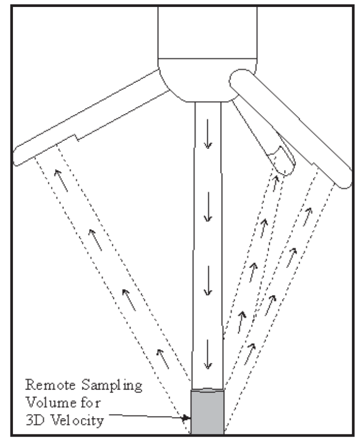
Sound Principles. Good Advice.

Expanded Description

ADVOcean/Hydra Expanded Description

The SonTek/YSI ADVOcean (Acoustic Doppler Velocimeter Ocean Probe) is a versatile, high-precision instrument used to measure 3D water velocity in the most challenging applications. The ADVOcean is designed for a wide range of environments including the surf zone, open ocean, rivers, lakes, and estuaries.



The ADVOcean uses acoustic Doppler technology to measure 3D flow in a small sampling volume located a fixed distance (18 cm) from the probe (Figure 1). The velocity range is programmable from ±5 to ±500 cm/s. Data can be acquired at sampling rates up to 25 Hz.

With no zero offset, the ADVOcean can be used to measure flow velocities from less than 1 mm/s to over 5 m/s. The remote sampling volume, stability, and rapid response of the ADVOcean make it perfect for all types of flow measurement: mean currents, waves, and turbulent flow parameters.

The ADVOcean consists of two elements: probe and processor. The probe includes the acoustic sensors, receiver, and optional sensors in a submersible housing. It is connected to the processor using a custom shielded cable up to 50 m in length.

The ADVOcean processor operates from external DC power and outputs data using serial communication or a set of analog voltages. The processor can be operated from any PC-compatible computer or can be integrated with a variety of data acquisition systems.

For autonomous deployment (internal data storage and battery power), the ADVOcean can be integrated as part of a SonTek Hydra system.

Standard ADVOcean

The standard ADVOcean probe is designed for long-term deployments in the most hostile environments. The entire probe is constructed from 316 stainless steel, and protected from corrosion by a sacrificial zinc anode (not shown). With no moving parts, the ADVOcean has excellent resistance to biological fouling. For added protection, the entire probe, including the transducers, can be coated with anti-fouling paint. The probe is connected to the processor using an underwater mateable connector.

For deep-water deployments, the ADVOcean can be rated for depths up to 2000 m (the standard depth rating is 400 m). Deep-water ADVOcean systems are commonly used on autonomous underwater vehicles (AUVs) and remotely operated vehicles (ROVs) for detailed microstructure measurements.

In any configuration, the ADVOcean probe is immune to zero drift and has no inherent minimum detectable velocity. The probe calibration can only change with physical damage to the system. No regular maintenance or re-calibration is needed.

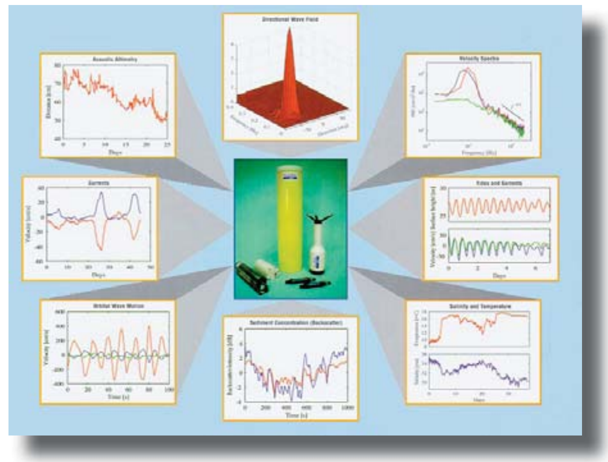
ADVOcean with Optional Sensors

The ADVOcean probe can include a number of optional sensors to greatly expand its measurement capabilities. These include – a compass and 2-axis tilt sensor allowing the ADVOcean to report velocity data in Earth (East-North-Up) coordinates; a pressure

sensor for wave height (PUVW) and surface-level measurements; and a temperature sensor for automatic sound speed compensation.

ADVOcean probes with optional sensors use an expanded housing constructed from acetyl (Delrin), and have the same reliability and performance as the standard ADVOcean probe.

Hydra (ADVOcean Autonomous Configuration)



Introduction

The heart of the SonTek/YSI Hydra is its datalogger. The central processor (CPU) controls the operation and precise synchronization of data from all sensors, even at the high 25-Hz sampling rates used by the SonTek/YSI ADV and ADVOcean Probe. In addition to the velocity sensor, the Hydra can accept one additional serial instrument and up to four additional analog sensors. The Hydra is also capable of multiple-burst sampling schemes.

Velocity Sensor

Velocities for the Hydra system can be measured by an ADV or by an ADVOcean Probe. The standard configuration includes compass/tilt, temperature, and strain gage pressure sensors mounted into an expanded bell cap on the probe's signal conditioning module. For detailed information on the operational principles of the velocity sensor, please see the ADV or ADVOcean Probe descriptions on this web site.

Serial Channel

To date we have written two drivers for the additional serial channel – one for the Paroscientific quartz crystal pressure sensor, and one for the SeaBird MicroCat Conductivity/Temperature sensor. While the standard strain gage pressure sensor is an excellent sensor for wave studies in relatively shallow water, the higher accuracy and stability of the quartz crystal sensor is necessary for long-term tidal studies. The Paros is limited to a maximum sampling rate of 4 Hz.

The SeaBird MicroCat CT sensor is designed for the measurement of slowly varying salinities and temperatures. The MicroCat is a highly accurate sensor that gathers data at a maximum rate of 0.2 Hz.

Analog Channels

There are three analog channels into the Hydra system, two of which are typically taken by the strain gage pressure sensor and the measured battery voltage. If a Paros is installed on the serial channel then the strain gage analog channel becomes free. The battery voltage measurement allows the user to develop a voltage vs. remaining battery power for their specific instrument configuration, but it can be bypassed if the channel needs to be used for another sensor. One of the most common additional analog sensor(s) integrated into a Hydra system is an Optical Backscatter Sensor (OBS) for turbidity studies.

Multiple Burst Sampling

The Hydra can support up to three independent sampling strategies to run simultaneously. A typical example would be to gather a five-minute average for mean properties, followed by two minutes of data at 4 Hz for wave studies, followed by a burst of 30 seconds at 25 Hz for turbulence studies, followed by a sleep period to conserve power.

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