

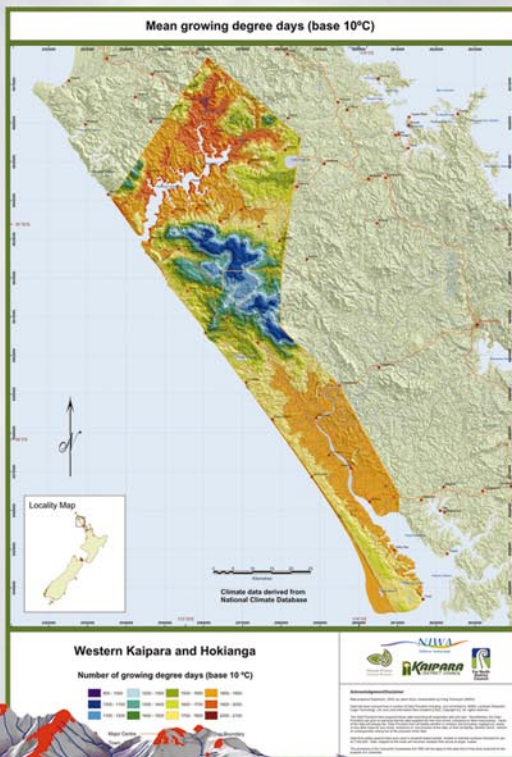


Just a second

Badly tuned vehicles are not only a cost to their owners, they are also a significant cost to society. About 400 people lose their lives prematurely in New Zealand each year through exposure to vehicle emissions. As part of the Auckland Regional Council's 'Big Clean Up' programme, NIWA staff used remote sensing equipment to measure the emissions of thousands of vehicles to help estimate emissions for the entire vehicle fleet. Scientists and engineers will use the information to assess the effect of vehicles on local air quality, and transport regulators and planners will use it for air quality and transport planning and emission control strategies.

An infrared and ultraviolet light beam is directed through the exhaust of each vehicle as it is driven past the testing point. The reading, which takes less than a second, measures the concentrations of carbon monoxide, carbon dioxide, hydrocarbons, nitrous oxide, and the opacity of the exhaust. A key feature of the programme, and a bonus for the drivers, was the large roadside sign which told drivers whether their vehicle's emissions were good, fair, or poor. This was designed to encourage owners to have or to keep their vehicles well tuned. Only 2.3% received a poor rating; most of the rest (84%) were good.

Atmosphere & Climate



Could you grow figs, or peanuts, or cherimoya?

One of the many uses for NIWA's climate maps is helping farmers and investors identify potential crops for their land. In the western Kaipara and Hokianga region, for example, climate maps were used with maps of soil properties and information on the growing requirements to identify suitable areas for crops as diverse as figs, peanuts, and hydrangeas. The project was funded by the Ministry of Economic Development to develop under-utilised land and to promote alternative land use. A number of research organisations were involved, with NIWA leading a team of scientists from Landcare Research, HortResearch, and Crop & Food Research.

Another example is mapping the maximum air temperature for Transpower to enable them to maximise the amount of current they can send down their power lines while maintaining minimum line ground clearance (power lines sag as they heat up, which is a function of the amount of current running through them, air temperature, solar radiation, and wind speed).

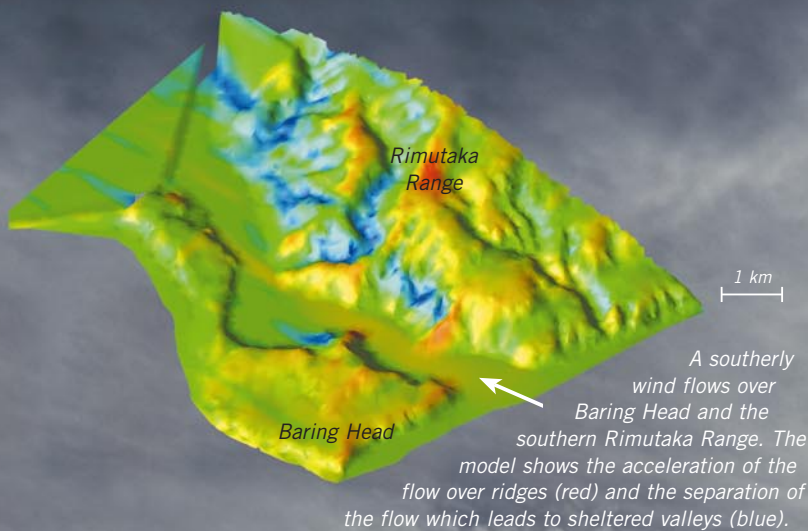
The Ministry of Agriculture and Forestry is also interested in climate maps to help model how pests and diseases might spread. Energy companies are also very interested in climate mapping to help them assess wind power generation.

This map shows the mean number of growing degree days for the western Kaipara and Hokianga region – a measure of the energy available for plant growth.



Tony Bromley during the Transpower survey.

A third example is this map which shows areas (in red) where the mean annual wind speed is sufficient for wind power generation.



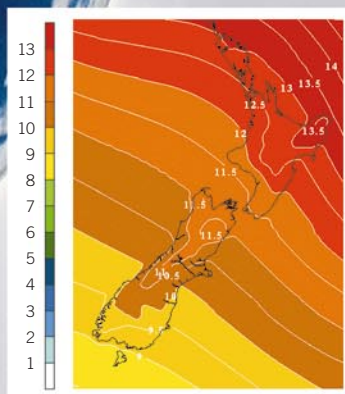
Mapping the wind

Wind power is an attractive way of helping New Zealand meet its increasing energy requirements. However, we need to be able to accurately predict local wind patterns to fully evaluate planned wind farm sites. New Zealand's rugged topography presents a serious challenge, but NIWA scientists have developed an innovative numerical model to accurately and efficiently predict detailed three-dimensional flow over complex terrain. The model gives information on average wind speeds as well as peak wind speed and wind gusts. This is vital for safe and efficient design and operation of wind farms. There are many other applications for this type of information, including air traffic control and the design of high-rise buildings.

Helping reduce skin cancer

New Zealanders experience relatively intense levels of UV radiation, and this is thought to be an important factor leading to one of the world's highest rates of skin cancer. About 300 New Zealanders die every year from skin cancer, and the annual medical bill for the treatment of skin cancers is more than \$33 million.

In response to this problem, NIWA provides UV information to the public through the internet in the form of daily maps (see www.niwa.co.nz/services/uvozone) and through ongoing contracts with MetService. Daily maps of clear-sky UV are calculated using satellite-derived ozone measurements. The example shown is for a day when the UV is close to its annual maximum. The lower values in the south arise because of the longer path of solar rays through the atmosphere. On the day shown, ozone amounts were lower in the east of the country.



Clouds can lead to reductions or increases in UV radiation. The photograph, taken at NIWA's atmospheric research laboratory at Lauder, Central Otago, shows sky conditions (partly cloudy, sun not obscured) which enhance UV radiation through scattering from clouds.