update

NIWA
Taihoro Nukurangi

Instrument Systems

collecting data, delivering solutions

Monitoring water quality in Doubtful Sound

A large-scale programme of monitoring water temperature and salinity is underway deep in the heart of the Fiordland National Park. The long-term work has been commissioned by Meridian Energy, whose Manapouri Power Station generates electricity from water as it travels in underground tunnels from Lake Manapouri to be discharged at Deep Cove, Doubtful Sound.

Staff from NIWA's Instrument Systems group and Dunedin office have designed and installed many of the suites of monitoring instruments, and are managing equipment maintenance and data collection in collaboration with Cawthron Institute and the University of Otago.

Why monitor water temperature & salinity?

The programme's aim is to establish a baseline for the physical and biological condition of the Doubtful Sound ecosystem. Over time, it will identify any long-term changes occurring. The data also enable the development of hydro-dynamic models, which contribute to validating designs and tests of power generation regime-change, as Meridian Energy works towards optimising the capacity of Manapouri Power Station.

What instruments are deployed, and where?

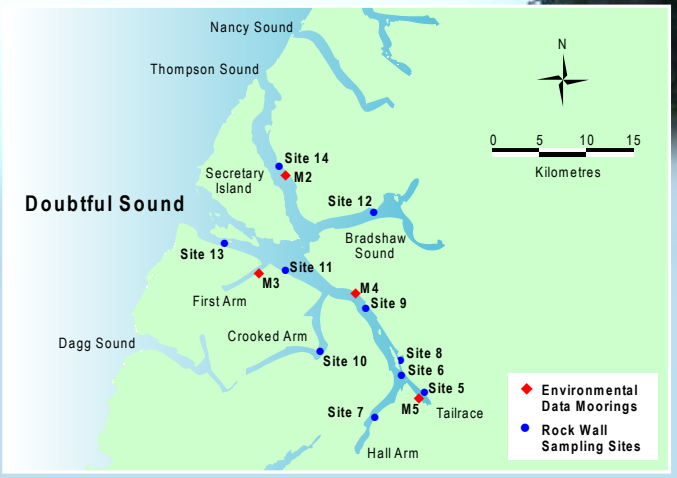
The instrument network totals five tethered floating buoys and four rock-wall installations. At each location, an instrument chain is suspended vertically in the water to a depth of 19 m from a floating buoy. Each chain has ten individual temperature and/or salinity vertical-profiling loggers mounted at fixed intervals along the chain.

Instruments have been deployed near the Manapouri Power Station discharge site, and at key sites throughout Doubtful Sound. Reference data are also being gathered from Milford Sound.

How are data recovered?

During regular site visits the chains are retrieved, and the data from the 100-plus data loggers are downloaded. Reference water samples are also collected to assure the continued quality of the data, which is later processed for reporting. After downloading, data are assimilated by NIWA and then sent to the Cawthron Institute, whose role includes modelling work and evaluation of the field data. To date, data recovery has been very good, with a loss of less than 3% over three years, most of which was caused by a severed instrument chain.

Above: Rock-wall buoys in Crooked Arm, Doubtful Sound. [Photo: Ian Maze, NIWA]



Location of monitoring sites, Fiordland

Right: A tethered buoy in Thompson Sound. [Photo: Ian Maze, NIWA]

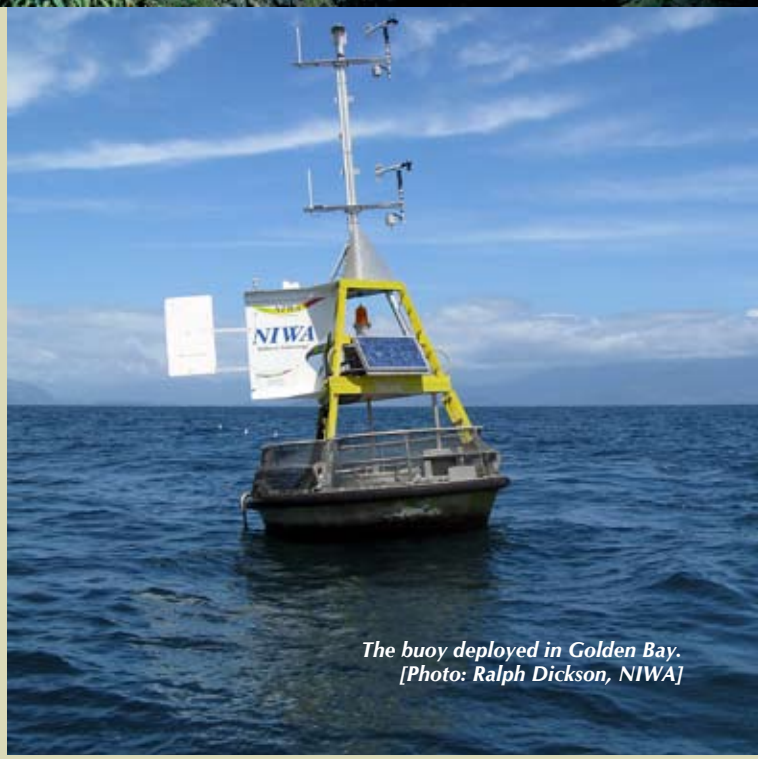
Monitoring the Golden Bay environment

Since May 2007 NIWA's marine buoy has been deployed in Golden Bay, off the Tasman coast. The buoy is New Zealand's most comprehensive coastal observation platform and is a floating environmental monitoring station, collecting and transmitting near real-time data back to shore.

Instruments onboard the buoy

The buoy is moored in about 30 metres of water, and onboard is a suite of above- and below-water instrumentation. Above-water instruments are recording solar radiation, winds, barometric pressure, and air temperature; there is also an accelerometer for measuring the size and frequency of waves.

Below water is an Acoustic Doppler Current Profiler (ADCP), which measures the speed and direction of water currents through the water column beneath the buoy – a New Zealand first. Other below-water instruments measure water quality indicators such as near-surface salinity, temperature, and turbidity.



The buoy deployed in Golden Bay. [Photo: Ralph Dickson, NIWA]

Data for local councils and industries

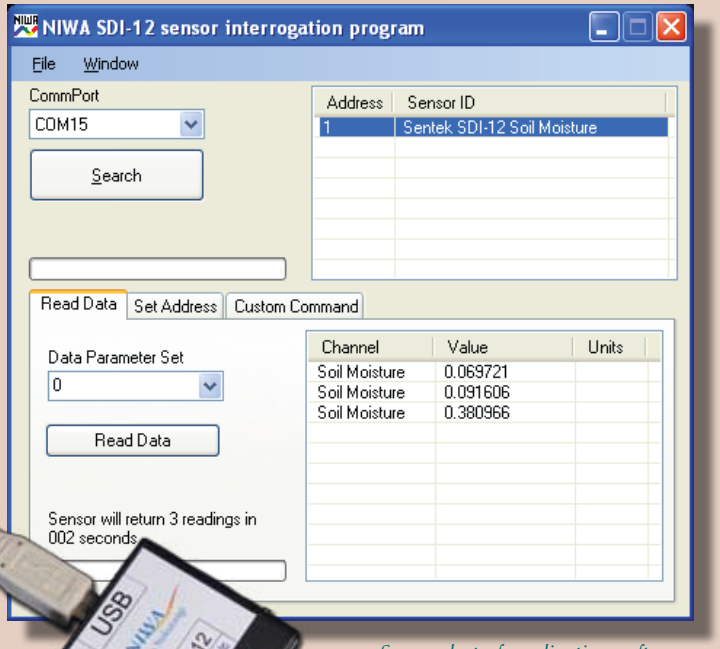
Most of the data are being returned in near real-time over a GPRS cellular link which feeds into the web. The data are available via the Tasman District Council (TDC) website: http://www.tasman.govt.nz/index.php?GoldenBayMetbuoyGraphs The data provide valuable information on sea and weather conditions for users such as the local scallop fleet, fishing industry, and recreational sea-goers. Further instrumentation will be installed over time that will be extending the measurement of ocean water quality, important for both council and industry resource managers including those involved in aquaculture. TDC are part-funding the deployment of the buoy.

Data for improving ocean forecasting

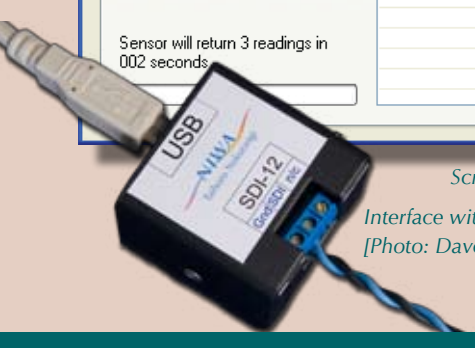
NIWA is also planning to use the buoy data for validating its Ecoconnect hazard-forecasting ocean current circulation models of Cook Strait and the Nelson Bays region. For example, data collected during the passage of tropical cyclone Funa over the Nelson Bays in late January will be used to test modelled responses to the cyclone including currents, waves, and atmospheric pressure.

The buoy is likely to stay where it is in Golden Bay for several years. NIWA will use it as a test-bed for new instrumentation, and procedures for data retrieval, storage, and transfer to a range of onshore users.

Trouble-shooting SDI instruments – a new tool



Screenshot of application software.



Interface with connection cables plugged in. [Photo: Dave Gibb, NIWA]

NIWA has produced a new diagnostic tool, the SDI Explorer, that will turn your PC screen into a 'window' that will let you observe the data traffic on your SDI-12 communications bus. SDI-12 is an industry standard serial data interface, often used between low-power environmental monitoring sensors and data loggers.

There is a trend toward measuring more and more environmental parameters, and increasing use of SDI-12 instruments. Operators therefore need more sophisticated diagnostic tools to trouble shoot and verify their operation.

The SDI Explorer comprises a hardware interface and an application program which is easily installed on a computer. The SDI to USB interface is simply connected between any standard SDI-12 serial data link and a USB port on a computer.

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