update

NIWA
Taihoro Nukurangi

NIWA
Natural Hazards

setting the foundation for a safer future

Drought – what trees can tell us

Drought is a very real climatic hazard, imposing huge costs on primary industries, and threatening hydroelectric power generation, human water supply, and aquatic ecosystems.

In a bid to improve our ability to predict drought, NIWA scientist Dr Andrew Lorrey is reconstructing past climate records from the rings of mountain beech trees (*Nothofagus solandrii*), found on the Craigieburn Range in Canterbury. Trees, especially old trees, can tell us a lot about past climatic conditions.

"Tree ring width and cell structure reveal information about past drought severity and periods of low river flows," says Andrew. "We have little detail of drought history in New Zealand beyond the early days of climate records, but examining tree rings means we can extend our records back by hundreds of years – into the 1700s in the case of these beech trees."

Reconstructing drought from 'proxy' records helps paint a picture about drought history and drought characteristics, and improves our ability to predict the likely future range of drought severity and risk under current global climate change trends. Tree ring analysis can be applied across New Zealand to other precipitation-sensitive tree species, and can provide local authorities with a tool for assessing drought history to help in formulating risk management schemes.

This work is supported by the NIWA Innovative Seed Fund.

Ancient mountain beech, Craigieburn, Canterbury. [Photo: Andrew Lorrey, NIWA]

Snow stability and avalanche forecasting

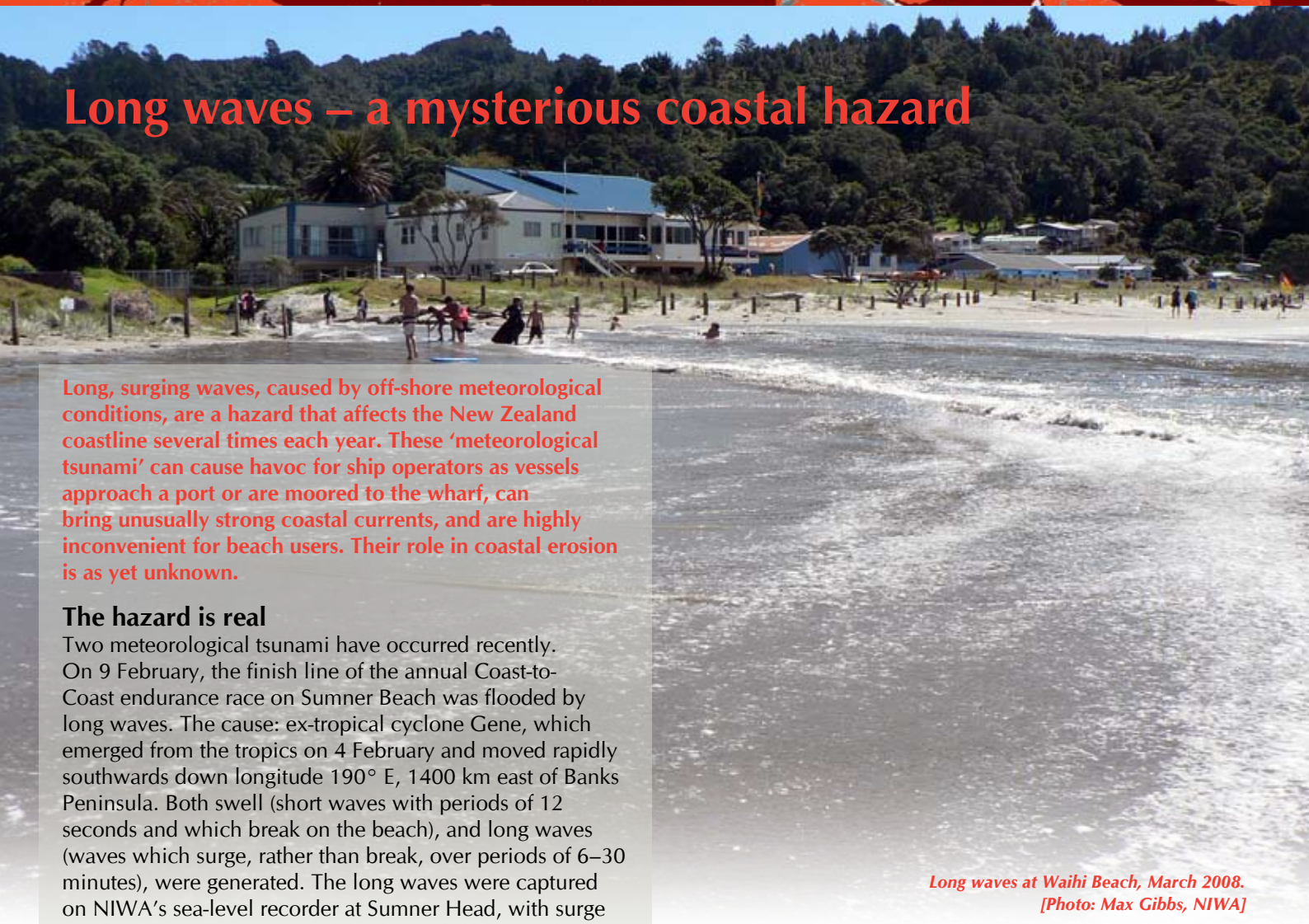
Jordy about to perform a snowpack test in stormy weather. [Photo: Karl Birkeland, US Forest Service National Avalanche Center]

Jordy Hendrikx has recently returned from a trip to Montana, where he was out on the mountains at wind chill temperatures as low as –54 °C to learn more about snowpack spatial variability – or what makes snow more likely to avalanche in some places rather than others. Jordy worked Dr Karl Birkeland, a world leader in snowpack spatial variability, and has developed some new research methods to apply in New Zealand.

"Understanding the spatial variability of snow is really important for avalanche forecasting," says Jordy. "We need information about the spatial extent of unstable snow areas, and how testing certain slopes will provide a representative (or unrepresentative) picture of the snow stability of a region. This is key issue for accurate avalanche forecasting. We also need to know more about how snow distribution across the landscape affects the duration of snowmelt in different areas and therefore the magnitude, timing, and duration of snowmelt runoff."

Avalanches pose a very real threat on New Zealand's mountains at certain times, but in North America they kill an average of 42 people each year, so generate a significant research effort. A short video about the research on YouTube, entitled 'Cedar Mountain Test Slopes' can be found at: www.youtube.com/watch?v=BrK8JuWb1Bo (or search for "Jordy Hendrikx" on YouTube).

Long waves – a mysterious coastal hazard



Long, surging waves, caused by off-shore meteorological conditions, are a hazard that affects the New Zealand coastline several times each year. These 'meteorological tsunami' can cause havoc for ship operators as vessels approach a port or are moored to the wharf, can bring unusually strong coastal currents, and are highly inconvenient for beach users. Their role in coastal erosion is as yet unknown.

The hazard is real

Two meteorological tsunami have occurred recently. On 9 February, the finish line of the annual Coast-to-Coast endurance race on Sumner Beach was flooded by long waves. The cause: ex-tropical cyclone Gene, which emerged from the tropics on 4 February and moved rapidly southwards down longitude 190° E, 1400 km east of Banks Peninsula. Both swell (short waves with periods of 12 seconds and which break on the beach), and long waves (waves which surge, rather than break, over periods of 6–30 minutes), were generated. The long waves were captured on NIWA's sea-level recorder at Sumner Head, with surge heights of 0.4–0.5 m.

A similar event occurred at Waihi Beach on 15–16 March with 0.3 m-high long waves surging in and out over six-minute periods, inundating and uncovering the entire beach. NIWA scientist Max Gibbs witnessed these waves that surprised many beach users.

What causes long waves?

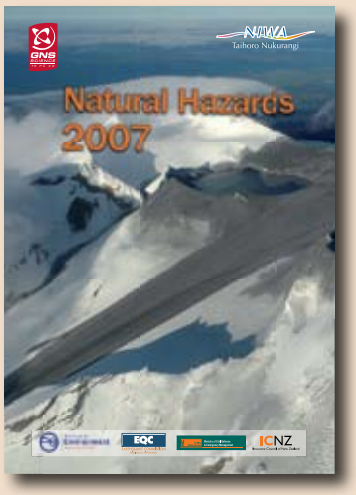
Although the processes behind the generation of meterological tsunami are not fully understood, we know the waves are generated by moving low-pressure weather systems well to the south or east of New Zealand (but only some of them). These weather systems may have little effect on our weather, but they can generate swells on the coast, sometimes also associated with much longer wave surges. At other times, there may be little swell activity locally and yet the long-wave surges can appear. Meteorological tsunami are sometimes also called 'rissaga'.

NIWA's coastal monitoring and research

NIWA's coastal monitoring and research, working with Mulgor Consulting, will continue as we analyse and build up a picture of the weather systems that cause long waves. We can then improve the forecasting of long-wave hazards, increasing the safety of port operations and coastal recreation. Derek Goring, a coastal oceanographer with Mulgor Consulting, observed the waves off the Canterbury coast first-hand on 9 February – see: http://www.tideman.co.nz/Rissaga09Feb08/

Long waves at Waihi Beach, March 2008. [Photo: Max Gibbs, NIWA]

Natural Hazards Review



The second annual review of New Zealand's natural hazards, produced jointly by NIWA and GNS Science, is due for publication in late April. The 32-page full-colour review summarises the major hazard events of 2007, describes some current hazards research by NIWA and GNS Science, and includes contributions from a number of organisations involved with hazard planning and mitigation.

A downloadable pdf will be available at www.naturalhazards.net.nz, or contact Harriet Palmer (h.palmer@niwa.co.nz) for a hard copy.

For more information, contact:

Doug Ramsay	**hazards@niwa.co.nz**
	0-7-859 1894
or call free on	**0800 RING NIWA**
	(0800 746 464)

This newsletter is printed on paper sourced from sustainably managed forests, produced using elemental chlorine-free processes. Vegetable-based inks from renewable sources are used. Packaging is fully biodegradable.