INTRODUCTION TO THE WIREWALKER™

Technical Note

THE CONCEPT

To obtain a two dimensional depth-time data record for your time-series sensors (Figure 1).

With the Wirewalker™, the traditional vertical chain of expensive instruments is replaced with a single sensor that is rapidly profiled. The Wirewalker™ harnesses the power of ocean waves for rapid propulsion, yet it produces measurements that are completely decoupled from the vertical motion of the sea-surface, enabling the collection of extremely high-quality data.

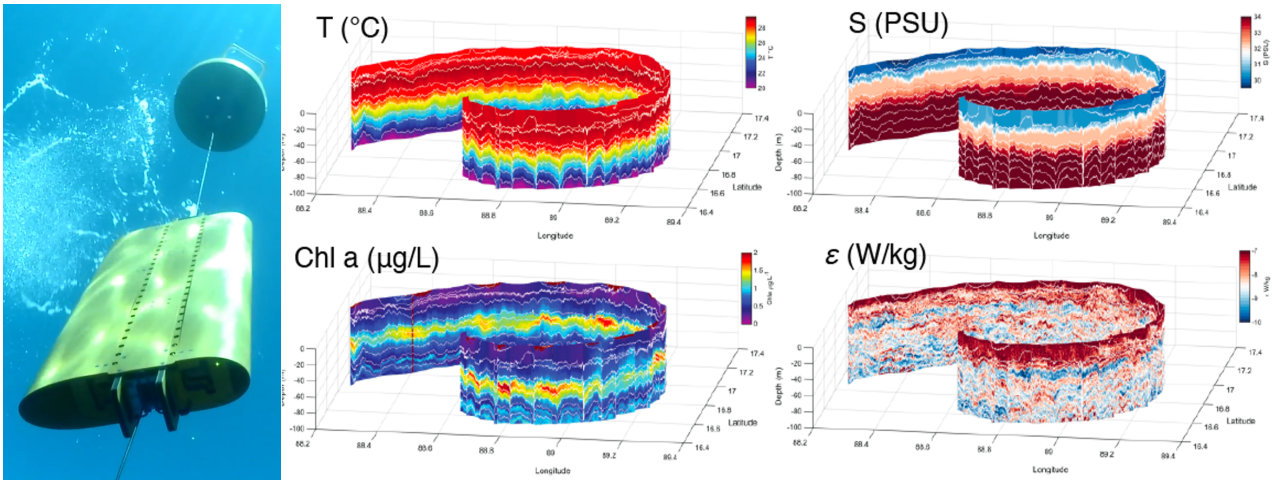

Figure 1: The rapidly evolving open ocean. The upper ocean responds to, and influences, the atmosphere across a range of time scales. It is also home to important biogeochemical transformations that modulate the ocean's impact on the carbon cycle, drives its productivity and thus influences global fisheries, and controls the ventilation (oxygenation) of the ocean interior. In this example, a 13.5 day, 2,414, 7.7 min per 100m profile Wirewalker drift in the open ocean shows the variability of the ocean boundary layer and the stratified region below. Observations gathered from a CTD, bio-optical, dissolved oxygen, and microstructure temperature sensors allow diagnosis of the rapid time evolution of the fluxes of those properties.

HERE'S HOW IT WORKS

As shown in Figure 2, a length of wire is suspended from a small surface float. At the deep end of the wire a weight encourages the entire length of wire to move vertically, following the oscillatory motion of the surface float. The Wirewalker™ profiler rides along the wire, with an internal cam grabbing the wire when it descends and releasing when the wire ascends. At the bottom of the desired profiling range, the profiler collides with a mechanical "stop" which releases the cam, enabling the Wirewalker™ to free-ascend to the top of the wire under its own buoyancy. Here, the cam is reset and the cycle repeats.

Typical profiling speeds are of order 10 m/minute, round-trip, through a wide range of sea states.

SO WHAT?

The Wirewalker™ differs from most buoyancy or motor-driven profilers in that it can either be moored to the sea-floor or drift free with the currents (Lagrangian). It can profile to within a meter of the sea surface in "undisturbed" water. Internally-recording, self-powered instruments are "interfaced" simply by bolting them to the Wirewalker™ and adjusting the floatation. Ballasting need not be as precise as with buoyancy-driven profilers. Just add pre-cut blocks of foam until the Wirewalker™ floats upward at about 0.5 m/s and you're good to go.

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BATTERIES NOT REQUIRED

The Wirewalker™ is designed to be simple in operation, robust to challenging conditions, and highly use-configurable. By transforming energy from the surface wave field to vehicle profiling motion, on-board batteries are used exclusively to power instrumentation. From conductivity, temperature and pressure observations, to optical, ocean-current, and turbulence measurements, the smooth free-ascent of the Wirewalker™ allows for the collection of high quality data from any fast-sampling oceanographic sensor.

The continuous profiling afforded by wave-energy enables the monitoring of rapidly-evolving, small-scale phenomena. The endurance afforded by wave-energy enables the big picture to be obtained as well.

PROVEN PERFORMANCE

From the Southern Ocean to Lake Superior, the Wirewalker™ has proven to be a global workhorse. Deployments have ranged from open ocean, free-drifting stations (1-500 meters every 50 minutes) to inner-shelf moorings just seaward of the surf zone (1-10 m profiled forty-thousand times per month). Over the past decade Wirewalkers have made over 500,000 profiles spanning more than 18,000 km of vertical distance, all powered by surface waves.

PROVEN PEDIGREE

The Wirewalker™ was developed by the Ocean Physics Group, Scripps Institution of Oceanography, La Jolla CA. under sponsorship from the Office of Naval Research and National Science Foundation. After extended development it is now produced commercially by Del Mar Oceanographic under exclusive license from the University of California. Wirewalker™ is a beneficiary of the Technology Transfer Programs of NSF, ONR and UCSD.

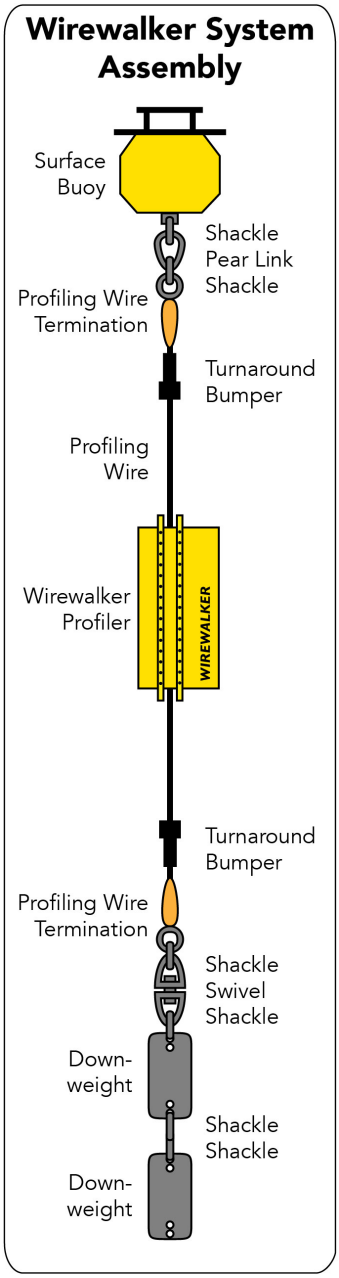

Figure 2: Wirewalker Profiling System Components and Assembly. As-is the system is ready for free-drifting deployments. Additional hardware and mooring tackle is required for moored deployments.