update

NIWA
Taihoro Nukurangi

Instrument Systems

collecting data, delivering solutions

Keep an eye on this buoy

NIWA's Nelson field team are trialling an innovative buoy to help alert marine farmers to potential faecal contamination.

Currently NIWA uses large salinity buoys, positioned at one or more strategic points in a bay. Every 15 minutes, NIWA's computer system interrogates the buoy and extracts salinity data. Salinity is used as a proxy for faecal coliform bacteria because the water freshens when it rains, and runoff from the land can bring pollution with it. When salinity is low, the concentration of these harmful bacteria will typically increase, and farmers may be required to stop harvesting shellfish.

NIWA Instrument Systems has developed a much smaller buoy with some new features. First, it measures turbidity as well as salinity, to test whether turbidity may be a more reliable indicator of contamination. Second, it incorporates Unidata Crossramp technology, which automatically pushes data to the server at the required intervals. Third, the buoy is much smaller (and lower cost) so could be deployed by individual marine farmers, providing them with specific data about conditions at their farm so helping them to better manage and extend their harvesting periods.

The first buoy will be trialled in Golden Bay for 6–12 months.

Our new salinity/turbidity buoy undergoing testing at the Nelson marina.

Inside our homes

NIWA has developed a nifty instrumentation package for comprehensive, low cost monitoring of indoor air quality.

New Zealand homes have often relied on burning wood or coal for heating, and can be cold and damp. There may be a link here with New Zealand's poor respiratory health, and especially high levels of asthma. The instrumentation package makes it possible to measure how much difference actions like retrofitting insulation can make to the air quality inside our homes.

The small, self contained package of sensors measures aerosols, NO_2 (nitrogen dioxide), temperature, and humidity. It is relatively cheap, maintenance-free, and does not interfere with people's daily lives. It also has the capability to measure VOCs (volatile organic compounds) and CO (carbon monoxide) if required.

The system is centred on a Unidata Crossramp web-based datalogger, so the user can access data in near real time via a web browser. Crossramp terminals can be reconfigured remotely and have very low power requirements: the internal battery can support up to two years of daily data transfers. We are using a range of gas sensors from Aeroqual Ltd (Auckland) and a Vaisala 50Y combined air temperature and relative humidity sensor. NIWA has also developed a low cost particle sensor, which is still being evaluated.

www.unidata.com.au/products/crossramp
www.aeroqual.com

NO_2 & particle sensors

Crossramp data logger
[Photos: Guy Coulson, NIWA]

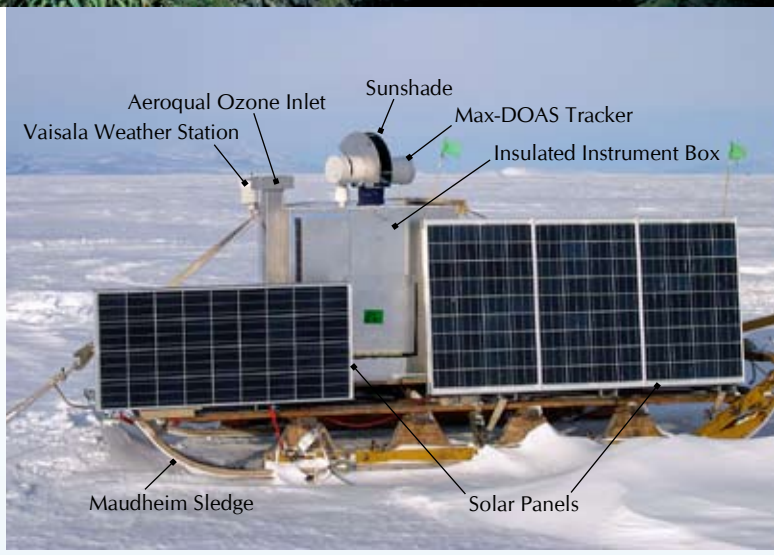
Tracking bromine explosions on sea ice

Two New Zealand scientists have spent almost two months perched on Antarctic sea ice trialling a prototype instrument for measuring bromine 'explosions'.

From time to time the amount of bromine oxide (BrO) above young sea ice increases exponentially ('explodes') over a matter of hours. Scientists don't yet know precisely what causes these events. One reason for studying these explosions is that BrO is involved in chemical reactions which convert mercury vapour into water soluble mercury. Human activity is putting more mercury into the atmosphere and bromine explosions can cause more of this toxic chemical to be deposited on the snow pack. The rapid melting of snow and ice during spring can result in massive pulses of mercury into the polar ecosystems where it accumulates along the food chain. This is especially concerning to people living in the Arctic.

Tim Hay (NIWA/Canterbury University) and Dr Katja Riedel (NIWA) have been observing these bromine explosion events on the sea-ice around McMurdo Sound. They used a MAX-DOAS (Multiple Axis Differential Optical Absorption Spectroscopy) instrument built at NIWA's atmospheric research station at Lauder, Central Otago. In essence, the instrument looks through the lower atmosphere along different light paths (from the horizon, then up at increasingly steep angles) and identifies the amount of BrO based on the distinctive pattern of absorption of light in different parts of the spectrum.

'We are getting good measurements even with the prototype,' says research supervisor Dr Karin Kreher of NIWA.



The prototype MAX-DOAS instrument built at NIWA Lauder. This year the team used a diesel generator to supplement the solar panels since the instrument must be kept running at all times to avoid freezing. Next year, they hope to add a small wind turbine instead. Logistical support by Antarctica New Zealand is gratefully acknowledged. [Photo: Tim Hay, NIWA/Canterbury University]

Tim Hay at McMurdo Sound; Mt Erebus is in the background. [Photo: Katja Riedel, NIWA]

The entire system – battery, solar regulator, and two modems – fits in a small box which can be easily fixed to a fence post. The equipment pictured enables NIWA's Marokopa water level measuring site to 'talk' to the Tuahu repeater site, Waikato. [Photo: Richard Keightley, NIWA]

Talk to me

When you want to collect near-real-time data from an isolated valley out of range of a cellphone or radio repeater station, what do you do?

The key is smart electronics. Ordinarily a datalogger 'talks' directly to a cellular modem, but sometimes there's no cellular coverage at the datalogger site. In such cases, Instrument Systems can configure pairs of modems to act as a bridge between the datalogger (typically down in a valley) and the cellular or radio connection at the repeater site (which would usually be up on a hill). We have defined a range of low-power interface modes and cables so that most common telemetry configurations can be extended to sites that were previously 'unreachable'.

For more information on NIWA Instrument Systems, contact us:

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