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NIWA
Taihoro Nukurangi

The Climate Update

A monthly newsletter from the National Climate Centre

December – very warm everywhere. Rain in the central North Island and in Southland brought some relief for water resources, but river levels in western, central, and eastern South Island areas remained below normal.

Outlook for January to March – near normal rainfall with above average temperatures.

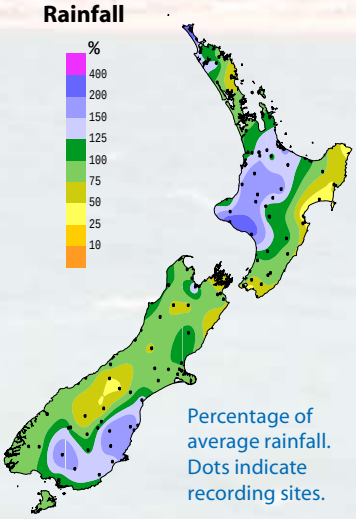
New Zealand climate in December 2005

Above average December rainfall was recorded in many regions, particularly in the western North Island and southern South Island. Gisborne, Hawke's Bay, Central Otago, and Marlborough had below average rainfall.

Mean temperatures everywhere were at least 1.5 °C above average, and more than 3.0 °C above average in parts of Otago and Southland.

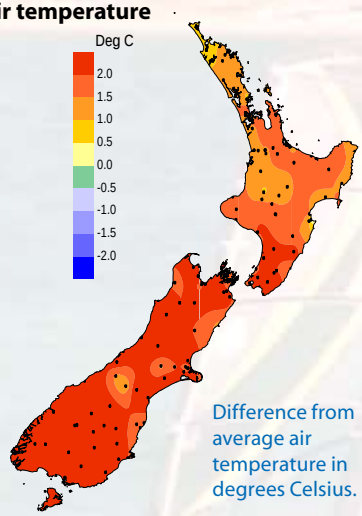
For more information on the climate in December, visit the climate summaries page at www.niwascience.co.nz/ncc/cs/mclimsum_05_12

Rainfall



Percentage of average rainfall. Dots indicate recording sites.

Air temperature

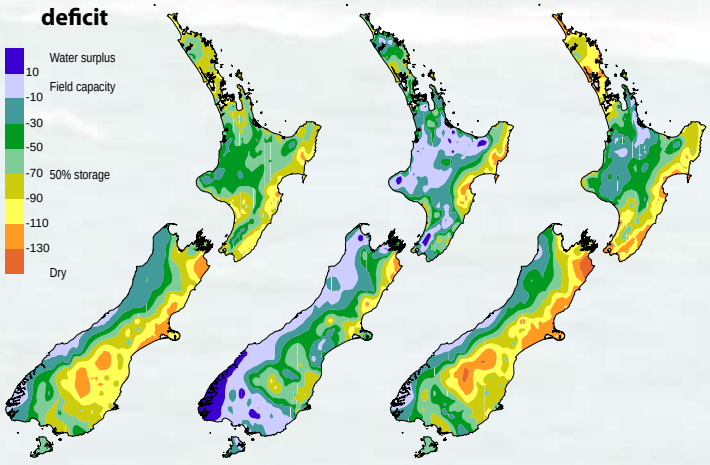


Difference from average air temperature in degrees Celsius.

Significant soil moisture deficits

By the end of December, significant soil moisture deficits had developed in eastern regions from Hawke's Bay to Otago, and also in Kapiti, Wellington, and Nelson. These deficits were severe in parts of Marlborough and Central Otago.

Soil moisture deficit



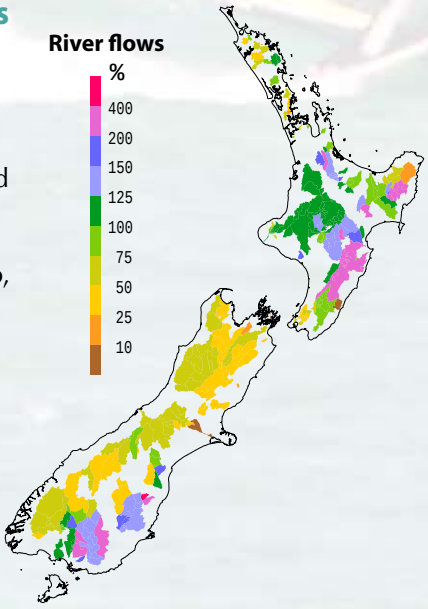
Historical average deficit on 31 December | Deficit on 31 December 2004 | Deficit on 31 December 2005

Water balance in the pasture root zone for an average soil type where the available water capacity is taken to be 150 mm.

North Island river flows increase

In December, North Island flows were average or high, apart from the Wellington region where they remained low. Stream flows were higher than normal in Southland and South Otago, but very low elsewhere in the South Island.

River flows



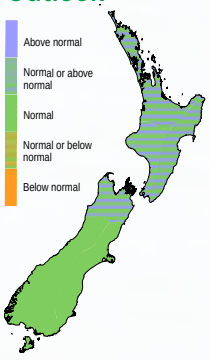
Percentage of average December river and stream flows at monitored catchments. NIWA field teams, regional and district councils, and hydro-power companies are thanked for providing data.

October to December: the climate we predicted and what happened

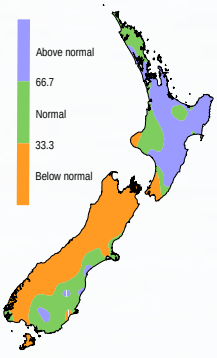
Rainfall

Rainfall was as predicted in most regions but was drier than expected in the north and west of the South Island and the southwest of the North Island.

Outlook



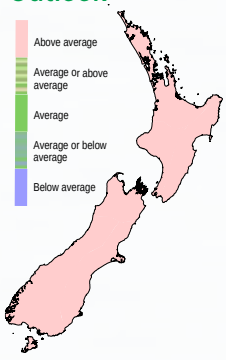
Outcome



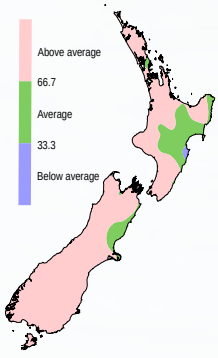
Air temperature

The north and east of the North Island were cooler than expected. Other regions were above average as predicted.

Outlook



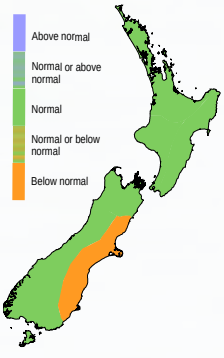
Outcome



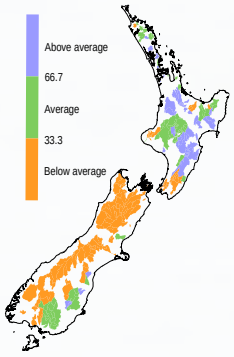
River flows

North Island stream flows were normal or high. South Island flows were low or very low, apart from average flows in Southland/Otago, after December rain.

Outlook



Outcome



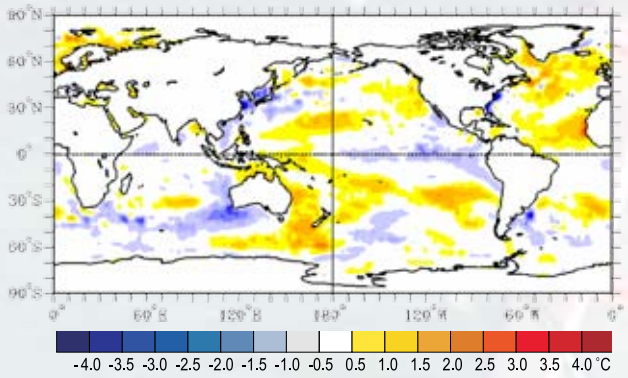
The three outcome maps give the tercile rankings of the rainfall totals, mean air temperatures, and mean river flows that eventuated from October to December, in comparison with the forecast conditions.

As an approximate guide, middle tercile rainfalls typically range from 80 to 115% of the historical normal, and middle tercile temperatures range about the average by plus or minus 0.5 °C.

Global setting and climate outlook

El Niño-Southern Oscillation remains neutral

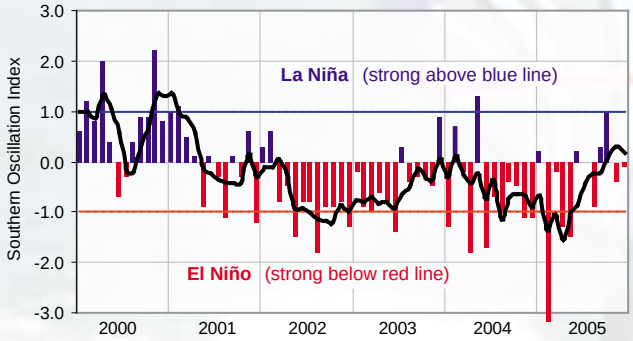
The tropical Pacific Ocean is in a neutral state with some features of weak La Niña conditions. Neutral conditions are expected to prevail into autumn 2006.



Difference from average global sea surface temperatures for December 2005. Map courtesy of NOAA Climate Diagnostics Center.

The SOI was near neutral in December (-0.1), with the 3-month October to December average at +0.2. The equatorial trade winds have strengthened near the Date Line.

Normal cyclone activity is expected through to April 2006. For New Zealand, this means a 70% chance of a cyclone passing near the country, with Northland and Gisborne being most at risk. The risk is greatest after the end of January.

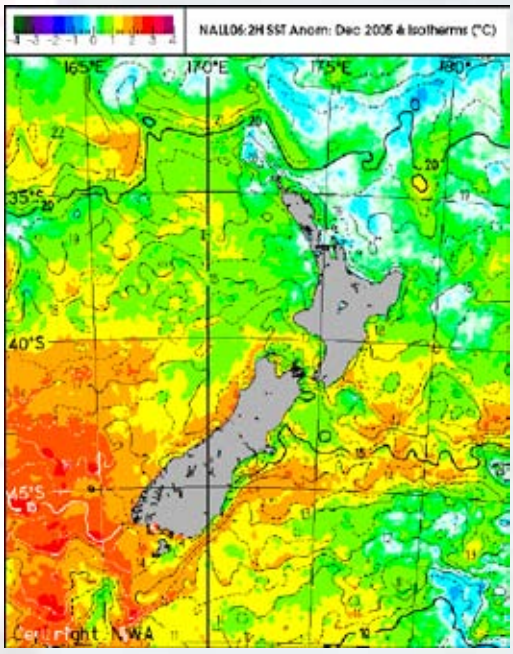


Monthly values of the Southern Oscillation Index (SOI), a measure of the changes in atmospheric pressure across the Pacific, and the 3-month mean (black line).

Sea surface temperatures (SST) around New Zealand

The New Zealand average difference from the historical normal SST was about +0.8 °C for December, and +0.6 °C for the October to December average. Surface waters remained warmer than normal over the Tasman Sea and around the New Zealand coast.

Sea surface temperatures around New Zealand are likely to remain above average through to March 2006.

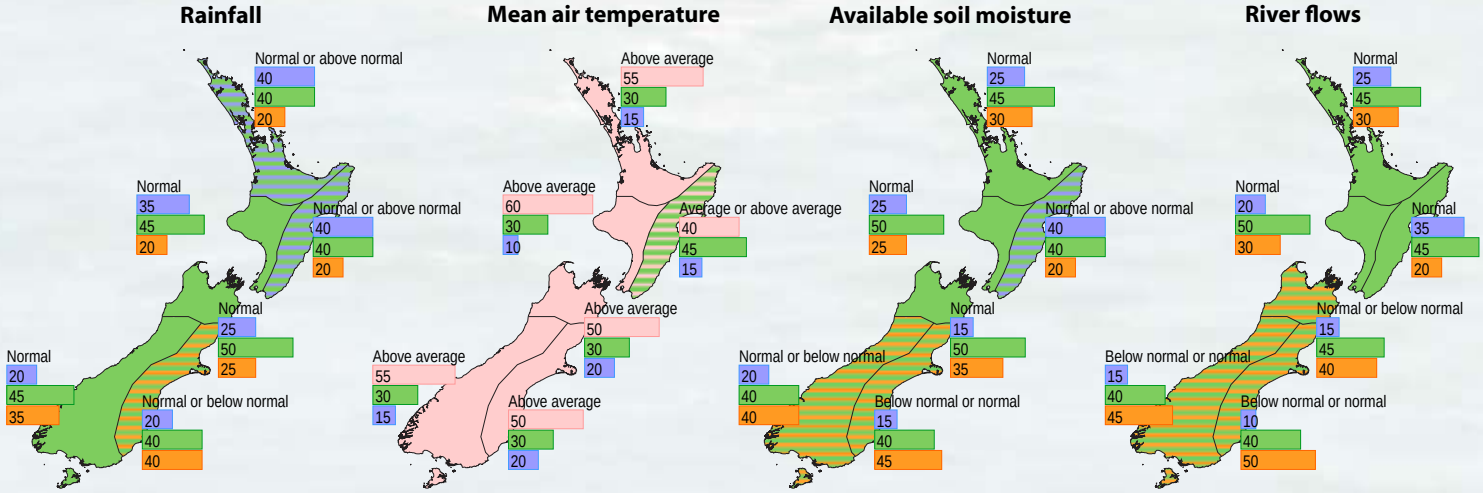


Difference from normal December surface temperatures in the seas around New Zealand.

Outlook for January to March 2006

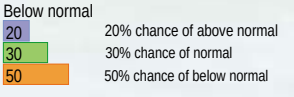
Circulation patterns for late summer, January to March, favour slightly lower than normal pressures to the northeast. Air temperatures are expected to be above average in most regions of New Zealand.

Rainfalls are likely to be normal or above normal in the north and east of the North Island, normal or below normal in the east of the South Island, and near normal elsewhere. Soil moisture levels and river flows are expected to be normal for the North Island, and normal or below normal in the South Island.



How to interpret these maps

In the example here the climate models suggest that below average conditions are likely (50% chance), but, given the variable nature of the climate, the chance of normal or above normal conditions is also shown (30% and 20% respectively).

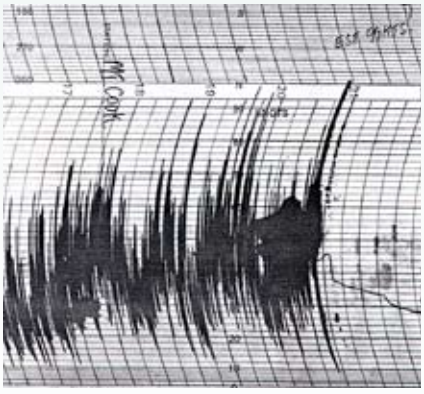


Recordings of wild winds need careful interpretation

Obtaining reliable measurements, and correct interpretation of extreme winds, are challenges in understanding the strength of New Zealand's wild winds.

Until the 1990s, wind data were mostly read from the anemograms of Munro anemometers and entered into a computer through punch cards. The mean speeds were the average over the 10 minutes before each hour.

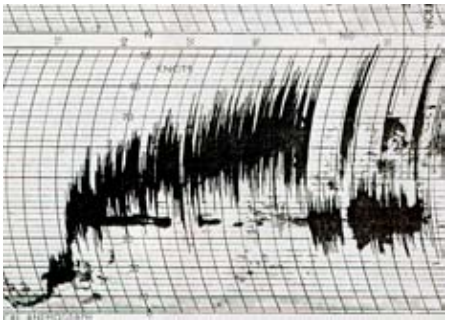
The anemograms have mainly been preserved, although interpreting an individual event is a laborious process and in some cases unsuccessful. The charts contain a wealth of information that is not easily preserved except as a visual record.



Anemogram (chart from anemograph) for Mt Cook Airport on part of 3 October 1981. Note curved speed scale, and horizontal hour scale within blank band near top of chart.

For example, the anemogram on the right is for Mt Cook airport on 3 October 1981. This was a day with widespread high winds, and both Lauder and Queenstown airport had record speeds. Features on the anemogram include an hourly time scale, a speed scale, blotches of ink that result from shaking of the instrument, and a note that the estimated maximum gust was 99 knots. Recording failed after a power cut stopped the anemograph, but the pen continued to run over the chart because the speed trace was driven by a small generator at the anemometer cups. An upper stop prevented the pen trace from exceeding 99 knots, and so the maximum gust was likely to have been more than 99 knots.

If a wind as wild as that one occurred in a built up area today, there would almost certainly be a lot of damage to structures.



Anemogram for Wellington Airport on part of 10 april 1968.

The trace on the left shows the wind at Wellington Airport on the morning of 10 April 1968 as the Wahine storm developed. The speed trace is less erratic in this case, and the gust excursions are less severe. The dips in the speed trace after 7 a.m. are not a wind effect, but are because the staff on duty were switching the anemograph on to half scale, which allows the maximum speed to be measured up to about 200 knots. The maximum gust (101 knots) is therefore preserved for this case, but was dependent on having staff available. There was a power failure, and at the extreme right-hand side of the figure the trace is broken. At this stage, the staff wound the chart on at 15-minute intervals, so that the time sequence of winds was preserved.

Munro anemometers were robust instruments, but were sometimes destroyed by winds. They are being replaced by new instruments that are stronger and have much smaller cups. The new instruments are more sensitive to light winds, so that the incidence of calms has decreased markedly at many stations.

The photograph shows the relative sizes of a Munro anemometer (left) and a modern Vector anemometer (right) during tests on Baring Head tower. It was found that not only were the thresholds at very low speeds different, but also the responses varied through quite a wide range of speeds up to about 20 knots.

Munro anemometer on left, and modern Vector instrument at top right.

For more information on interpretation of wind records, contact Dr Steve Reid, s.reid@niwa.co.nz

Windsurfers taking advantage of a steady southerly on Wellington Harbour.

Cover photo: *Wendy St George*

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Email: ncc@niwa.co.nz
Phone: 0-4-386 0300.
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