

How and where is an ADCP used?



Offshore Energy Applications:

- 1. Oil & Gas:** Long range current profiles and wave measurement in support of deepwater oil and gas exploration, drilling and production. Real-time current measurement for decision making during drilling, riser deployment & recovery and ROV operations. Full water column current profiles to detect VIM phenomenon and help model VIV.
- Seismic, Cable and Pipe Laying Vessel Operations:** Real-time current profiles for streamer cable feathering angle prediction and correction, pipe lay and cable lay operations to calculate accurate touchdown position, ROV operations.

- 2. Renewable Energy—Tidal/Wave/Offshore Wind** Current and wave measurement for site selection, design and performance monitoring, and environmental impact studies.

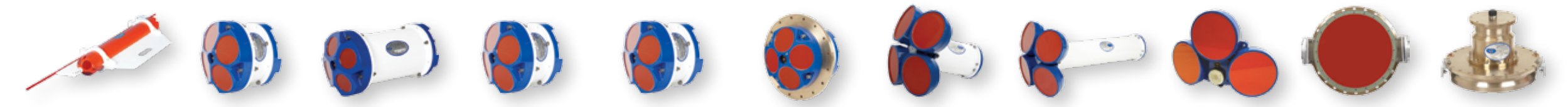
Academic Coastal Oceanography: Current and wave measurements for research areas including near-shore circulation, tidal currents, meso/micro scale turbulence, waves and wave current interaction.

Oceanographic Applications:

- 3. Biological Oceanographic** Wave and current measurements for oceanographic/meteorological data collection, display/analysis to quantify the biological/ecological condition of coasts and estuaries.
- Environmental Management:** Oceanographic and meteorological data collection, display/analysis to properly manage coastal development and quantify the environmental effects of development and conduct environmental impact studies.
- 4. Fisheries/Aquaculture** Current and wave data for site assessment and short or long-term environmental monitoring.
- 5. Navigation Safety** Current and wave measurements for oceanographic/meteorological data collection, display/analysis to increase the safety of vessel navigation within or approaching a terrestrial port.
- 6. Coastal and Ocean Engineering** Current and wave measurements for oceanographic/meteorological data collection, display/analysis to properly design coastal structures and public works projects, provide long-term monitoring, and assess impact to the littoral environment.
- 7. Integrated Ocean Observation Systems (IOOS) and Ocean Observatory Initiatives (OOI)** Real-time current and wave data support the integrated long-term monitoring, predicting and modeling of ocean environments with time scales ranging from minutes to decades.
- 8. Deep and Mid-Water Depth Moorings** Moored ADCPs for oceanographic research based on the measurement of seasonal, annual, and decadal variability of ocean currents.
- 9. Oceanographic Research Vessels** Large-scale, detailed measurements of ocean currents and motility of entrained biomass populations using vessel-mounted ADCPs.
- 10. Autonomous Underwater Vehicles (AUVs) and Gliders** ADCPs installed onboard AUVs and gliders collect current profile data over an extended range and duration for academic, commercial, and military applications.

Pick your Perfect Profiler...a simple 3-step process.

- Step 1:** Select the product best suited to your **Application**
- Step 2:** Narrow your product selection by reviewing the **Product Specifications**
- Step 3:** Further narrow your selection by choosing a **Method of Deployment**



- Doppler Volume Sampler (DVS)** Advanced alternative to a single-point current meter, offering up to 5 bins of high-resolution data.
- Workhorse Monitor** Direct read for real-time data collection.
- Workhorse Sentinel** Versatile self-contained ADCP for mooring, bottom-mount, or moving boat applications.
- Workhorse Waves Array** Product option that allows you to simultaneously collect multi-directional waves and current-profiling data.
- Workhorse Express** Value priced ADCP configuration for your basic current-profiling needs.
- Workhorse Mariner** Vessel-mounted ADCP for coastal applications.
- Workhorse Quartermaster** Highly flexible extended-range ADCP for "Continental Shelf" applications.
- Workhorse Long Ranger** Rugged and reliable ADCP for extended range applications.
- Workhorse Horizontal** ADCP that "looks out" horizontally from its mounting structure to measure near-surface water currents and multi-directional waves.
- Ocean Observer** Our longest-range ADCP for deployments from offshore platforms. High-resolution or long-range settings.
- Ocean Surveyor** Advanced long-range vessel-mounted ADCP for deep water current-profiling applications.

Application

Oil and Gas	*		*	*			*	*	*	*	
Seismic, Cable and Pipe Laying Vessel Ops		*				*	*				*
Renewable Energy		*	*	*	*	*			*		*
Biological/Oceanographic	*	*	*	*	*	*	*				
Environmental Management	*	*	*	*	*	*					
Fisheries/Aquaculture	*	*	*	*	*						
Navigation Safety		*	*	*	*				*		
Coastal and Ocean Engineering			*	*	*	*					
Observatories	*	*	*	*			*	*			
Deep and Midwater Moorings	*		*				*	*			
Research Vessels							*				*
Academic Coastal Oceanography	*	*	*	*			*	*	*		*

Product Specifications

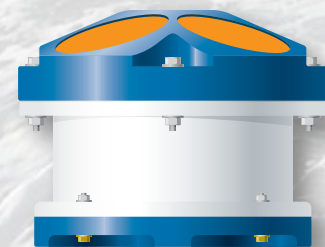
Frequency (kHz)	2400	1200/600/300	1200/600/300	1200/600/300	1200/600	1200/600/300/150	150	75	300N/300/600	38	150/75/38
Sampling Rate—Typical (Minimum)	1Hz (40Hz)	1–15 min. (~5Hz)	1–15 min. (~5Hz)	0.5Hz typ.	5 min.	1–60 min. (~5Hz)	1–60 min. (~1Hz)	15–60 min. (0.3Hz)	1–15 min. (~1Hz)	15–60 min. (~0.2Hz)	15–60 min. (~0.2Hz)
Profile Resolution—Typical (Minimum)	1m (3cm)	2m (5cm)	2m (5cm)	2m (25cm)	2m (25cm)	4m (5cm)	8m (40cm)	16m (80cm)	4m (20cm)	20m	16m
Measurement Range	0.2m–5m	0.6m–150m	0.6m–150m	2.5m–80m	0.6m–60m	0.6m–300m	10m–300m	20m–700m	6m–200m	50m–1000m+	10m–1000m+
Typical Deployment Duration	>2 years	Real-time	>1 year	>1 year	>1 year	Real-time	>1 year	6 months	Real-time	Real-time	Real-time
Operational Depth Rating	750m/6000m	200m/6000m	200m/6000m	200m	200m	Up to 50m	1500m/3000m	1500m/3000m	200m	100m	Up to 50m
Waves Upgrade		Optional	Optional		Optional				Optional		

Method of Deployment

Moving Vessel		*	*			*	*				*
Mooring/Bottom Mount	*	*	*	*	*		*	*			
Marine Structure								*	*	*	

What is an ADCP?

An Acoustic Doppler Current Profiler (ADCP) is a type of sonar that measures and records water current velocities over a range of depths. Teledyne RD Instruments actually designed and delivered the industry's first ADCP in 1982. The ADCP is now considered an essential tool for oceanography, estuary, river, and stream flow current measurement worldwide.



How do they work?

An ADCP transmits sound bursts into the water column. Suspended particles carried by water currents produce echoes (from these sound bursts) which are "heard" by the ADCP. Echoes arriving later, from deeper in the water column, are assigned greater depths in the echo record. This allows the ADCP to form vertical profiles of current velocity. The ADCP senses in four orthogonal directions simultaneously. Particles within the current flow moving towards the instrument exhibit different frequencies from those moving away. This is the famous Doppler shift, which enables precise measurement of current speed and direction.

What do they do?

When the ADCP is mounted in a moving vessel, the information obtained is used to measure water current speed, vessel speed and direction, and also distance above the sea bed. The ADCP also shows the distribution of suspended material. When the ADCP is mounted on the seabed to look upwards it measures current velocity and direction and—with a simple software add-on—the direction of waves. So with a Teledyne RDI ADCP you can:

- Survey the patterns of currents, suspended sediments, and zooplankton.
- Simplify difficult measurements—e.g. river discharge and biomass.
- Receive rapidly updated hi-res data in shallow water and observe short-lived events or small sized features.
- Measure vessel movement through water or over the bottom.
- Determine position and altitude of underwater vehicles such as AUVs and ROVs.
- Collect high-resolution time series of currents at many depths using a single instrument.

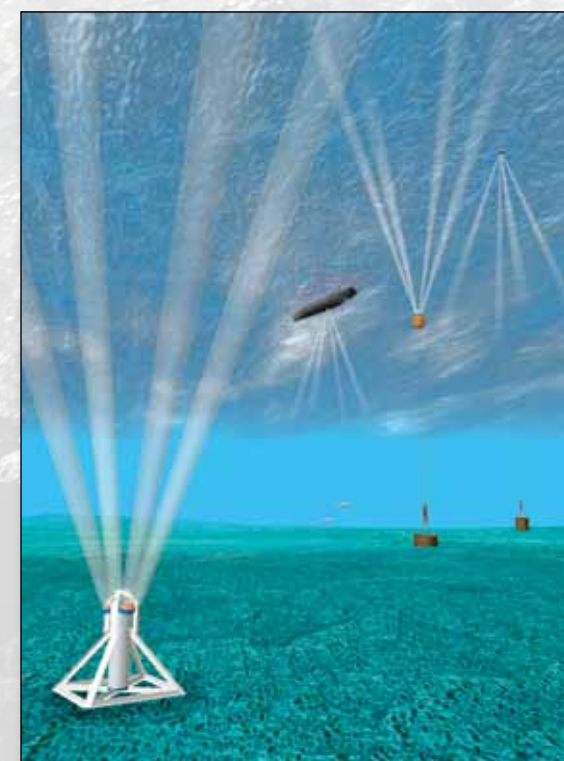
What makes Teledyne RDI's ADCPs unique?

With well over 12,000 Doppler products delivered worldwide, Teledyne RDI's Workhorse ADCP products have become the de facto standard instrument used worldwide by scientists and field engineers to improve their understanding of water current circulation. Only Teledyne RDI's proven ADCP products can provide:

- Our patented BroadBand processing for significantly improved data quality, power efficiency, and error detection over competing narrowband systems.
- Our patented 2-dimensional phased array transducer design for significantly reduced size, weight, and deployment complexity.
- Our unique 4-beam configuration designed to ensure data redundancy for quality and reliability.
- A highly flexible design, which ensures that your base instrument is designed to meet your current needs and future needs as well.

Teledyne RDI's ADCPs have become synonymous with high-quality data, ease of operation, and unsurpassed value. Each and every one of our products is backed by:

- The best customer services team and philosophy in the industry. We gauge our success by your success.
- 24/7 emergency service and support. You'll never be left to sort out an issue alone.
- Our worldwide offices and leading industry representative network to ensure local support when and where you need it.
- Free online training and product support via our highly informative and dynamic Teledyne RDI University.
- Our uncompromising commitment to product quality and field dependability.

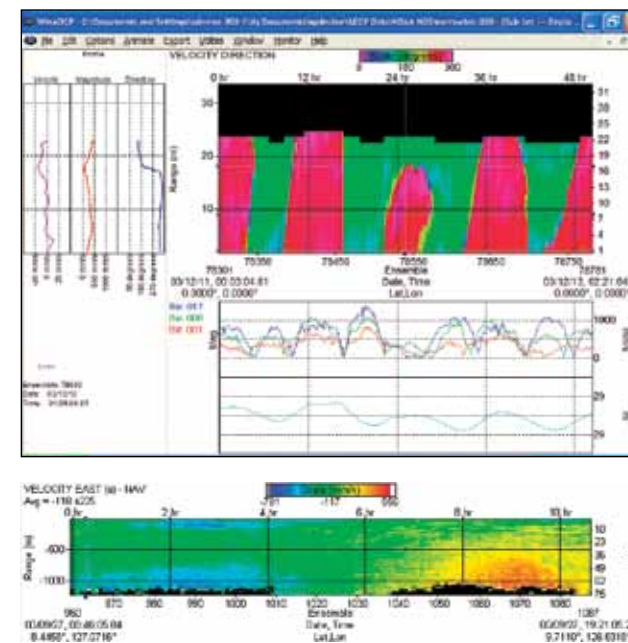


Teledyne RDI ADCPs are versatile enough to be used in a wide range of marine applications.

How is my data displayed?

Teledyne RDI offers an array of software suites designed to quickly convert data into a variety of graphical display options, allowing you to quickly and easily view and assess the data you've collected. Our versatile software packages allow you to study the results of long-term self-contained deployments, or watch your real-time measurements as they unfold.

For those new to data collection, Teledyne RDI's software offers Wizards that quickly walk you through your system setup and data collection functions. For those with advanced or highly specific data requirements, Teledyne RDI offers the most comprehensive and powerful ADCP software in the industry. From rivers to deep-ocean projects, Teledyne RDI has a software solution to meet your project needs. Consult with our sales staff to see which option is right for you.



Top right: ADCP time series data from New York Harbor showing shear going out of the harbor at the surface and into the harbor at the bottom.

Above right: The east-west velocity field as measured by a 38 kHz Ocean Surveyor mounted on the JAMSTEC R/V Kaiyo, which was steaming at 13 kts off the coast of Mindanao (Philippines). The x axis is ensemble number (five minutes per ensemble), the y axis is range in meters and the velocity range is indicated by the color bar at the top of the plot. Note the deep, strong eddy centered at 1,000 m depth.



Teledyne RD Instruments, Inc. specializes in the design and manufacture of underwater acoustic Doppler products and oceanographic sensors for a wide array of commercial, academic, and defense applications. The company currently employs over 200 multi-disciplined scientists, engineers, technicians, sales, and support personnel, and resides in an 80,000 square-foot ISO-9001:2000 facility that includes state-of-the-art engineering, laboratory, manufacturing, and test areas. The company is comprised of three distinct business units, each focused on acoustic Doppler technology:

Marine Measurements: Acoustic Doppler current-profiling, wave-measurement, and CTD products for coastal and deepwater oceanographic environments.

Navigation: Precision acoustic Doppler navigation products for the marine environment.

Water Resources: Acoustic Doppler discharge and flow-measurement products for inland environments.

Since 1982, Teledyne RDI has led the industry by providing our customers with the highest quality, innovative Doppler technology backed by our unparalleled customer service and support.

Our Commitment to you...

At Teledyne RD Instruments, we aspire to maintain leadership in our marketplace, enlisting customers as partners to work together in enduring relationships built on mutual trust and mutual benefit. From this foundation, we will continually evolve our products and services to meet our customers' needs.



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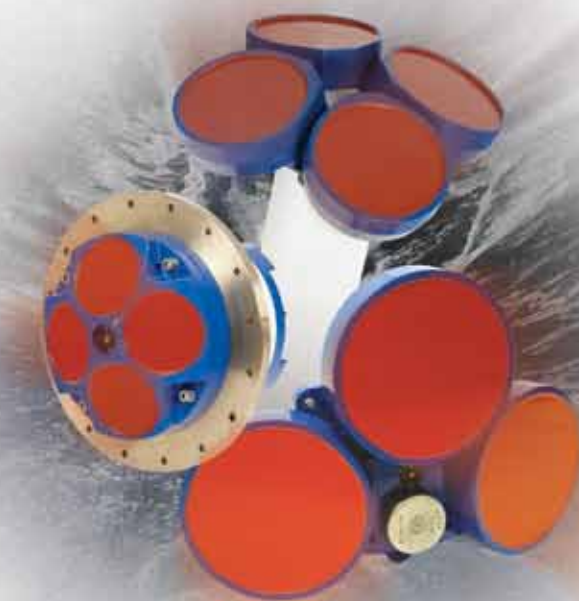
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MARINE MEASUREMENTS
PRODUCT OVERVIEW
GUIDE

