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NIWA
Taihoro Nukurangi

The Climate Update

Summer dry in places

Dry areas intensifying; near average temperatures for many places ... *page 2*

Outlook

Drier than normal in the east; average conditions in most other places; ... *page 3*

New Zealand's climate network

Locations and range of instruments ... *page 4*

New Zealand climate in December 2002

Air temperature and rainfall

Temporary relief for Marlborough

Rain in early December meant rainfall was above average for the first time in six months in central Marlborough, but below average rainfall continued in eastern regions from Northland to Otago. In contrast it was cloudier and wetter than usual in some western districts.

Temperatures near average

Most regions had near average temperatures but it was warmer than normal in Hawke's Bay and Wairarapa, and cooler than normal in Fiordland. The highest air temperature for the month was 36.5 °C, recorded at Darfield on 31 December, the highest air temperature on record there since records began in 1939.

The national average temperature of 15.6 °C was 0.1 °C below the 1961–1990 normal.

Sunny in the east

Sunshine hours were above average in many eastern regions from Hawke's Bay to Southland, but below average in the western North Island from Auckland to King Country.

Unseasonal snowfall

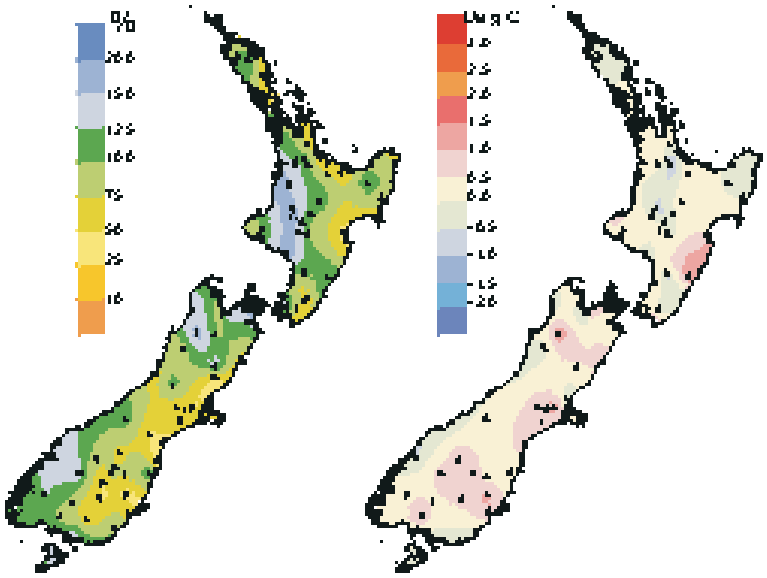
Snow lay at the Homer Tunnel on 26 December and visitors to Whakapapa at Christmas were skiing and snowboarding.

Fog caused chaos

A warm, humid, easterly airflow cooled over cold water through Cook Strait caused persistent fog which closed Wellington Airport for most of 2–4 December, disrupting travel for thousands. Wellington also experienced significant thunderstorms, with frequent lightning, for almost an hour just after midnight on the 8th.

Rainfall

Mean air temperature



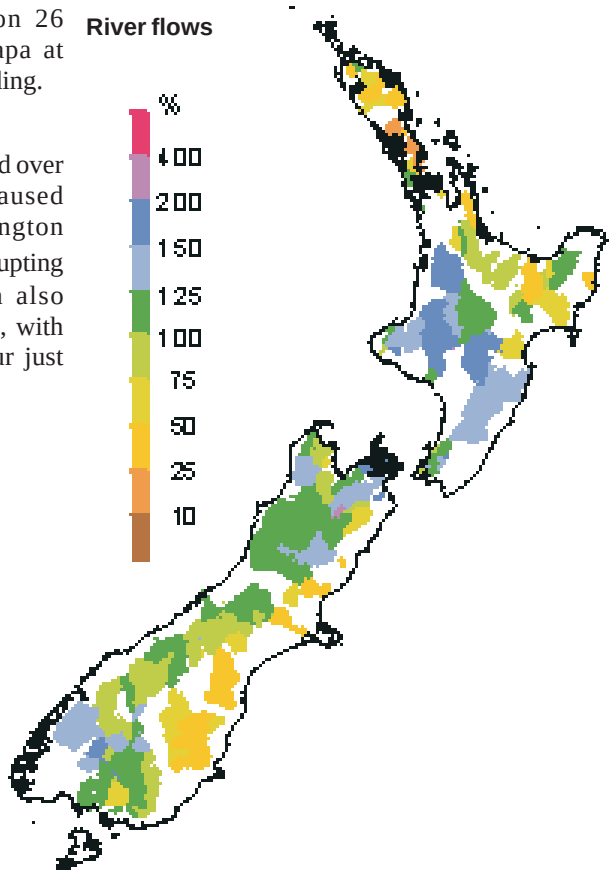
ABOVE: Percentage of average rainfall (left) and difference from the average air temperature in degrees Celsius (right). Dots indicate recording sites.

River and streamflows

December streamflows lower in North and East

December flows were low in the upper North Island, South Canterbury, and Central Otago. They were mostly normal or above normal elsewhere.

River flows



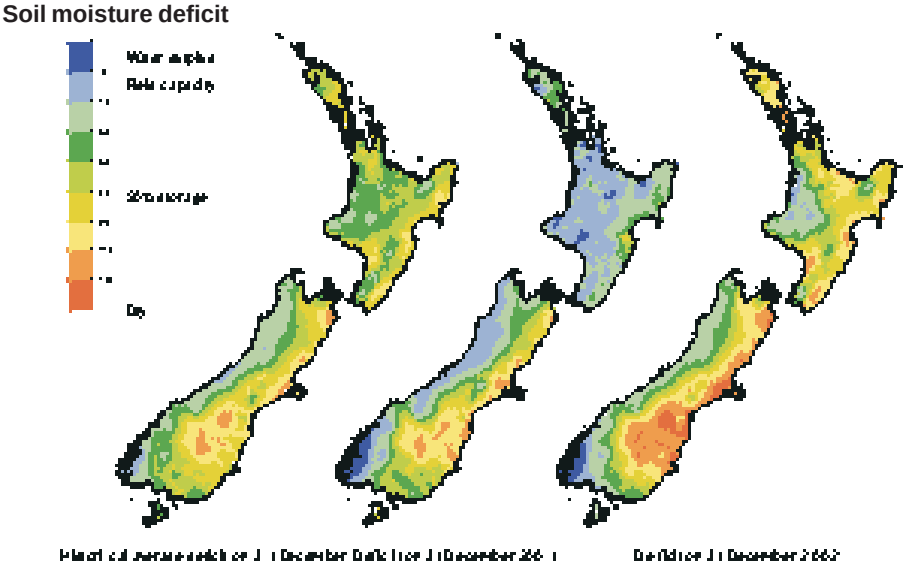
ABOVE: Percentage of average December streamflows for rivers monitored in national and regional networks. The contributing catchment area above each monitoring location is shaded. NIWA field teams, regional and district councils, and hydro-power companies are thanked for providing this information.

Soil moisture

Marlborough had temporary relief from early December rainfall but significant soil moisture deficits were apparent there again from mid month, and similar dry conditions have spread throughout most of Otago and Canterbury.

Soil moisture was well below average for the time of year in eastern Northland, coastal Bay of Plenty, Gisborne, Hawke's Bay, Manawatu, and parts of Wairarapa.

Soil moisture deficit



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

Checkpoint

October to December 2002

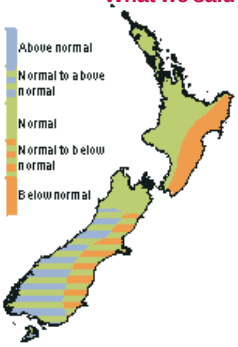
Rainfall was as predicted for the South Island, apart from Nelson-Marlborough which was drier than expected. Northland and Bay of Plenty were also drier than expected, and Hawke's Bay and East Cape received more rain than predicted.

Air temperatures were generally lower than expected, apart from Marlborough where they were near average, and western South Island regions where below average temperatures were as predicted.

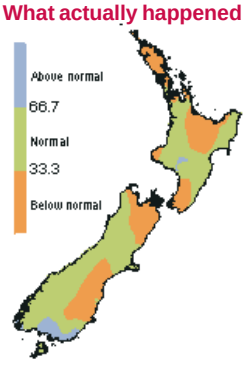
River flows were much as expected over most of the country. They were lower than predicted in the west and south of the South Island.

Rainfall

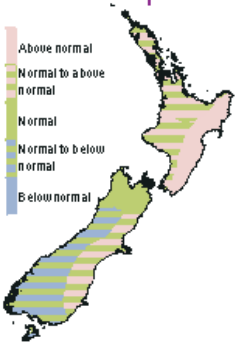
Outlook What we said

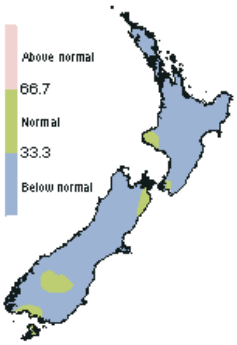


Outcome What actually happened

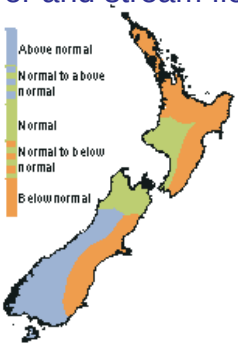


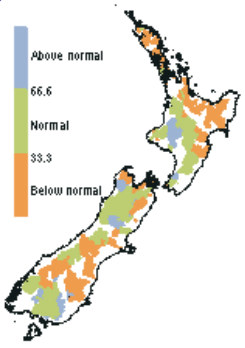
Mean air temperature





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 October to December 2002. Terciles were obtained by dividing ranked October to December 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

January to March 2003

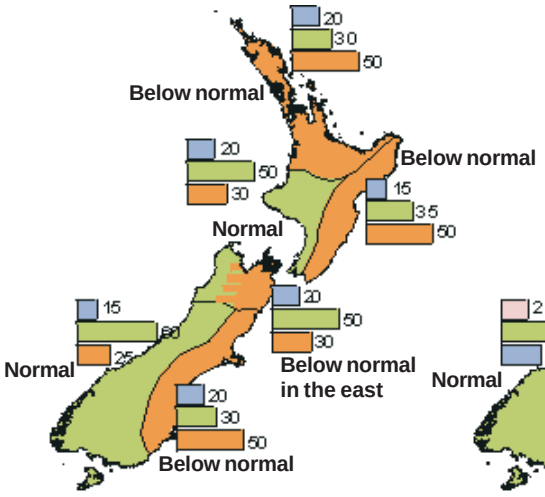
The enhanced cyclonic activity across southern New Zealand with episodes of stronger than normal westerly or southwesterly winds is expected to continue to influence late summer weather in New Zealand. The moderate El Niño event in the tropical Pacific is expected to last into autumn 2003, and should wane with conditions easing back to neutral by the end of autumn. It should remain weaker than the 1997–98 event. El Niño conditions imply a slightly less than normal risk of a tropical cyclone affecting New Zealand during the late summer.

Temperatures are likely to be near normal over much of the country, and normal or above normal in all eastern areas.

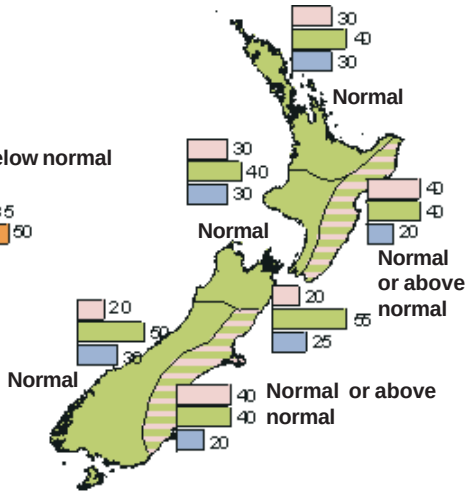
Below average rainfall is expected in the north and east of the North Island, and east of the South Island. Average rainfall is likely elsewhere.

Below normal soil moisture levels and river flows are expected to persist in the north and east of the North Island and the east of the South Island.

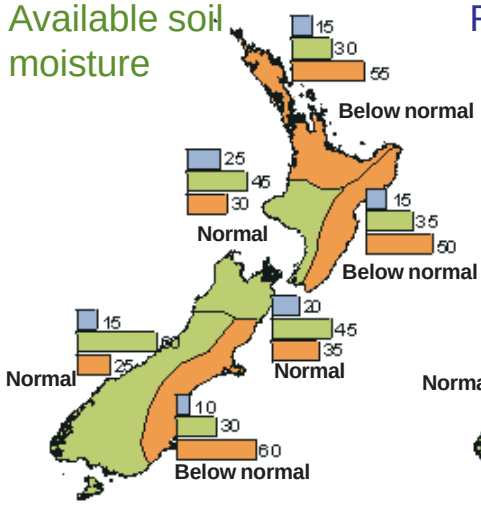
Rainfall



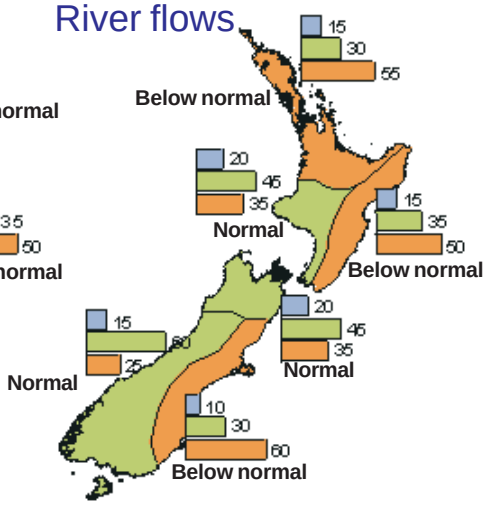
Mean air temperature



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

Climate data network

Instrument sites where a range of meteorological parameters are measured are often referred to as climate stations. In addition to rainfall and air temperature, many aspects of the climate that influence our lives are measured. The table on the right gives a list of these. Most climate stations record only a selection of these parameters.

New Zealand's climate network dates back to 1841 but records were sporadic until the 1860s. In 1867 there were 13 observatories reporting to Dr James Hector who, among other duties at The New Zealand Institute, was *Director of Meteorological Stations and Officers in charge of stations in the various Provinces*. Today there are more than 200 climate stations from Raoul Island to Scott Base. The National Climate Database also includes data from many islands in the South Pacific.

Table of meteorological parameters

- Rainfall – total, intensity
- Air temperature
- Ground temperature
- Soil temperature at 5, 10, 20, 30, 100 cm
- Radiation
- Wind – gusts, direction and speed
- Sunshine hours
- Evaporation
- Relative humidity
- Barometric pressure

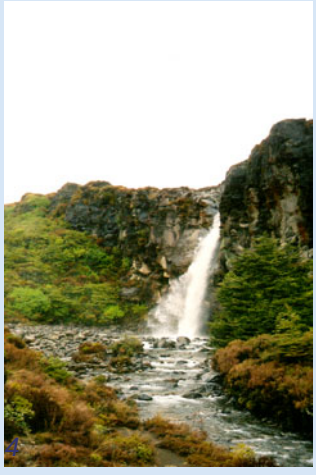
Since the late 1860s responsibility for meteorological observations has been under the control of seven different government departments, with the Royal New Zealand Air Force taking responsibility during World War 2. In 1992 MetService and NIWA were formed. Currently, observations are made by the former to assist with weather forecasting, and by the latter for climate research. MetService observations are archived in NIWA's climate database along with those observations made by many private individuals and businesses, other crown research institutes, and government departments.

As well as the open stations, the database includes observations of several hundred now closed stations. These figures are used to identify climate variations and cyclical trends, such as the influence of the Southern Oscillation on New Zealand's weather.

The likelihood of successful diversification of the agriculture and horticulture sectors into new livestock farming and crop production is increased with detailed knowledge of climate patterns.

Knowledge of patterns of rain, wind, and sunshine hours or solar radiation allow the development of renewable sources of energy like hydro-electricity, wind farms, and solar energy powered water heating.

The photograph above shows a climate station at Clyde, Central Otago. Photographer: Steve Le Gal.



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Email: ncc@niwa.co.nz **Phone:** 0-4-386 0300 **Fax:** 0-4-386 0341
Visit our website: www.niwa.co.nz/ncc

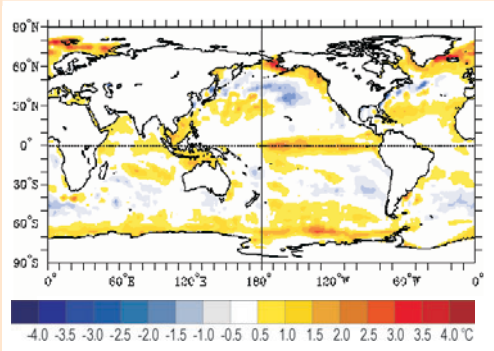
Cover picture:
Taranaki Falls, Whakapapa River, on the slopes of Mt Ruapehu. The climate of Tongariro National Park has a significant impact on North Island river flows.
Photograph: Alan Porteous

Global setting

Pacific ENSO signal

The orange-yellow shading along the Equator, stretching west from Ecuador, is a typical 'footprint' of the El Niño phase of the El Niño–Southern Oscillation. The shading indicates that sea surface temperatures in the area are 1–2 °C or more above normal.

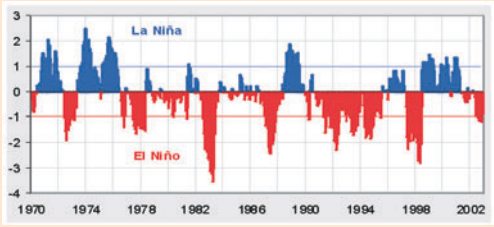
An unusual feature of the current situtation is the higher than normal sea surface temperatures around the Antarctic.



ABOVE: Mean sea surface temperature departures from normal for the period from 8 December 2002 to 4 January 2003. Image from NOAA web site.

Update on the SOI

The mean Southern Oscillation Index (SOI) for December was -1.3, with the three month average now -1.0. The present moderate El Niño is expected to last through summer, and is likely 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