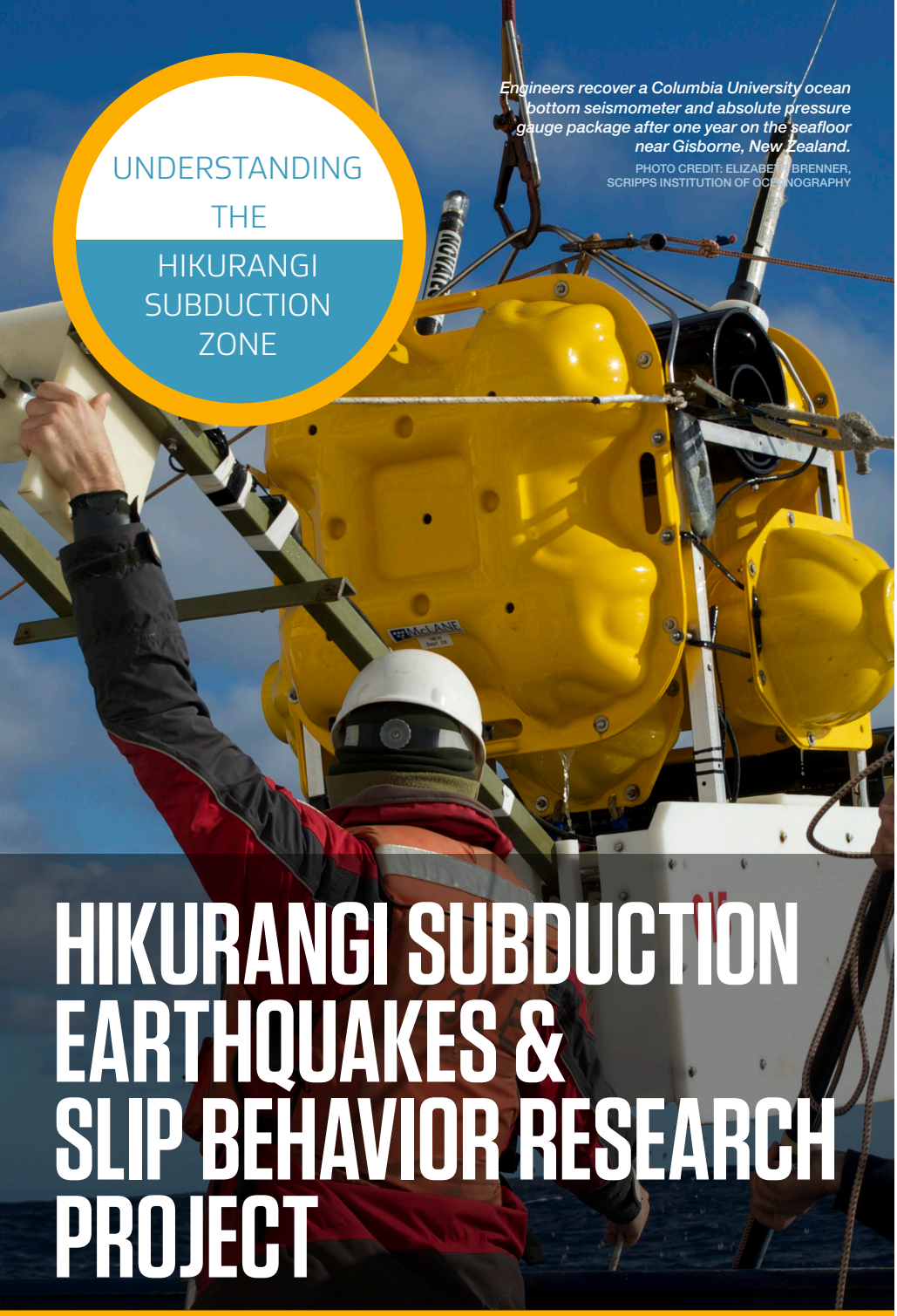
UNDERSTANDING THE HIKURANGI SUBDUCTION ZONE



Engineers recover a Columbia University ocean bottom seismometer and absolute pressure gauge package after one year on the seafloor near Gisborne, New Zealand.

PHOTO CREDIT: ELIZABETH BRENNER, SCRIPPS INSTITUTION OF OCEANOGRAPHY

HIKURANGI SUBDUCTION EARTHQUAKES & SLIP BEHAVIOR RESEARCH PROJECT

Between 2016-2021, a large team of national and international scientists will be studying the Hikurangi plate boundary to find out what risk it poses to New Zealand. The Hikurangi plate boundary is where the Pacific tectonic plate subducts (or dives underneath) the Australian tectonic plate and is what scientists call a subduction zone. Subduction zones are a type of fault and are responsible for the largest and most powerful earthquakes and tsunamis in the world, such as Sumatra 2004, Chile 2010, and Japan 2011.

New Zealand's involvement in the project is supported by the Ministry of Business, Innovation and Employment (MBIE) Endeavour fund. The project involves scientists at GNS Science, NIWA, Victoria University of Wellington, Massey University, University of Auckland, University of Otago, and the University of Canterbury.

WHY THE HIKURANGI SUBDUCTION ZONE?

The Hikurangi subduction zone is poorly understood, yet potentially the largest source of earthquake and tsunami hazard in New Zealand. We know that the Hikurangi subduction zone can produce large earthquakes and tsunamis, and that these events have occurred in the past. However, we don't know how often these earthquakes tend to happen, nor do we know how large they can be.

It is also the best place to study **slow slip events** (also referred to as "slow earthquakes" or "silent earthquakes"). The world's shallowest slow slip events occur just offshore of the North Island's East Coast, near Gisborne, and offer a globally unique opportunity to understand why slow slip events happen.

WHAT METHODS WILL BE USED?

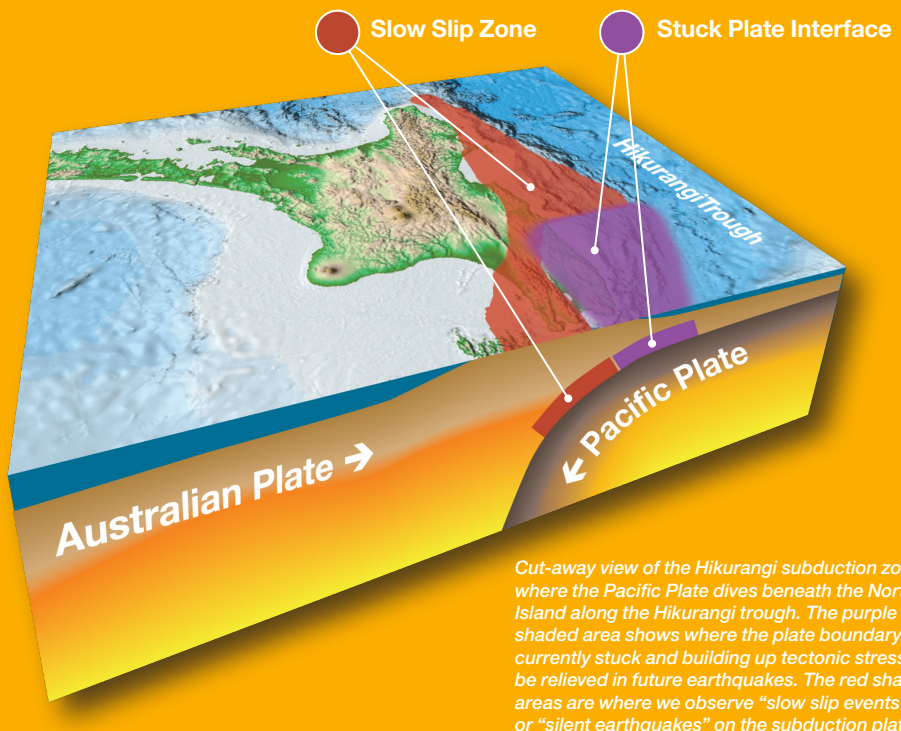
A large component of the project involves building and installing seafloor sensors off the East Coast to detect offshore earthquakes, slow slip events, and reveal New Zealand's offshore plate tectonic movements for the first time. Similar types of sensors could be used in tsunami and earthquake early warning systems in the future and will create new technological capability for New Zealand.

Part of this project provides resources for New Zealand scientists to work on the new data being collected by visiting specialised research ships that carry out drilling and seismic imaging. This data will tell them about the physical conditions and rock types at the plate boundary, and reveal what is causing the Hikurangi subduction zone to move slowly (in slow slip events) or suddenly (in earthquakes). This helps scientists understand what has influenced earthquakes and tsunamis in the past, so they can better anticipate what might happen in the future.

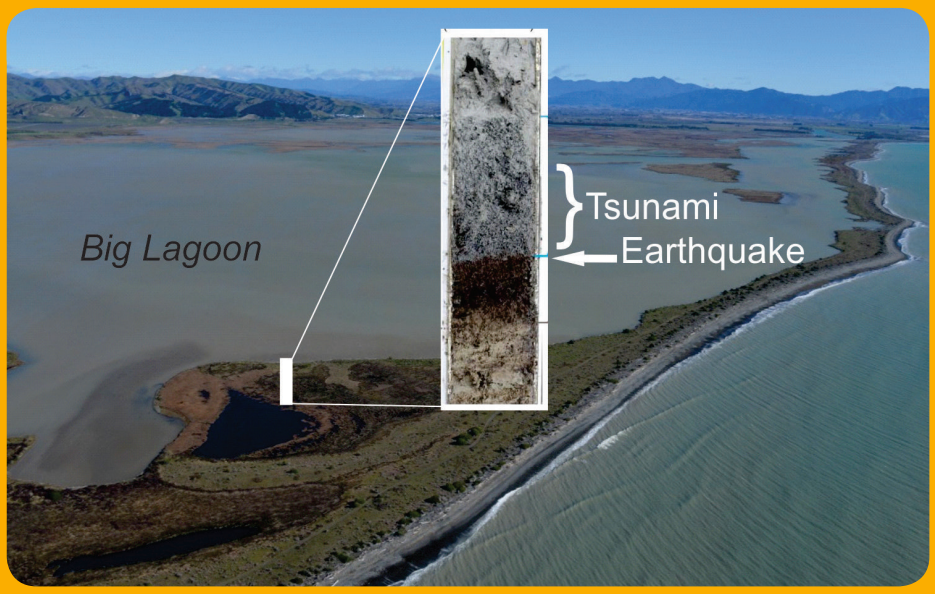
DELVING INTO THE PAST

The scientists will also be gathering geological and historical evidence for past large Hikurangi earthquakes to improve our understanding of subduction zone hazards posed to New Zealand. This involves collecting offshore cores and studying coastal sediments to explore the geological record of past earthquake and tsunami events. They will be working with iwi partners to integrate Mātauranga Māori of past Hikurangi earthquakes and tsunamis.

Slow slip events are where movement between the tectonic plates occurs slowly across the subduction zone, over a period of weeks to months, rather than suddenly in a large earthquake. Scientists only discovered their existence about 15 years ago, and are still trying to solve the mystery of why they happen.



Cut-away view of the Hikurangi subduction zone, where the Pacific Plate dives beneath the North Island along the Hikurangi trough. The purple shaded area shows where the plate boundary is currently stuck and building up tectonic stress to be relieved in future earthquakes. The red shaded areas are where we observe "slow slip events" or "silent earthquakes" on the subduction plate boundary.



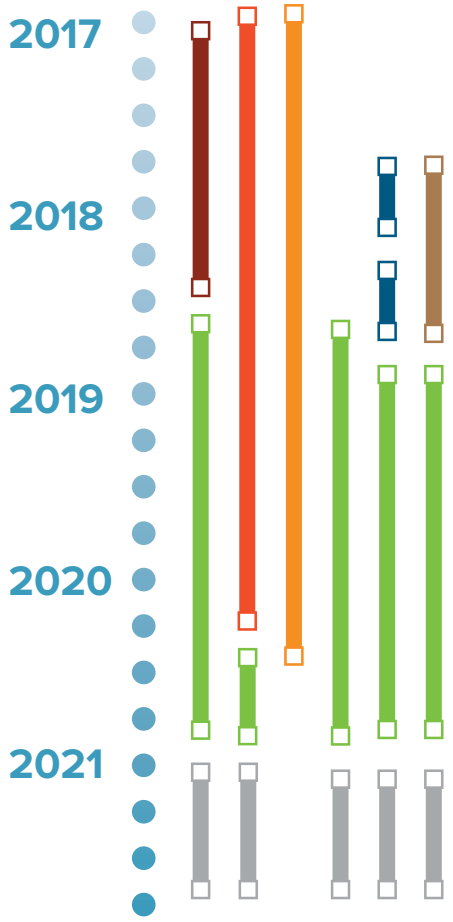
Geological evidence for earthquakes and tsunami can be found along the Hikurangi subduction zone in sediment cores such as this one taken from Big Lagoon near Blenheim.

MAIN PHOTO BY GRAHAM HANCOX, INSET BY KATE CLARK, BOTH COURTESY GNS SCIENCE

Expedition 349 – Placing whole-round marine cores in the core rack.

PHOTO COURTESY OF JRSO, CC0/PDM, WWW.IODP.ORG.

PROJECT TIMELINE



HOW CAN YOU BE INVOLVED?

The scientists are actively working with schools, iwi and local communities to share knowledge and create opportunities for involvement. They will also be offering field-based experiences to raise awareness of earthquake and tsunami risk along the East Coast. If you want to learn more about the project or be involved in the project in some way, please contact:

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MORE INFORMATION

To read more about the International Ocean Discovery Program (IODP):
www.joidesresolution.org and www.iodp.org

For more information on this project visit:
www.gns.cri.nz/hikurangi

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