

# The Climate Update

A monthly summary of New Zealand's climate from the National Climate Centre for Monitoring and Prediction

## Rain brings relief to many dry areas

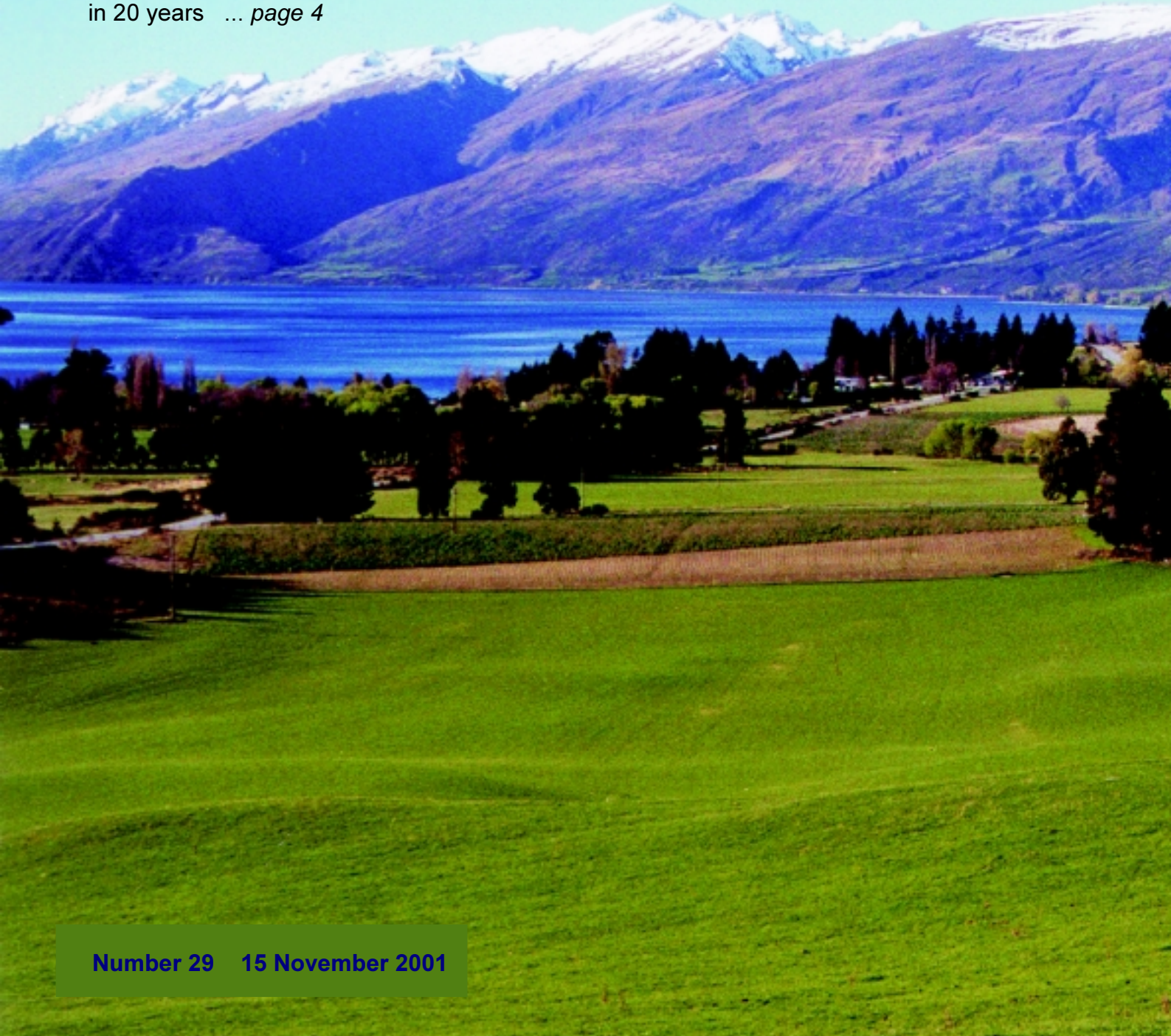
October rainfalls were high and well distributed – just what was needed in many of the drier parts of the country ... *page 2*

## Pleasant start to summer likely

Rainfall and air temperatures are expected to be average to above average in most places, signalling a good start to summer for agriculture ... *page 3*

## Low hydro lake inflows

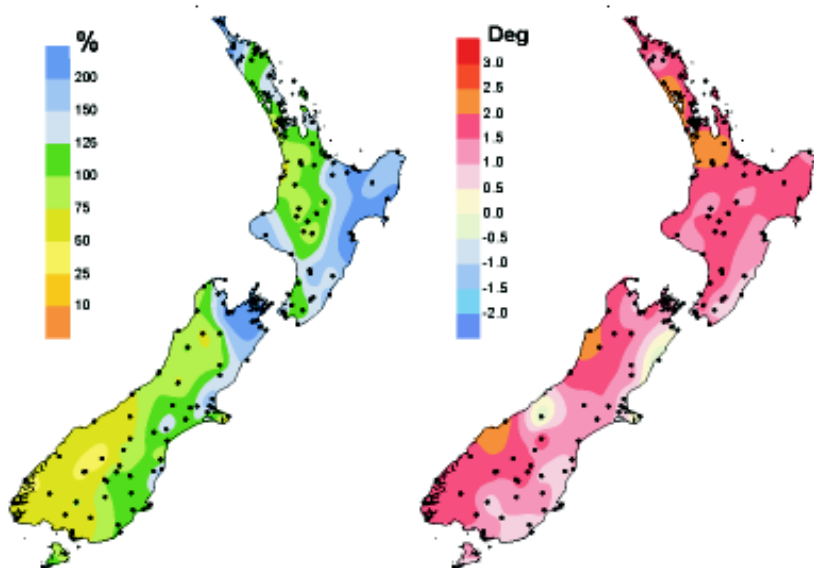
Total New Zealand hydro lake inflows for the year 2001 to the end of October have been the lowest in 20 years ... *page 4*



# New Zealand climate in October 2001

## Rainfall

## Mean air temperature



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

### Timely rainfall in dry areas

Most of the North Island, Nelson, Marlborough, and east coast areas of the South Island from Kaikoura to Otago received average or above average rainfall, with double the normal rainfall in some places. In contrast the Southern Lakes area recorded half its normal rainfall. It was also drier than average in south Westland, Fiordland, and much of Southland.

Much of October's rainfall was from more frequent depressions than usual passing over the North Island. Pressures were above average to the south of the Chatham Islands. These acted to reduce the normal spring westerly winds and produced more

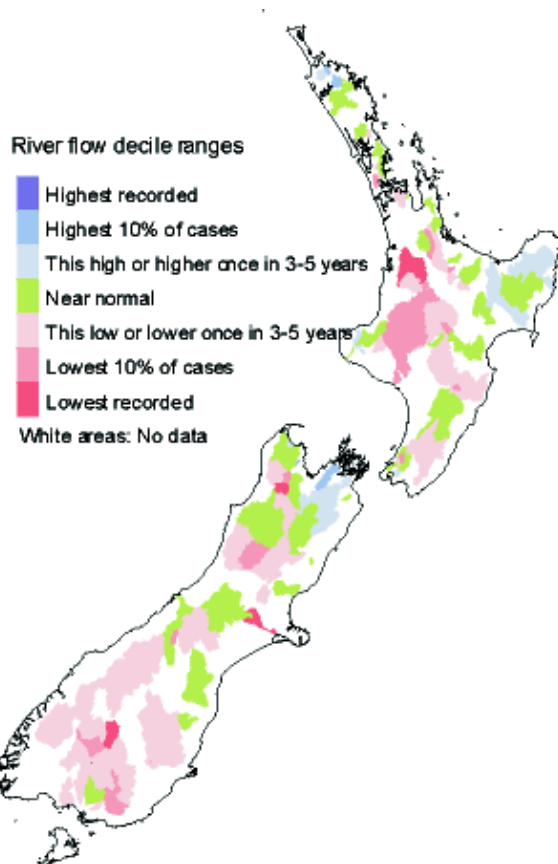
frequent and mild northerlies over northern New Zealand, and northeasterlies over the remainder of the country.

### Mild in many regions

The national average temperature for October of 13.4 °C was 1.3 °C above normal, making this the third warmest October on record since reliable measurements began in the 1860s. Warmer Octobers occurred in 1961 and 1893. Auckland and Hokitika had their warmest Octobers since records began in 1868 and 1866 respectively.

In contrast, in the northeast of the South Island, onshore northeasterlies kept mean temperatures close to average in north Canterbury, and up to 0.5 °C below average along the Kaikoura coast.

## River flows

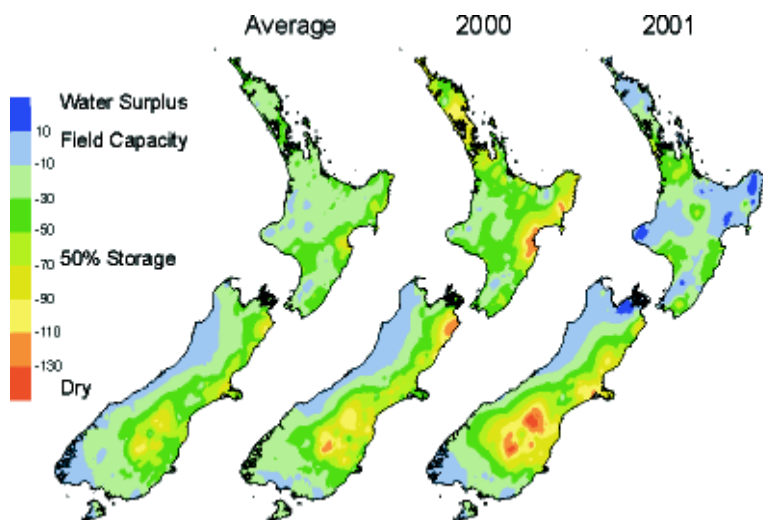


Streamflow decile ranges in October for rivers monitored in national and regional networks. The contributing catchment area above each monitoring location is shaded. NIWA field teams, regional and district councils, and hydro-power companies are thanked for providing this information.

### Flows improved in some areas

Following a relatively dry September, above average rainfalls in October lifted river flows in the far north, East Cape, around Taranaki, and in Marlborough to above normal. Elsewhere flows were mostly below normal. A few catchments (darkest shade of pink in the above map) had record low flows for the month.

## Soil moisture deficit on 31 October



### Soil moisture levels significantly improved

The high October rainfalls have resulted in soils reaching field capacity in areas of the North Island, Nelson, Marlborough, and Kaikoura. For many areas this was a significant improvement from the drought-like conditions of late September.

Canterbury soil moisture levels also improved during October, while in some parts of Otago, particularly inland, and in coastal areas north of Dunedin, rainfall barely kept up with evapotranspiration demand.

Southland soils had about average moisture levels for this time of year.

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

# Checkpoint

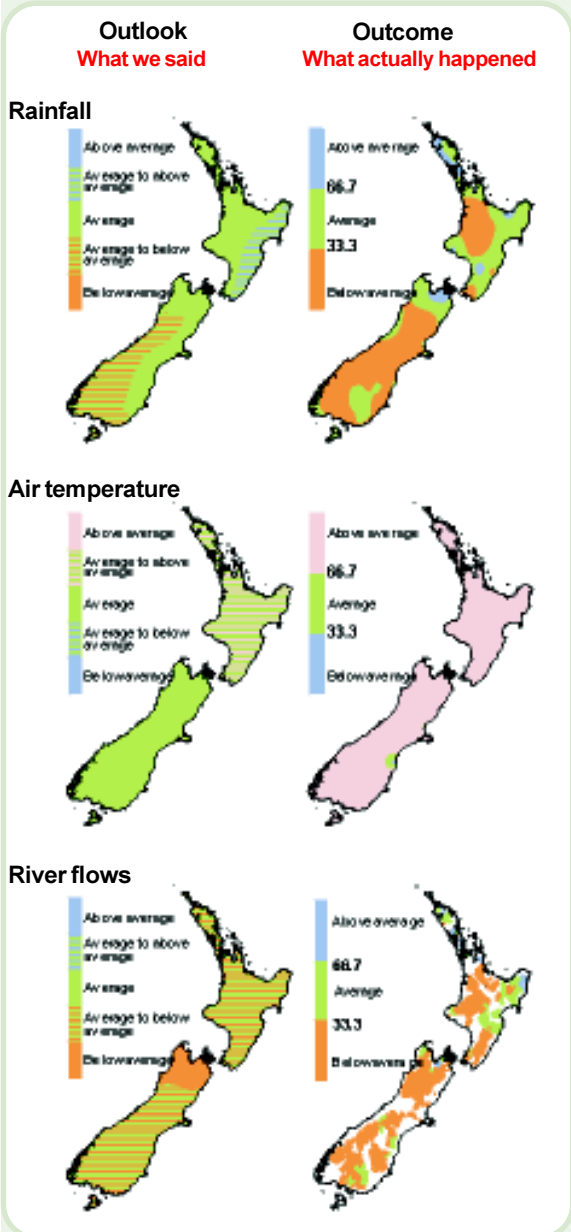
## August to October 2001

Atmospheric pressure patterns were higher than normal to the east of the Chatham Islands, resulting in a tendency for a more northeasterly air flow than normal over New Zealand.

Rainfall was lower than expected over much of the North Island, near expected in much of Nelson and Marlborough, and lower than predicted over much of the rest of the South Island.

Air temperatures were generally higher than expected.

River flows for August to October were higher than expected in Northland, Auckland, Coromandel, and East Cape. Most river flows in the northern South Island were below average as predicted. Elsewhere in the country, flows were average to below average as anticipated in the August to October outlook.



The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for these months. Terciles were obtained by dividing ranked August to October 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.

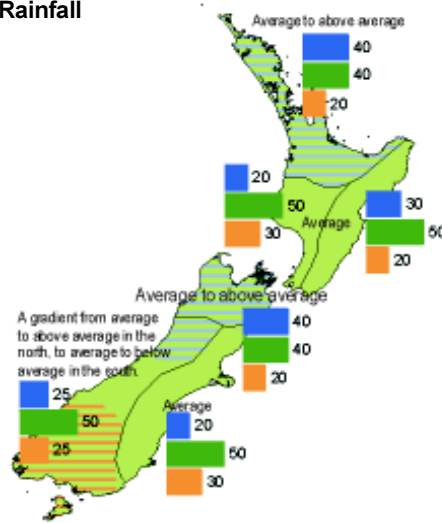
# Outlook

## November 2001 to January 2002

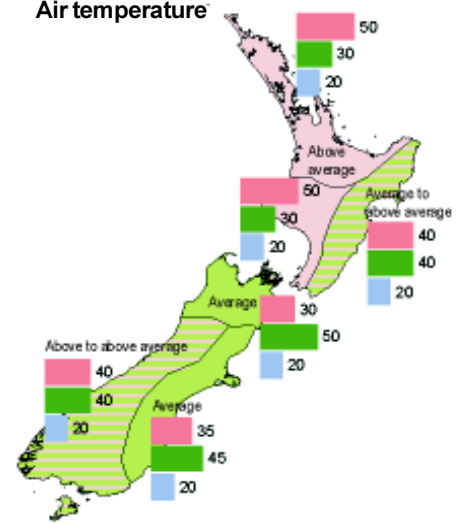
Ocean and atmospheric conditions in the Equatorial Pacific are near normal for this time of year, and sea surface temperatures are expected to remain near average through summer 2001–02. These features continue to indicate that a near-neutral state of the El Niño-Southern Oscillation will persist for the next few months.

Sea surface temperatures around New Zealand are likely to remain above average through the early summer, which will influence summer temperatures to some extent. Large scale pressure patterns are expected to favour anticyclones east of New Zealand, with more disturbed conditions in the Tasman Sea, and a tendency for weaker westerlies over much of the country. Temperatures are expected to be above average over the north and west of the North Island, but nearer average elsewhere. Rainfalls are expected to be average to above average in the north of both islands, and closer to average elsewhere. The present state of the tropical Pacific suggests a smaller risk than usual of an ex-tropical cyclone affecting northern New Zealand over the next three months.

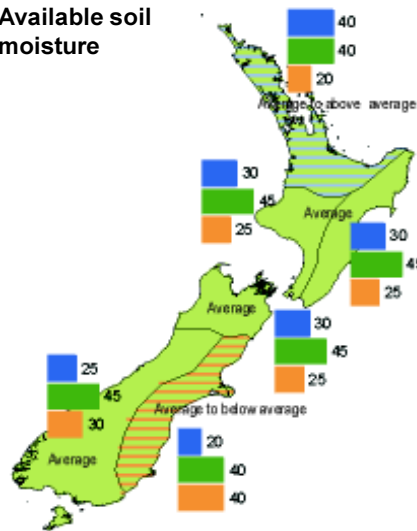
### Rainfall



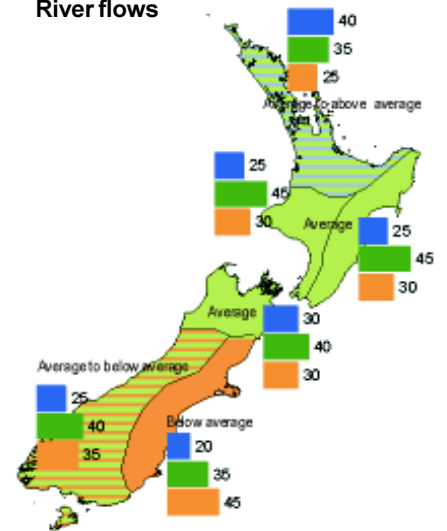
### Air temperature



### Available soil moisture



### River flows



### KEY to maps (Example interpretation)

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.

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

|               | No strong climate signal | Strong expectation of below average |
|---------------|--------------------------|-------------------------------------|
| Above average | 33                       | 10                                  |
| Average       | 33                       | 30                                  |
| Below average | 33                       | 60                                  |

# Backgrounder

## January to October total hydro lake inflow drought

National Climate Centre

Total New Zealand hydro lake inflows were lower than normal in October, adding another relatively dry month to a year so far of relatively low hydro lake recharge. Lakes right across the country have been affected, including the largest hydro lakes, Pukaki, Tekapo, and Taupo. Here we have selected the five driest years since 1979 and compared historical rainfall and inflow levels to the current year to show that 2001 has been exceptionally dry.

### Lake inflows: summer versus winter

The amount of water stored upstream of New Zealand hydro electric dams is dependent on inflows, mainly from regular rainfall with a smaller contribution from snow melt in summer. Taking all the dams in the country as a whole, the inflow is generally higher during summer. This is because 60% of the total New Zealand inflow is in the Southern Lakes area of the South Island, where the summer six months is the wetter time of year.

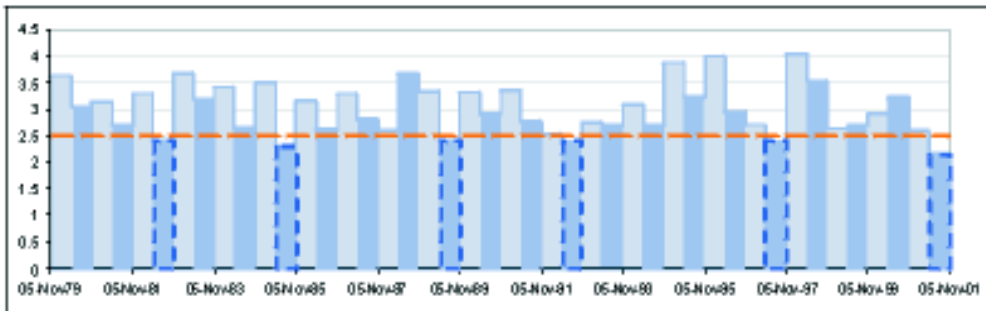
The figure below illustrates this. The vertical bars represent 6-month totals of hydro lake inflows, shown in terms of the energy potential going into storage (GigaWatts). The

bars show summer values from early November to early May (pale blue), and winter values from early May to early November (dark blue). Typically, the warm half-year inflows are larger than the inflows in the cooler part of the year.

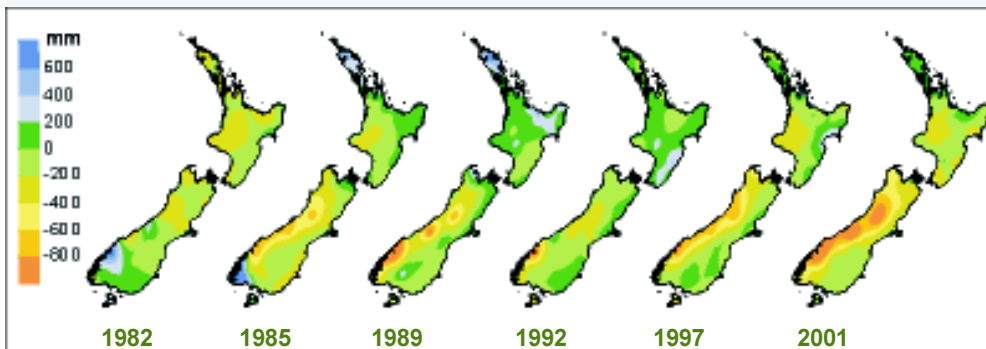
Inflows to New Zealand hydro lakes are consistently reliable; the year to year variation in the semi-annual inflows in the graph is relatively small.

### Relatively dry years

The inflow for the six months to 5 November 2001 was the lowest in the series shown (final bar highlighted by blue dots). Other low winter



ABOVE: New Zealand total 6-monthly inflows to hydro electric dams, 5 November 1979 to 5 November 2001. The vertical axis represents a rate of energy input in GigaWatts. Warm and cool season inflows are highlighted by light and dark blue shading respectively.



ABOVE: Rainfall departures from average for 1 January to 31 October, for the 6 years between 1980 and 2001 which had the lowest winter hydro lake inflows.

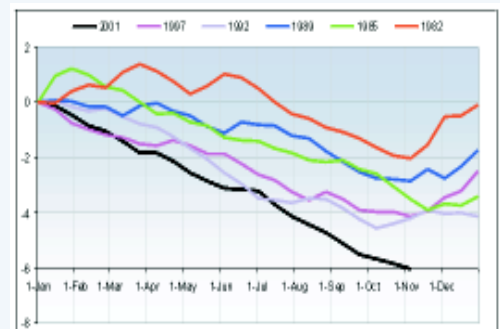
inflows (less than 2.5 GW, and similarly highlighted) have been used here as a basis for selecting relatively dry years from the historical record to compare with 2001.

### January to October rainfall

For each of the calendar years with a winter drought as identified above, the total January to October rainfall is shown in the six maps in the lower figure. Rainfall was below average over most of the South Island in all the years shown, and below average over much of the North Island in 1982, 1985, 1997, and 2001. The maps indicate that the dry conditions of 2001 have been more widespread and more severe than in the other years.

### Annual inflows

Total annual inflows to all hydro lakes for the selected years are shown below. From a starting point of zero deficit on 1 January, each line represents the accumulated deficit of total inflow below its seasonal mean. The vertical axis indicates water quantity in terms of stored energy in TeraWatt hours. The graph shows how far the inflows for 2001 (black line) are below those of the 5 other driest years of the past 22.



### Inflow monitoring

Hydro lake inflows are monitored in real time by flow gauges which are linked by telemetry to a web server that NIWA maintains for M-co, the administrator of the New Zealand Electricity Market (NZEM).

NZEM provides a free to air website containing a basic outline of electricity related hydrology at [www.comitfree.co.nz](http://www.comitfree.co.nz). Subscriptions to detailed information about hydro lake inflows and storage are available from M-co on freephone 0800 323 323.

## The Climate Update

Published by NIWA (The National Institute of Water and Atmospheric Research Ltd), PO Box 14-901, Wellington. Comments and ideas are welcome. Please contact:

Alan Porteous, Editor

E-mail: [ncc@niwa.co.nz](mailto:ncc@niwa.co.nz)

Telephone: 0-4-386 0300

Facsimile: 0-4-386 0341

For more information visit our [websites](http://www.niwa.co.nz):

The Climate Update: [www.niwa.co.nz/ncc/](http://www.niwa.co.nz/ncc/)

NIWA homepage: [www.niwa.co.nz](http://www.niwa.co.nz)

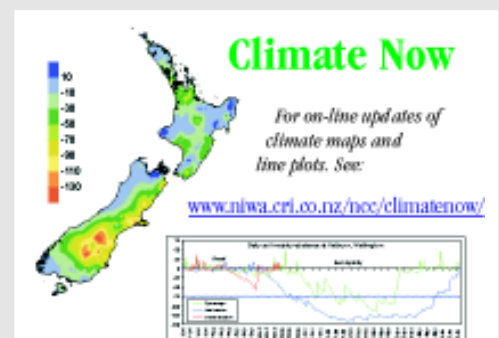
**NOTICE OF COPYRIGHT:** The contents of The Climate Update may not be copied or reproduced without prior consent of NIWA. Please contact the Editor.



### Cover picture:

The winter snow line above Lake Wakatipu near Kingston. Snow melt is an important part of summer inflows to the Southern Lakes.

Photograph: David Turner



**Climate Now**

For on-line updates of climate maps and time plots. See:

[www.niwa.cri.co.nz/ncc/climatenow/](http://www.niwa.cri.co.nz/ncc/climatenow/)