Number 30 15 December 2001

NIWA
Taihoro Nukurangi

The Climate Update

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

Heavy rainfall events a feature of November

Heavy rainfall events in many parts of New Zealand contributed to a generally wet month ... *page 2*

Generally warm summer expected

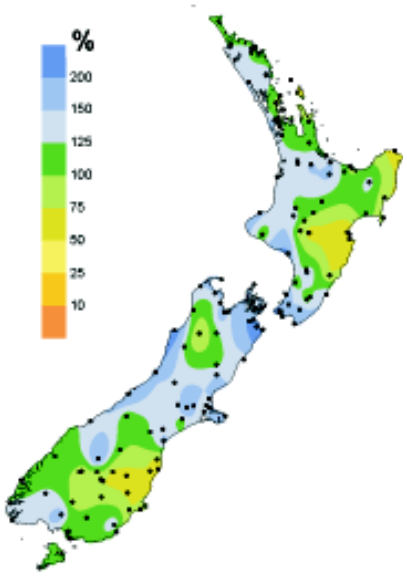
Summer air temperatures are likely to be average or above over much of the country ... *page 3*

Sunburn season ahead

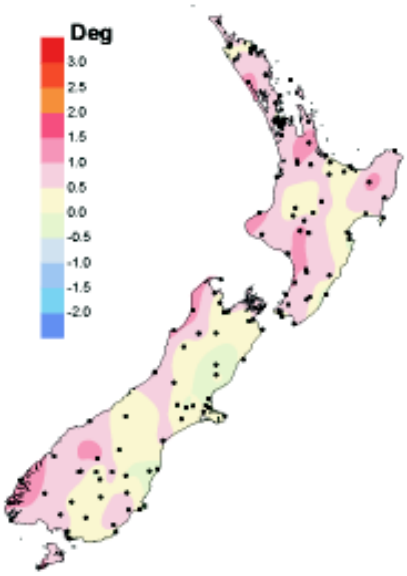
This summer's ultraviolet radiation levels will probably be as high as ever ... *page 4*

New Zealand climate in November 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.

November characterised by high rainfall events

November was generally wet, and characterised by some heavy rainfall events in many parts of New Zealand. The wettest days were: 6 November, up to 85 mm thoughout Northland; 13 November, up to 65 mm over the central North Island; 18 November, 200 mm in Fiordland; 22 November, 50 mm in south Auckland and western Bay of Plenty, and 50–100 mm in Wellington and the Hutt Valley. Marlborough recorded double the normal monthly rainfall for the second month in a row.

A few areas missed the wet conditions, notably parts of Hawke's Bay and north Otago, where rainfall was below average.

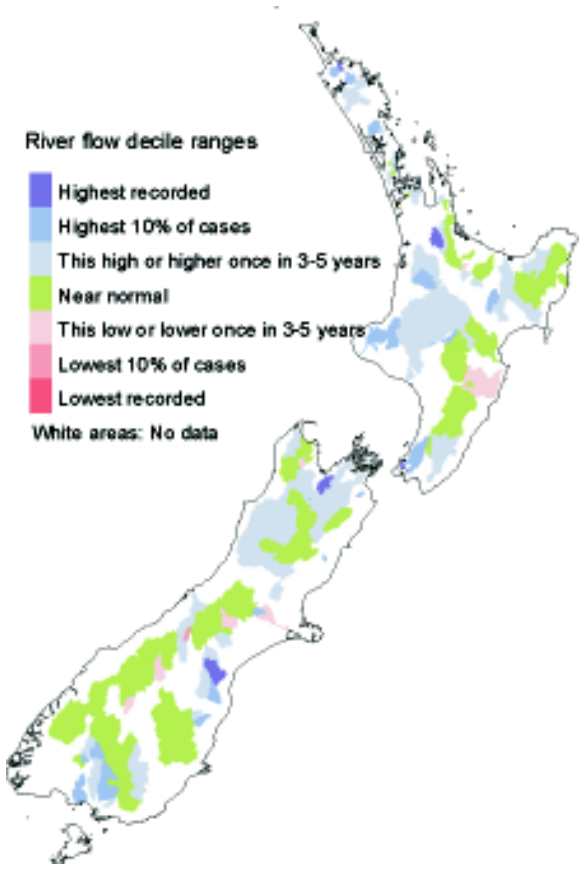
Air temperatures were just above normal over much of the country, although patches of the east coast were a little cooler than usual for November as a whole. The national average temperature of 14.1 °C was 0.3 °C above the historical mean for the month.

Cloudy and northeasterly

Radiation and sunshine levels were lower than normal over most of the country. Moist, northeasterly air flow over New Zealand was a common feature of the month, with a lower than normal frequency of spring westerly winds.

Wellington preserved its windy reputation with storm force winds gusting to 198 km/h (107 knots) at Baring Head on 17 November. Four tornadoes were sighted near Whakatane on 4 November.

River flows

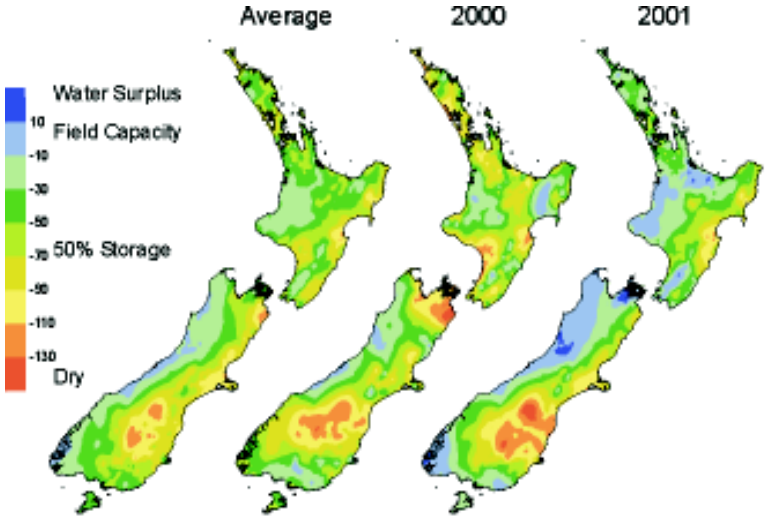


Streamflow decile ranges in November for rivers monitored in national and regional networks. The contributing catchment area above each monitoring location is shaded. NIWA field teams, regional and district councils, and hydro-power companies are thanked for providing this information.

Flows generally higher than in October

Flows were above normal in the north and west of the North Island, and the north, east, and south of the South Island. Flows were normal for much of the west coast of the South Island and normal to below normal for the east coast of the North Island. South Island hydro-lake inflows were near normal, and river flows into Lake Taupo were above normal.

Soil moisture deficit on 30 November



Soil moisture levels generally up on average

Soils in most regions of the North Island, and in the north, west, and south of the South Island, held generally high moisture levels at the end of November. The main point of contrast with last year at this time is in Marlborough, where soils were extremely dry a year ago.

Top soils in Canterbury received welcome moisture gains during the month, although total root zone storage was only average at the end of the month.

Total root zone soil moisture in parts of south Canterbury and Otago remained lower than average, although moisture in the top horizon aided high spring pasture growth in many areas.

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

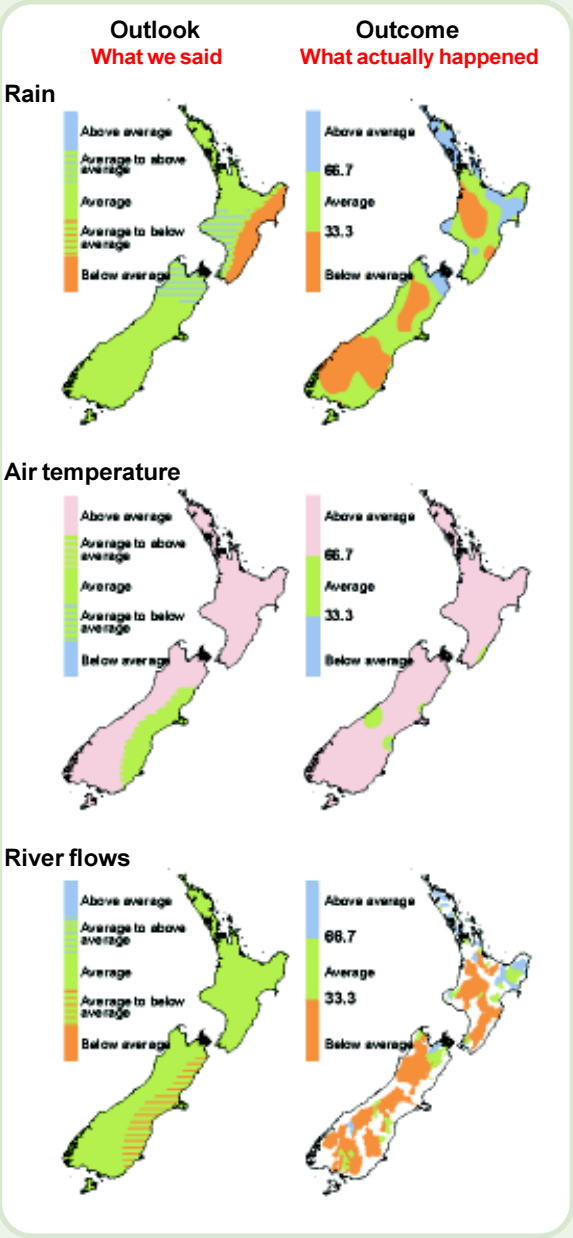
Checkpoint

September to November 2001

Rainfall in some central regions of New Zealand was average to above average as expected. The north and east of the North Island was wetter than forecast, while some central and southern areas of the South Island were drier than anticipated.

Air temperatures in most places were above average as was expected, although temperatures were higher than forecast in much of the east of the South Island.

Normal to below normal river flows were correctly forecast for the east of both islands. Flows were higher than expected in East Cape, Northland, and western Marlborough, and lower than forecast elsewhere.



The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for September to November 2001. Terciles were obtained by dividing ranked September to November 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 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.

Outlook

December 2001 to February 2002

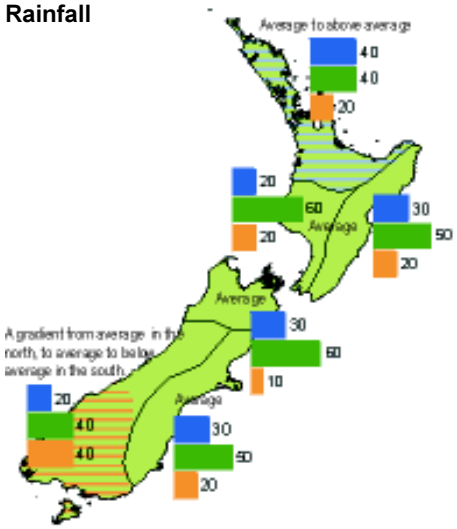
The El Niño-Southern Oscillation is in near neutral phase at present, with no major changes in this situation expected over the next three months. Sea-surface temperatures near New Zealand should remain above average through the summer, especially east of the country.

Large scale pressure patterns are likely to favour the formation of anticyclones to the east of New Zealand, accompanied by enhanced depression activity over the north Tasman Sea, and a tendency for weaker westerlies over much of the country.

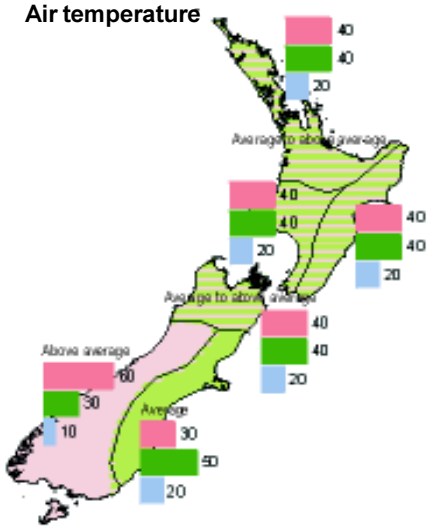
Temperatures are expected to be average to above average in all districts. Rainfalls are expected to be near average in many places, but tending towards above average in the northern North Island, and towards below average in the southwest of the South Island.

There is a lower than average risk of an ex-tropical cyclone affecting northern New Zealand over the next three months.

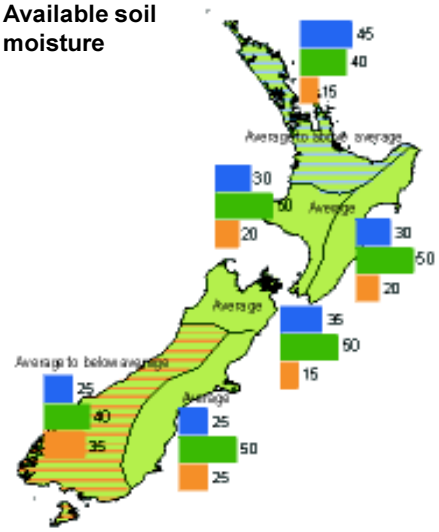
Rainfall



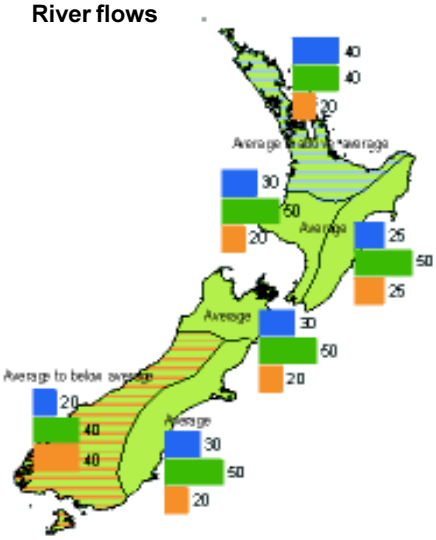
Air temperature



Available soil moisture



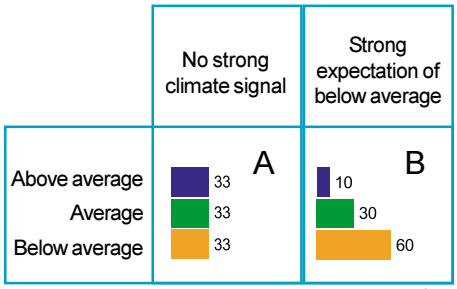
River flows



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).



Summer ultraviolet (UV) radiation heading for another high

National Climate Centre

Each summer in the Southern Hemisphere, ozone-depleted air spreads out from the Antarctic region and extends over much of New Zealand. Less ozone in our upper atmosphere, about 10–50 km above the Earth, means that more of the UV radiation that is present in sunlight will reach us, heightening the risk of sunburn and other biological and chemical damage. This summer's UV radiation levels may be as high as ever.

The ozone hole: boom and burst

During the Southern Hemisphere winter, cold, relatively stable conditions develop above the South Pole region, allowing the formation of stratospheric clouds. On the surface of these clouds, when the sun returns to Antarctic skies towards the end of spring, chemical reactions involving chlorine compounds destroy ozone.

This ozone depleted air is initially confined to the Antarctic by the action of the strong winds—known as the polar vortex—that blow around the polar region. This mass of air, where ozone is thinner than it is elsewhere in the world, is commonly called the ozone "hole".

During late spring and summer, the polar air warms up and starts to mix with air in mid latitude regions, including above New Zealand (below). This has the effect of diluting levels of available ozone over New Zealand, and allows more UV radiation to penetrate the atmosphere.

Annual event since late 1970s

The Antarctic ozone hole has developed each year since the late 1970s. It was at that time that human induced damage to the Earth's protective ozone layer started to become particularly noticable. The main culprit was the widespread use of chlorofluorocarbons (CFCs) since the 1940s. These compounds release chlorine atoms in the high atmosphere, which then react with the ozone and are its main destroying agent.

International agreements are now in place to minimise the use of some of these potentially ozone-destroying chemicals. As a result of these measures, the ozone layer should gradually recover to what it was like before human induced changes took place. However, this process will probably take many decades, and in the meantime we have to live with the higher than usual summer UV risk.

UV danger this summer

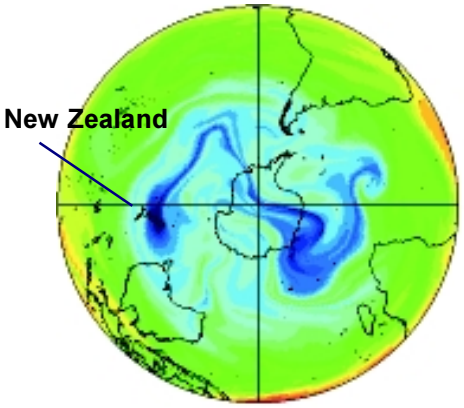
The signs are that the UV danger this coming summer is likely to be similar to last year. This is because ozone levels over New Zealand so far this year have been similar to last year. However, the break up of the polar vortex this year is expected in mid December, about a month later than last year, and this will increase the risk of low ozone and high UV over the summer.

Background UV information and daily forecasts of UV radiation levels can be found on a web site hosted by NIWA on behalf of the Ministry for the Environment. See the web address below.

http://katipo.niwa.cri.nz/lauder/

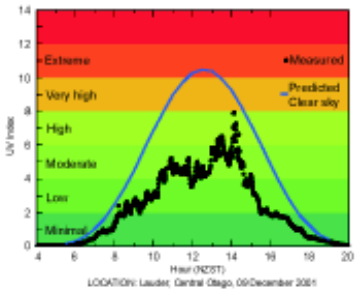
The UV Index

- A standardised scale for reporting the level of UV radiation risk to the public.
- Higher values correspond to higher radiation intensities. Index values exceeding 10 (0.25 W/m^2 of "sunburning" UV) are considered to be extreme.
- A UV Index of 10 corresponds to a 'burn time' of about 14 minutes.
- Risk levels of above 8 are common between about 11 am and 3 pm during summer in New Zealand, and can rise to 14 in the north of the country.

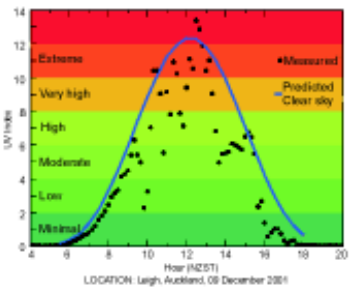


ABOVE: The Antarctic polar vortex, where the ozone hole is formed in winter, showing the process of summer break up. Blue 'swirls' of ozone depleted air spread out from the Antarctic over the Southern Hemisphere. This image, for 26 December 1998, was produced by Brian Conner and Jelena Ajtic at NIWA, Lauder.

Central Otago



Auckland



ABOVE: UV Index for Lauder, Central Otago (left), and Leigh, north of Auckland (right), for 9 December 2001. The plots show the predicted clear sky radiation for this time of year (blue curve) and the measured values on this date (black dots). The Lauder observations show variable UV radiation levels during the day due to the blocking of radiation by passing thick clouds. The data at Leigh show partial blocking at times but generally high radiation during the middle part of the day.

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:
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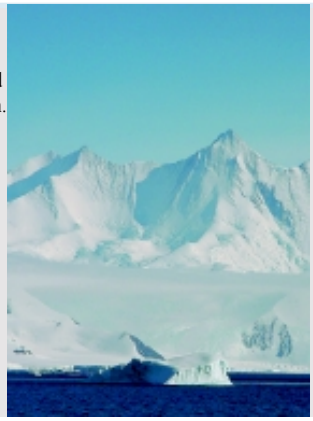
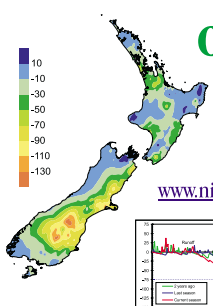


Cover picture:
Clear sky above Mt Herschel (3,335 mts), Antarctica. The extreme cold of the stratospheric air over the polar region aids the breakdown of ozone.

Photograph:
John Mitchell



Climate Now

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

www.niwa.cri.co.nz/ncc/climatenow/