago are still drier than normal. Western and southern South Island regions are near normal.



RIGHT: Soil moisture deficit in the pasture root zone at the end of September (right) compared with the deficit at the same time last year (centre) and the long-term end of September average (left). The water balance is for an average soil type where the available water capacity is taken to be 150 mm.

Checkpoint

July to September 2002

Rainfall was generally as expected over all the North Island as well as western, southern, and eastern South Island regions. In northern South Island regions rainfall was lower than predicted.

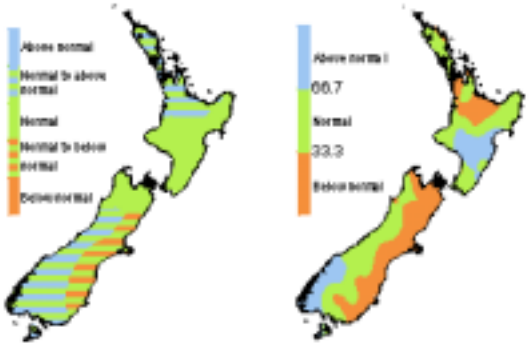
Air temperatures were much as predicted for all districts except the south of the South Island, which was warmer than predicted.

River flows were lower than predicted in northern and eastern South Island regions, and in northern North Island regions. Flows in East Cape and the central plateau were higher than predicted. Elsewhere, flows were as predicted.

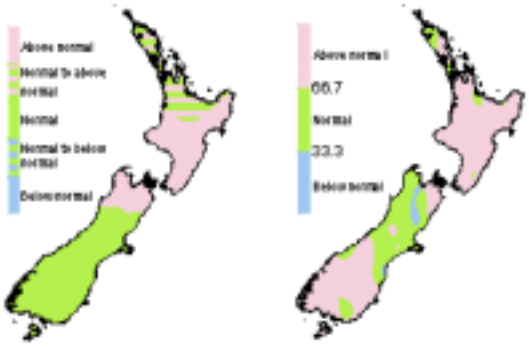
Rainfall

Outlook
What we said

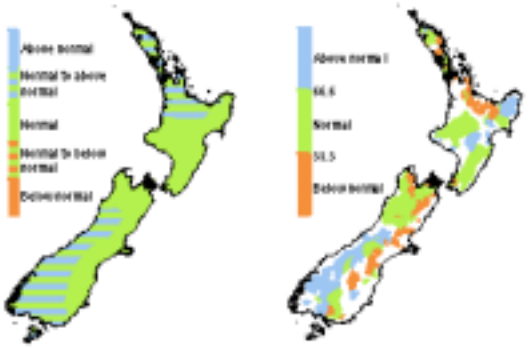
Outcome
What actually happened



Mean air temperature



River and stream flows



The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for July to September 2002. Terciles were obtained by dividing ranked July to September data from the past 30 years into three groups of equal frequency (lower, middle, and upper one-third values) and assigning the data for the present year to the appropriate group. As an approximate guide, middle tercile rainfalls (33.3 to 66.7%) often range from 80 to 115% of the historical average. Middle tercile air temperatures typically occur in the range of the average plus or minus 0.5 °C. Note that in the maps above, the upper, middle, and lower tercile ranges are described by the terms *Above normal*, *Normal*, and *Below normal,* respectively.

Outlook

October to December 2002

El Niño conditions are expected to last through summer 2002–03, but it is likely to be a much weaker event than that of 1997–98. Stronger than normal westerly winds are predicted during late spring.

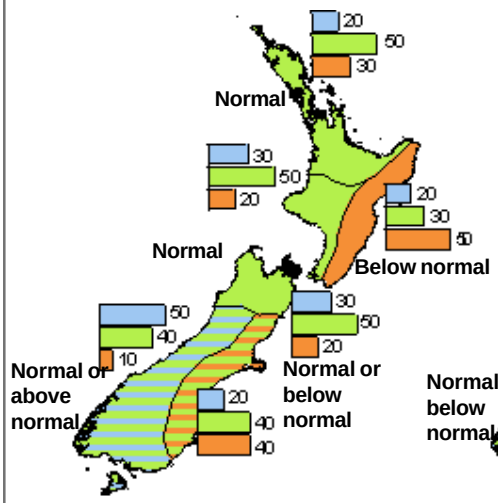
Over most of the country, temperatures are expected to be average to above average. However, above average temperatures are likely in the eastern North Island, and below average temperatures are possible in the western South Island.

Near normal rainfall is expected for the North Island, except for the east where falls are expected to be below normal. For the South Island, there is a tendency towards above normal rainfall in the west, and below normal rainfall in the east.

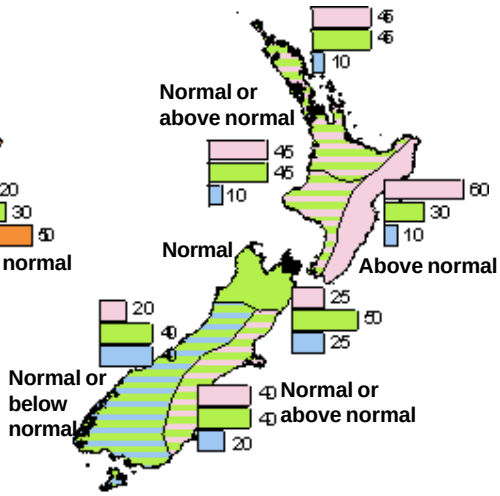
Below normal soil moisture levels and river flows are predicted for the east coasts of both islands, with lower river flows also likely in the north of the North Island. Above normal soil moisture levels and river flows are likely in the west and south of the South Island.

The tropical cyclone season usually begins in November: El Niño conditions imply a slightly reduced risk of a tropical cyclone affecting New Zealand during this summer.

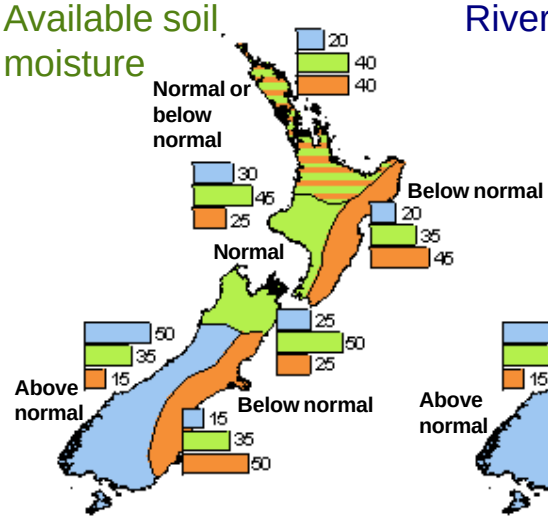
Rainfall



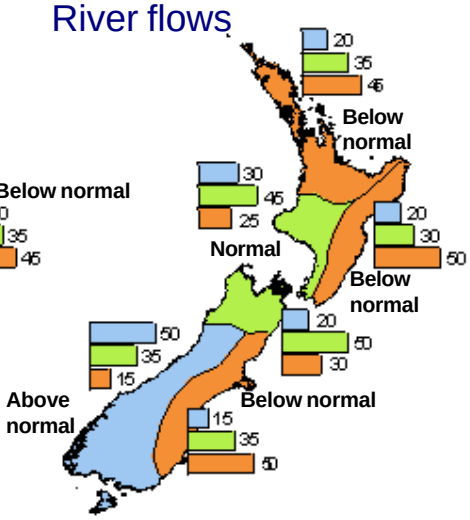
Mean air temperature



Available soil moisture



River flows



KEY to maps (Example interpretation)

In example A, climate models give no strong signals about how the climate will evolve, so we assume that there is an equal chance (33%) of the climate occurring in the range of the upper, middle, or lower third (tercile) of all previously observed conditions.

In example B there is a relatively strong indication by the models (60% chance of occurrence) that conditions will be below normal, but, given the variable nature of climate, the chance of normal or above-normal conditions is also shown (30% and 10% respectively).

	No strong climate signal	Strong expectation of below normal
	A	B
Above normal	33	10
Normal	33	30
Below normal	33	60

Backgrounder

Teleconnections

In the meteorological context, the term *teleconnections* is used to refer to linkages between climate variations in one part of the world and associated climate signals in other parts. NIWA climate scientists are working to improve understanding of teleconnection cause and effect in order to achieve better climate forecasts for New Zealand.

Definition

Teleconnections can be defined as "the linkages over great distance of seemingly disconnected climate anomalies". In other words, when the climate varies in one place there is also a consistent variation in perhaps another ocean or continent, without any obvious physical link. These connected variations, which may occur together or with a time delay, are usually identified statistically. Then, because we recognise that some atmospheric processes are manifested as waves, we can begin to understand the connections in qualitative terms ("when this happens, look out for that effect"). This is like dropping a stone in the middle of a pond, and sometime later seeing small waves lap the shoreline.

Not teleconnections

New Zealand climate is strongly influenced by local sea surface temperatures (SSTs) and winds – these are not teleconnections. A large proportion of the variability in regional seasonal temperatures in New Zealand is linked to the local SST for the same season. These contemporary correlations tend to be strongest for the northern and western regions, and weakest (but still significant) in all regions in winter.

We can apply this link to seasonal forecasting. If we are forecasting land temperatures for spring, we would use the SST during winter. There is a relationship between say last season's SST, and the current season's land temperature, called a lag correlation, although it is not as strong as the contemporary links. We use the term persistence to describe this type of forecasting relationship.

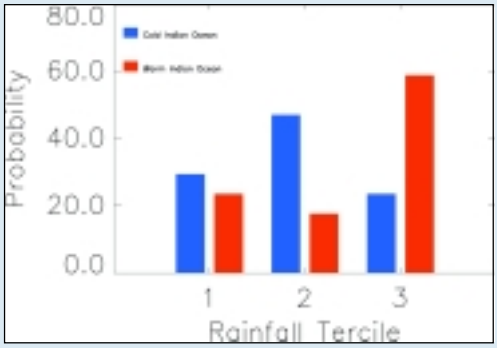
Example

Elsewhere in the world, there are also local SST-atmosphere interactions that exhibit persistence. If such effects are strong and long-lasting, they can propagate out of the region where they began. The best known such example of this is the El Niño-Southern Oscillation. There are many examples of ENSO teleconnections – during El Niño, it tends to be dry in northeast Brazil and in southern Africa, with a poor monsoon season in India.

A teleconnection that is not as well understood but also appears to affect New Zealand is one from the Indian Ocean. Increased sea temperatures in the southern subtropics northwest of Australia in autumn and winter appear to be associated with enhanced cloudiness over Australia (the "north-west cloudband") in winter. Also in winter there are downstream anomalies in the Tasman-NZ region:

- higher pressures north of the North Island ,with anticyclonic northwesterlies over the South Island;
- above average temperatures in most regions;
- drier in the east of the North Island and wetter on the west coast of the South Island (*see figure*).

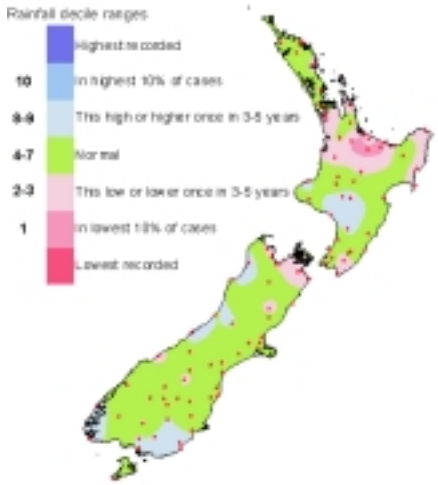
During winter 2002, Indian Ocean SSTs were above average and so was rainfall in the west and south of the South Island.



ABOVE: Tercile probabilities of winter rainfall in the west and south of the South Island for a cold (blue) and a warm (red) Indian Ocean. For a warmer Indian Ocean there is an increased chance of winter rainfall being in tercile 3 (above average).

2002 rainfall to date

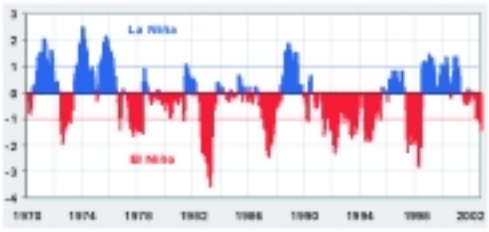
Most of New Zealand has received near normal rainfall. Parts of Waikato, Bay of Plenty, south Wairarapa, and Marlborough have been drier than average. Parts of Manawatu, Westland, Southland, and Otago have been wetter than average.



ABOVE: Total rainfalls for 1 January to 30 September 2002, shown according to decile rankings of all rainfalls for this period from 1972. Dots indicate observation sites used in the analysis.

Update on the SOI

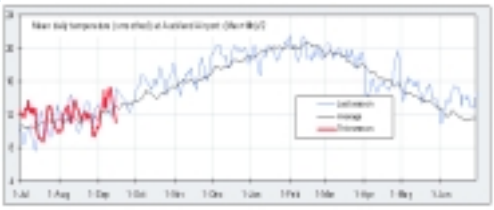
The mean Southern Oscillation Index (SOI) for September was –0.9, with the three month average now at –1.2. The present moderate El Niño is expected to be weaker than the 1997–98 event. Further general information on El Niño is available on the World Meteorological Organization web site, www.wmo.ch



ABOVE: The Southern Oscillation Index (SOI), a measure of changes in the atmospheric pressures across the Pacific, smoothed over three months. La Niña or El Niño typically have an observable effect on the New Zealand climate when there is a large departure of the SOI from zero.

Online climate graphics

Climate maps and line plots of climate site observations are updated each week on the Climate Now website at: www.niwa.co.nz/ncc/climatenow



The Climate Update is a monthly newsletter from NIWA's National Climate Centre for Monitoring and Prediction, and is published by NIWA, Private Bag 14901, Wellington. It is also available via the web. Comments and ideas are welcome. Please contact Alan Porteous, Editor.
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Cover picture:
Monsoon cloud build-up over the Western Ghats of India. Sea surface temperatures in the Indian Ocean affect the Indian monsoon directly, but *teleconnect* with New Zealand climate. *Photograph: Alan Porteous*