

# Focus on Energy

*finding the energy to move New Zealand forward*

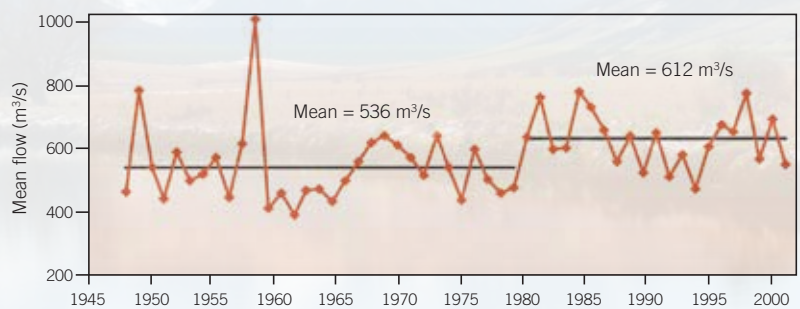
great science

## The effect of future climate on hydro inflows

NIWA research into climate variability and change provides important insights into likely future hydro inflows, helping industry to understand and manage changing levels of dry-year risk.

The period 1977–98 was relatively wet on the South Island west coast and in the headwaters of key southern lakes compared with the preceding 30 years. Such long-term variability is related to alternating phases of the Interdecadal Pacific Oscillation (IPO). The IPO may be changing phase, back to a state where La Niña events are more frequent, and generally mild, less windy conditions prevail. If this occurs, low inflow periods for South Island lakes will be more frequent, and possibly more severe, over the next 20–30 years than in recent times.

In the longer term, however, climate change may mean stronger westerly winds, more rain in western and alpine regions, and more reliable flows into our hydro lakes. The accumulation and melt of snow in the Southern Alps is likely to change, altering the seasonality of hydro inflows. NIWA research aims to quantify these effects.



Annual flows recorded for the Clutha River at Balclutha, 1 October 1947–30 September 1999. The mean flow is substantially higher during the recent positive phase of the Interdecadal Pacific Oscillation.

## Wave energy device under development

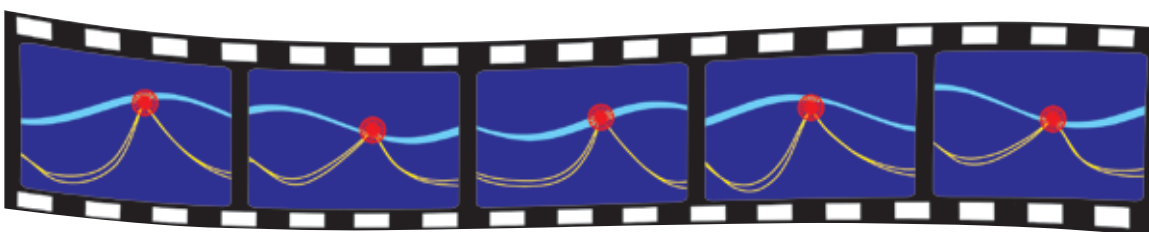
NIWA is part of a collaborative R&D project which aims to develop, test, and deploy a proof-of-concept wave energy converter in New Zealand by 2008. The research partners are Industrial Research Ltd (IRL), NIWA, and Power Projects Ltd.

We are aiming to make a lightweight, compliant device, which is small in mass but ‘thinks big’. The device will have controls that forecast incoming waves and ‘tune’ its response to changing wave patterns. The consortium is currently applying for patents.

NIWA’s role is in hydrodynamics and investigating likely locations for a test deployment. IRL has developed concepts for direct drive power take-off. Power Projects is responsible for industry liaison and developing an ‘economic benchmarking procedure’ to assess the financial viability of design options.

The project is funded by the Foundation for Research, Science & Technology.

[www.wavenergy.co.nz](http://www.wavenergy.co.nz)



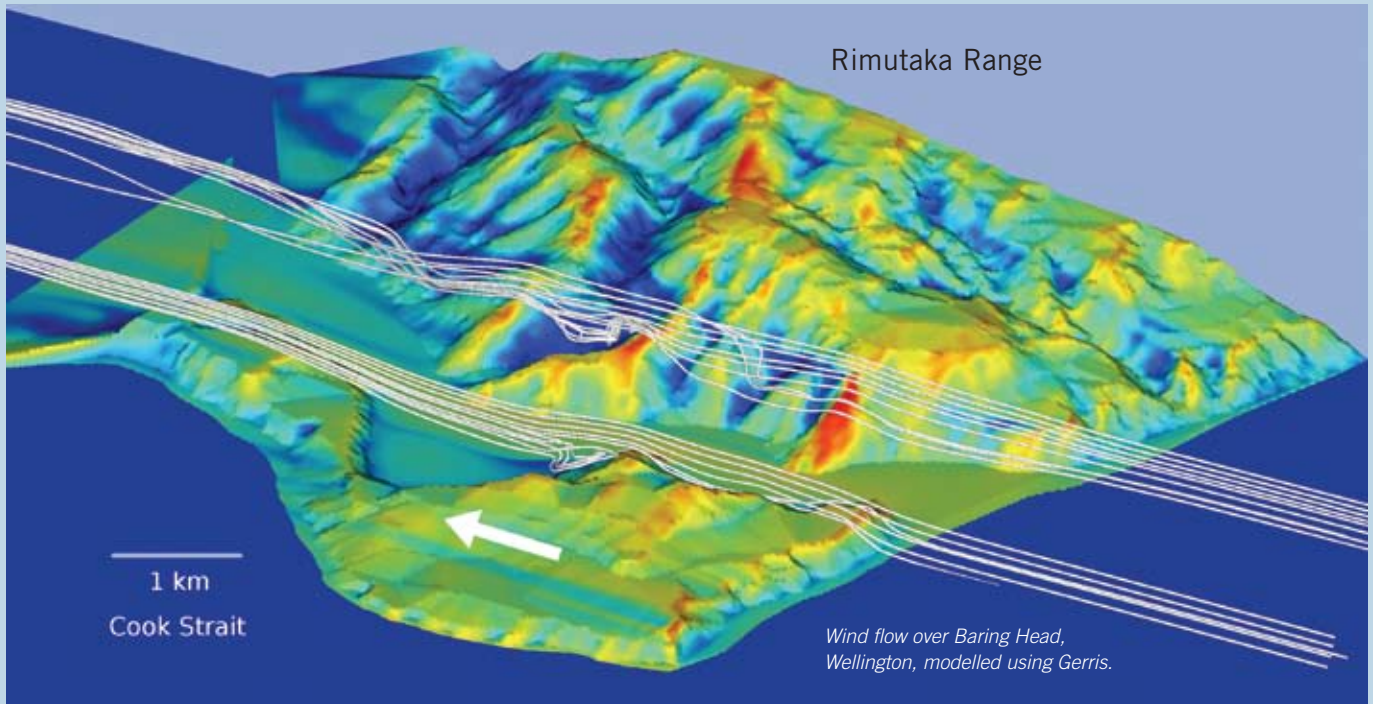
Stylised representation of wave energy device (red) riding a wave (light blue). The detailed design is confidential due to patent application.

## Our wind energy toolbox

NIWA uses a robust combination of measurements and modelling to help clients assess potential wind energy sites.

To select suitable locations for further investigation, we use our extensive climate database to produce site specific estimates, and have derived gridded wind speed data for the entire country at 500 m resolution. We also use a 6-year archive of data from our mesoscale model.

For detailed assessments at specific sites, the 'gold standard' is still measurements made by anemometers mounted on a tall mast. To cover the territory more quickly, we also use a portable SODAR (sonic detection and ranging – similar to radar). At the same time, we can combine a digital terrain model with the very smart, high resolution 'adaptive flow solver' called Gerris developed at NIWA. This microscale modelling is detailed enough to simulate individual eddies. It can be used to precisely site turbines to benefit from the strongest winds while minimising turbulence.



## NIWA Group – New Zealand's leading energy research provider

### NIWA Science

#### SCIENTIFIC SERVICES

Assessment of renewable resources (measurement & modelling of hydro, wind, wave, tidal, solar)

Nationally significant databases: water resources & climate

Environmental effects assessment for consenting & other purposes

Environmental monitoring instruments & services

Daily operational forecasting of renewables

Marine geological services for offshore structures & cables

#### KEY RESEARCH PROGRAMMES

- Climate-related risks for energy supply & demand
- Improving rural Māori communities through new energy technologies
- Recovery of energy from wastewater: biomass
- Wave Energy Technology-New Zealand (with IRL & Power Projects Ltd)

### CRL Energy

#### SCIENTIFIC SERVICES

Geological, geotechnical engineering, & hydrogeological services

Solid fuels analysis & combustion testing

Bioenergy & biofuels

Internal combustion engines, fuels, & emissions

Vehicle technologies

Environmental monitoring & remediation

Energy modelling with the Energy Efficiency & Resource Assessment (EERA) model and database

#### KEY RESEARCH PROGRAMMES

- Clean coal technologies (advanced gasification & combustion)
- Carbon capture & storage
- Hydrogen energy systems (with IRL)
- Causes, impacts, & remediation of acid mine drainage