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CANADA

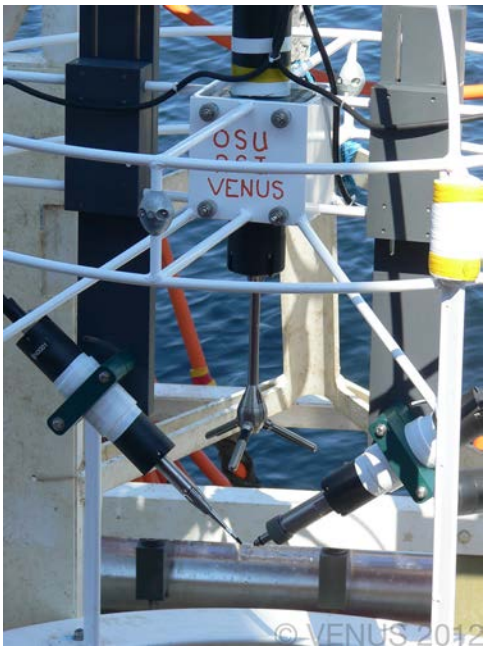
MicroSquid

Eddy Correlation Sensing System

The MicroSquid is a modular sensor package for eddy correlation measurements. It is plug-and-work compatible with a variety of current meters (e.g., Nortek Vector ADV), requiring no additional interface hardware. The MicroSquid supports a variety of high-resolution, fast-response sensors for

- Temperature
- Dissolved Oxygen
- Conductivity
- Fluorescence[1]

Our customers use MicroSquid to measure turbulence fluxes above permeable sediments, coral reefs, and sea grass beds, as well as at the ice-water interface. The up to 500 m depth rating also permits MicroSquid deployment on deep-sea benthic landers.



Design Features

- Modular individual sensor units containing sensing element and electronics
- Pressure Case rated to 500 m depth
- Sensor support for
  - FP07 micro-thermistor
  - SBE7 micro-conductivity
  - Micro-oxygen sensor (e.g., AMT galvanic DO probe)
  - Micro-fluorometer (under development)
- High bandwidth, low noise analog signal conditioning electronics operating at the thermodynamic noise level
- High-Q anti-aliasing filtering to avoid spectral signal leakage
- Dual gain settings to support galvanic and polargraphic oxygen sensors
- Supply voltage 9 – 18 VDC
- Signal output 0 – 5 V
- Available external data logger and battery packs are available for extended deployments
- Flexible and transparent Matlab processing scripts for data analysis


Photo courtesy of Brent Else, Univ. Manitoba


Photo courtesy of Kora Brandt, Univ. Trier.

[1] Under development

Description

MicroSquid is plug-and-work compatible with the Vector ADV (or other current meters that provide analog input channels). The MicroSquid receives power from the current meter and returns two high-resolution analog signals from the micro sensors. These signals are digitized and logged by the Vector. This is a simple and elegant solution that reduces the amount of hardware required for the measurement. One of the main benefits of this configuration is that the measurements of velocities and scalar signals are perfectly synchronized. There is only one data file with columns for u, v, w, plus the scalar signals. This makes it easy to calculate covariance's directly from the data file and eliminates synchronization and phase shift problems.

For extended deployments, an external data logger can be supplied that synchronously records data from up to four analog sensors and three velocity signals at acquisition rates up to 256 Hz per channel. Power is supplied from external battery packs that can be dimensioned to support long deployments.

To ensure a high signal-to-noise ratio, the signal conditioning electronics for the MicroSquid are designed using the same high standards RSI applies to their turbulence profilers. The dissolved oxygen electronics are galvanically isolated from the surrounding water using optical signal couplers. The electronics housings have internal copper cladding and electric chokes to shield against RF noise emitted by the acoustic current meter. These measures, combined with the selection of high-grade electronic components, ensure that the amplifiers operate at the theoretical thermodynamic noise level, resulting in superior signal-to-noise ratio.

MicroSquid deployment in an artificial sea ice pool using DO, thermistor, and micro conductivity sensors. Researchers at the University of Manitoba, Alberta, are using the MicroSquid system to investigate the flux of salt from the ice to the water. The study is part the Canada Excellence Research Chair program (http://www.cerc.gc.ca/chairholders-titulaires/rysgaard-eng.shtml#).

Photos and description courtesy of Brent Else, University of Manitoba.