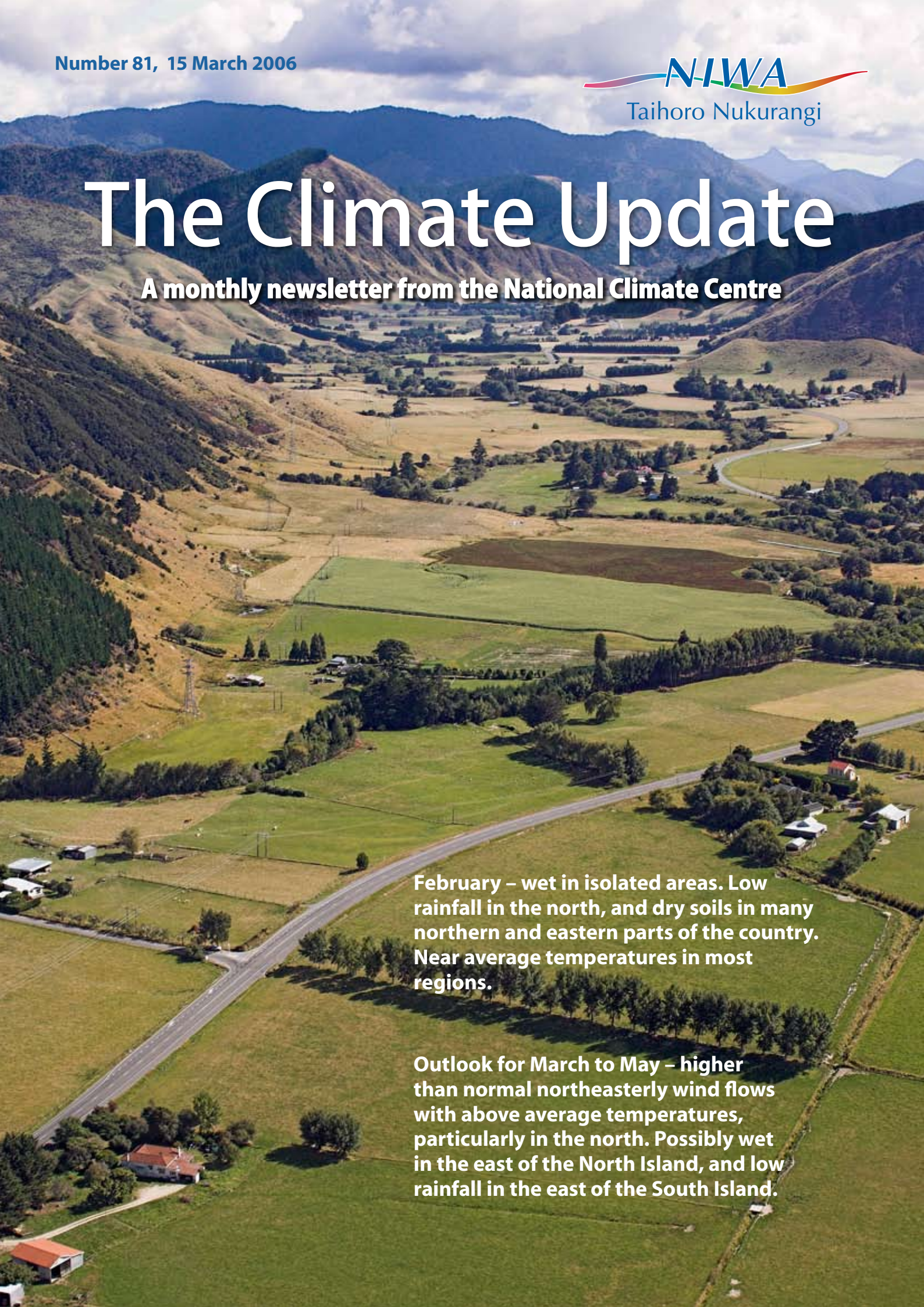
Number 81, 15 March 2006

NIWA
Taihoro Nukurangi

The Climate Update

A monthly newsletter from the National Climate Centre



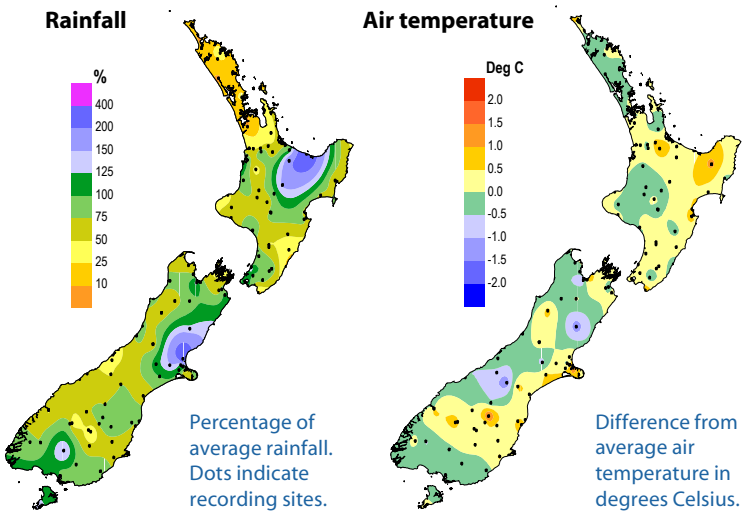
February – wet in isolated areas. Low rainfall in the north, and dry soils in many northern and eastern parts of the country. Near average temperatures in most regions.

Outlook for March to May – higher than normal northeasterly wind flows with above average temperatures, particularly in the north. Possibly wet in the east of the North Island, and low rainfall in the east of the South Island.

New Zealand climate in February 2006

Rainfall was almost 300% of normal in parts of eastern Bay of Plenty. Above normal rain fell in inland Bay of Plenty, Taupo, Kapiti, Wellington, central Wairarapa, and isolated parts of Nelson, the Marlborough coast, north Canterbury, and Southland. In contrast, rainfall was 25% of normal or less throughout much of Northland, Auckland, and coastal Wairarapa, and 50% or less of normal in Central and East Otago. It was drier than normal in Taranaki, south Westland, and Fiordland.

Mean temperatures were above average in parts of Auckland, Bay of Plenty, Hawke's Bay, Manawatu, Horowhenua, Canterbury, and Otago. They were below average in Westland, and near average elsewhere.



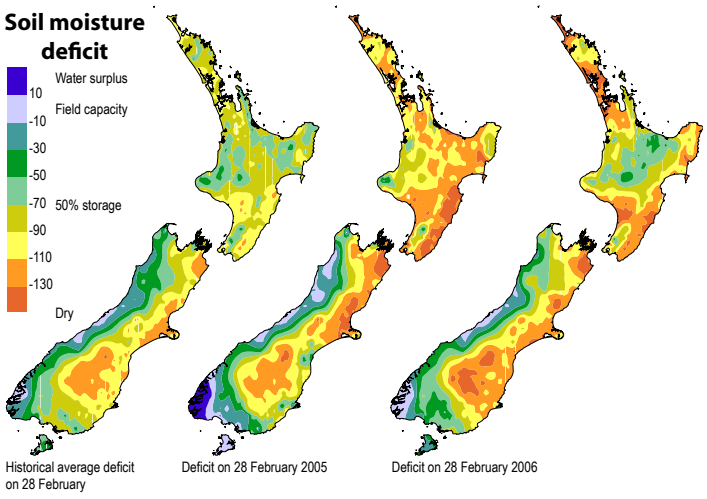
Percentage of average rainfall. Dots indicate recording sites.

Difference from average air temperature in degrees Celsius.

For more information on the climate in February, visit the climate summaries page at www.niwascience.co.nz/ncc/cs/mclimsum_06_02

Widespread dry conditions

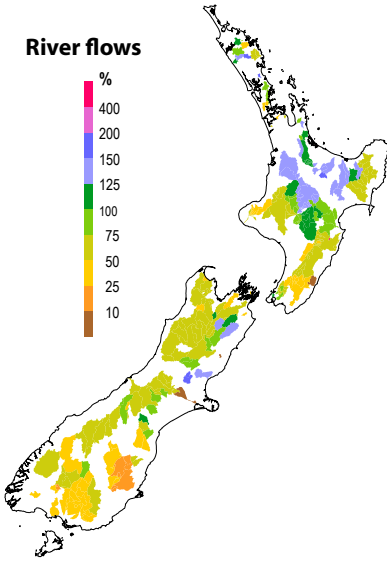
Northland soils that were well watered in January lost most of their moisture during February. East coast and southern North Island soils also became drier during the month.



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

High flows in the north and low in the south

Normal to above normal stream flows occurred in much of the North Island and in parts of Marlborough and north Canterbury. Low stream flows occurred in Taranaki, the southern North Island, and over most of the South Island. Stream flows were extremely low in the South Island alpine catchments.



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

December to February: the climate we predicted and what happened

Rainfall

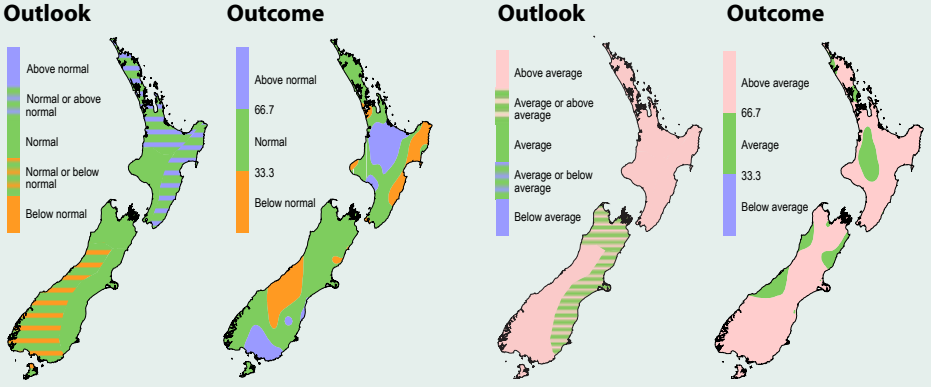
Rainfall was lower than expected in the east of the North Island, but mostly as predicted elsewhere except for wet conditions in the far south.

Air temperature

Air temperatures were above average in many areas as predicted.

River flows

Normal or above normal streamflows in much of the North Island and coastal Southland; below normal in Taranaki, Wairarapa, Kapiti Coast, and much of the rest of the South Island.



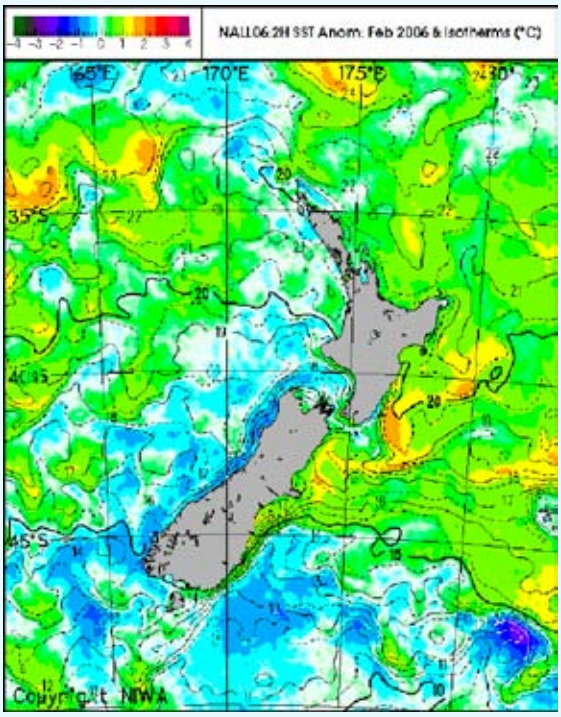
The three outcome maps give the tercile rankings of the rainfall totals, mean air temperatures, and mean river flows that eventuated from December to February, in comparison with the forecast conditions.

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

Sea surface temperatures (SST) around New Zealand

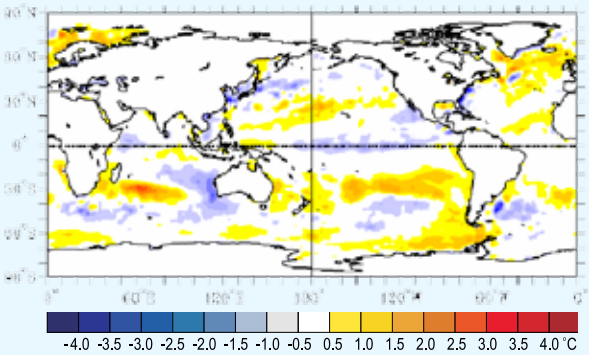
Sea surface temperatures around New Zealand are close to average or above average and are expected to remain this way until May. The average SST anomaly at the end of February was about +1.0 °C, up strongly from +0.3 at the end of January.



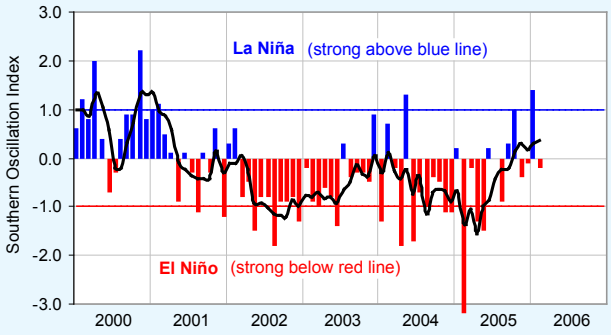
Difference from normal February surface temperatures in the seas around New Zealand.

La Niña weakens further

The tropical Pacific is in a weak La Niña state at present, but conditions should ease to neutral by winter 2006.



Difference from average global sea surface temperatures for February 2006. Map courtesy of NOAA Climate Diagnostics Center.



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).

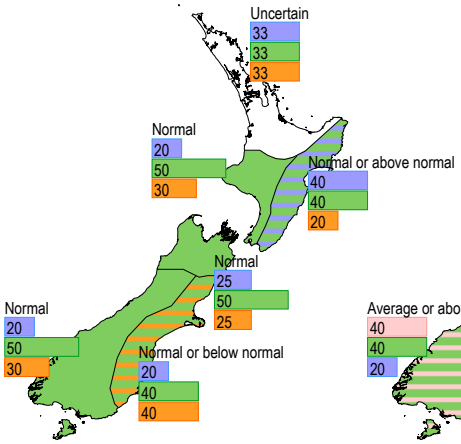
Outlook for March to May 2006

During autumn, atmospheric pressures to the east of the South Island are likely to be higher than normal, increasing the likelihood of northeasterly wind flows on to the North Island. Air temperatures are expected to be above average in the North Island and northern South Island, and average or above average in the rest of the South Island.

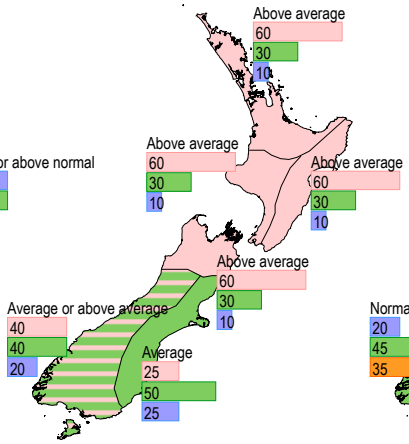
Rainfalls are likely to be normal or above normal in the east of the North Island, and normal or below normal in the eastern South Island. Elsewhere, near-normal rainfalls are the most likely outcome, apart from the northern North Island, where the outlook is unclear due to conflicting guidance from the suite of available prediction models.

Soil moisture levels and stream flows are likely to be below normal in the east of the South Island, and normal or below normal in the northern North Island. Normal or below normal streamflows are likely in the west and south of the South Island. Elsewhere, normal soil moisture levels and streamflows are likely.

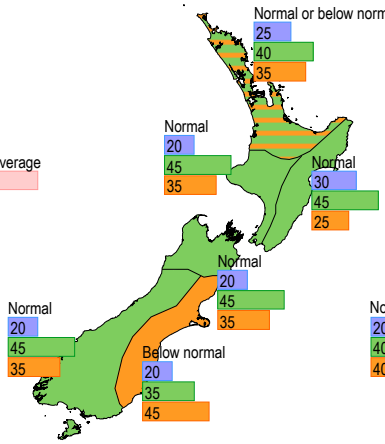
Rainfall



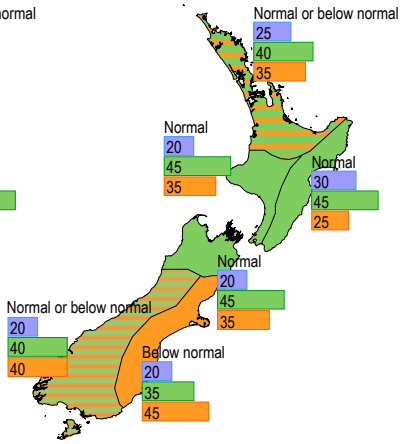
Mean air temperature



Available soil moisture

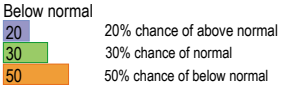


River flows

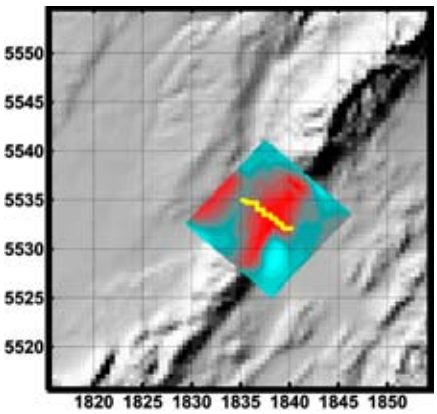


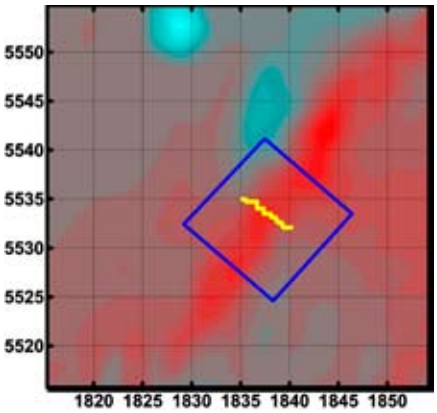
How to interpret these maps

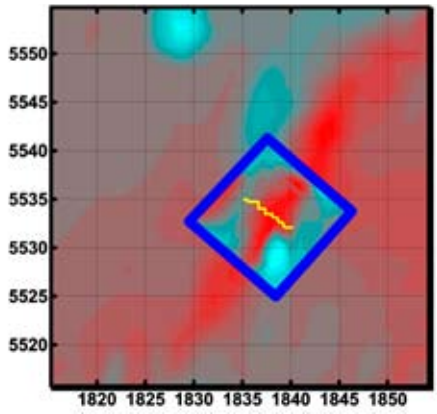
In the example here the climate models suggest that below average conditions are likely (50% chance), but, given the variable nature of the climate, the chance of normal or above normal conditions is also shown (30% and 20% respectively).



Modelling wind behaviour over complex terrain

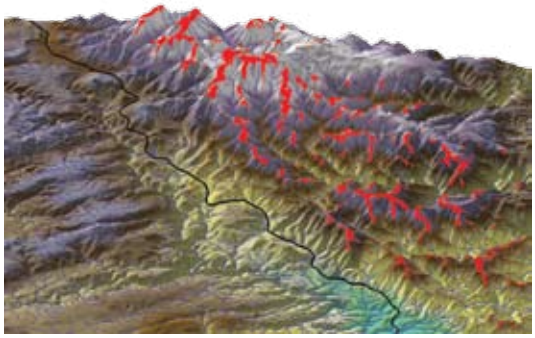






Understanding New Zealand's wind climatology is very important in a number of areas, such as:

- Identifying areas of high daily wind runs for the siting of wind-farms.
- Identifying areas prone to extreme wind gusts. This is important for hazard mapping.
- Identifying local katabatic winds (drainage flows) on cold stable nights. Important in knowing the direction of movement of plumes of highly concentrated pollutants or viral airborne diseases.



Potential sites for wind power generation are identified in red.

New Zealand has very complex terrain, and terrain effects are very important in all three of the above applications.

Wind observations that have been archived in the past, while being of a high quality, may not always be representative of winds at locations near the observing site due to these complex terrain effects. One way to get around this problem is to use computer models, such as BLASIUS, CALMET, and the UK Unified Model.

These models are used by NIWA research meteorologists in the applications mentioned above. However, we still also need to compare their performance against each other and the observations for various meteorological conditions and locations in New Zealand.

This helps to identify the limitations and strengths of each of the models, and tells us when and where we can apply a model or the conditions under which models with known limitations should not be used.

The figures presented (left) are from numerical simulations of typical conditions over the Manawatu Gorge – that of a neutral to weakly stable atmosphere in a prevailing west-northwest airflow. The top graphic gives a high resolution flow simulated by BLASIUS; the next shows a lower resolution flow over Manawatu from CALMET. The bottom one compares the flows from both CALMET and BLASIUS. The red areas are regions of high wind speed and the blue are areas of low wind speeds.

Both models are providing similar results by showing higher speeds over the ranges for the same situation. Neither model is outperforming the other, increasing the confidence of the meteorologist in applying such models in a range of applications.

For further information on wind climatology, contact:
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Looking north above Okaramio, Marlborough. Wind models can determine wind energy potential and high wind risk.

Cover photo: *Alan Blacklock*

The Climate Update is a monthly newsletter from NIWA's National Climate Centre, and is published by NIWA, Private Bag 14901, Wellington. It is also available on the web. Comments and ideas are welcome. Please contact Alan Porteous, Editor
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