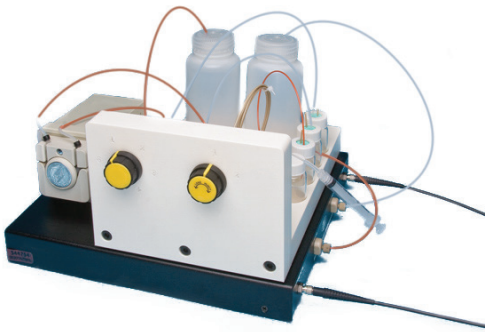
The CDOM-COAST System 1-4 m^{-1}			
LOW VOLUME		**HIGH VOLUME**	
Product Description	**Item #**	**Product Description**	**Item #**
LWCC, 100 cm pathlength	LWCC-3100	LWCC, 50 cm pathlength	LWCC-4050
PDA Spectrophotometer System, UV/VIS (190-720nm) with integrated D2H Lamps	505067	PDA Spectrophotometer System, UV/VIS (190-720nm) with integrated D2H Lamps	505067
(2) UV-Enhanced Fiber Optic Cables. 1 m, 600 µm Core.	FO-600-SMA1M	(2) UV-Enhanced Fiber Optic Cables. 1 m, 600 µm Core.	FO-600-SMA1M
Ministar Peristaltic Pump	MiniStar	PeriStar Pro Pump	PeriPro-4LS
LWCC Injection System	89372	Injector Kit	72100
TTL Control Module for Ministar and/or Peristar	503120	TTL Control Module for Ministar and/or Peristar	503120
UV-Enhanced Fiber Optic Cable	FO-200-SMA1M	UV-Enhanced Fiber Optic Cable	FO-200-SMA1M
(2) SMA Bulkhead feed through Connector/Coupler	13395	(2) SMA Bulkhead feed through Connector/Coupler	13395

The CDOM-Ocean System < 1 m^{-1}			
LOW VOLUME		**HIGH VOLUME**	
Product Description	**Item #**	**Product Description**	**Item #**
LWCC, 250 cm pathlength	LWCC-3250	LWCC, 100 cm pathlength	LWCC-4100
PDA Spectrophotometer System. UV/VIS (190-720nm) with integrated D2H Lamps.	505067	PDA Spectrophotometer System. UV/VIS (190-720nm) with integrated D2H Lamps	505067
(2) UV-Enhanced Fiber Optic Cables. 1 m, 600 µm Core.	FO-600-SMA1M	(2) UV-Enhanced Fiber Optic Cables. 1 m, 600 µm Core.	FO-600-SMA1M
Ministar Peristaltic Pump	MiniStar	PeriStar Pro Pump	PeriPro-4LS
LWCC Injection System	89372	Injector Kit	72100
TTL Control Module for Ministar and/or Peristar	503120	TTL Control Module for Ministar and/or Peristar	503120
UV-Enhanced Fiber Optic Cable	FO-200-SMA1M	UV-Enhanced Fiber Optic Cable	FO-200-SMA1M
(2) SMA Bulkhead feed through Connector/Coupler	13395	(2) SMA Bulkhead feed through Connector/Coupler	13395



CDOM complete system, showing the LWCC, MiniStar peristaltic pump and LWCC injection system.

WORLD PRECISION INSTRUMENTS

USA: International Trade Center, 175 Sarasota Center Boulevard, Sarasota FL 34240-9258 USA

Tel: (941) 371-1003 • **Fax:** (941) 377-5428 • **E-mail:** wpi@wpiinc.com • **Internet:** www.wpiinc.com

UK: 1 Hunting Gate, Hitchin, Hertfordshire SG4 0TJ England • Tel: 44 (0)1462 424700 • E-mail: wpiuk@wpi-europe.com
Germany: Saarstraße 23, D-61169 Friedberg (Hesson), Tel: +49 (0)6031 1602171 • Fax: +49 (0)6031 1602180 • E-mail: wpide@wpi-europe.com
China & Hong Kong: Rm 25e, No8 Donfang Rd., Pudong District, Shanghai 200120 PRC • Tel: +86 688 85517 • E-mail: ChinaSales@china.wpiinc.com
Brazil: Conselheiro Nabias, 756 sala2611, Santos-São Paulo 11045-002 Brazil • E-mail: info@brazil.wpiinc.com

WORLD
PRECISION
INSTRUMENTS
Instrumenting scientific ideas

MEASURE

Color Dissolved Organic Matter (CDOM)

Liquid Waveguide Capillary Cell (LWCC) for aquatic ecosystems

- Detect lower concentrations of solutes
- Conduct a broader range of absorbance measurement

What is CDOM?

CDOM (Colored Dissolved Organic Matter) is organic matter whose optical properties are measurable using WPI's Liquid Waveguide Capillary Cell. CDOM occurs naturally in water systems and is derived from organic tannins. CDOM concentration depends on the location where samples are taken, with coastal waters showing higher CDOM concentrations compared to open-ocean waters. In addition, CDOM absorption depends on open-ocean water depth.

Why is the study of CDOM levels important?

CDOM is naturally occurring but the environment can influence the level of CDOM in water particles. Measuring the level of CDOM is important because CDOM can have a big effect from fresh to oceanic environments. For example, a higher concentration of CDOM in water particles reduces photosynthesis and negatively affects the food chain.

Common applications of CDOM detection

- Determine the biogeochemical cycles, e.g. the organic carbon-based cycle in the ocean.
- Monitor and map of surface-water masses.
- Measure the UV light penetration into the ocean to determine:
  - Photosynthesis reaction with effects on phytoplankton population
  - Effect on oceanic food chains
  - Atmospheric oxygen concentration
- Monitor the light absorption of CDOM as it relates to heat storage and the decline of sea ice.

Why use WPI's LWCC over traditional spectroscopy systems?

Technology–LWCCs are fiber optic flow cells that combine an increased optical pathlength (1–500 cm) with small sample volumes ranging from 2.4 µL to about 3mL.

Key features

Select models:

- 10–250 cm pathlength (depending on LWCC model)
- 0.125–3.1 mL internal volume (depending on LWCC model)
- 230–730 nm wavelength range (depending on LWCC model)

All models:

- 5–500 fold sensitivity improvement in comparison to 1 cm cuvettes
- 0.55 mm ID for low sample volume sampling
- 2 mm ID for unfiltered liquid samples
- SMA 905 fiber optic connections

Benefits

- Improved dynamic range for broader range of absorbance measurements
- Improved sensitivity of measurement
- Detect lower concentrations of solutes
- Measurements can be made using smaller sample volumes
- Compact, portable system for real time measurement on yboard a ship

Determination of LWCC pathlength

Selecting the proper equipment is imperative when setting up your system. Here are a few considerations:

- Select the LWCC pathlength based on the desired absorption range. Here some reference values for different water types:
  - Fresh water with absorption range > 4.0 m^{-1}
  - Coastal-ocean waters with absorption range 1.0–4.0 m^{-1}
  - Open ocean water with absorption range < 1.0 m^{-1}
- Select the usable internal volume.

Now, you can select components to complete your CDOM analysis system, depending on the selected LWCC.

The effective pathlength of WPI's LWCC is defined as the equivalent pathlength of the cell, if it is assumed that the LWCC follows strictly the Beer-Lambert law: $A = \varepsilon \times c \times L$, where A is measured absorbance, ε the molar extinction coefficient, c is concentration and L the effective pathlength.

Typically, the longer LWCC pathlength is used to increase the sensitivity when the maximal absorbance values are supposed to be <0.1 AU (Absorbance Unit). Inversely, when absorbance measurements are above 1.4 AU, the LWCC pathlength should be decreased to ensure that measurements still remain within the linear range of the LWCC detection system.

Absorbance measurements obtained with WPI's LWCC and Tidas S300 UV/VIS spectrophotometer are linear up to 1.4 AU. The measured absorbance can be converted to the spectral absorption coefficient α(λ), commonly used in oceanography for CDOM measurements. Absorbance and spectral absorption are related by the formula: $\alpha(\lambda) = 2.303\ A(\lambda) / L$, where 2.303 is the conversion factor from decimal to natural logarithmic, A (λ) is the absorbance at wavelength λ and L the LWCC pathlength.

LWCC Type	Pathlength (cm)	Noise (mAU)	Absorbance Range (mAU)	Absorption Range (m^{-1})	Internal Volume (mL)
LWCC-4010	10	< 0.1	0.5 - 1400	0.012 - 32.0	0.31
LWCC-4050	50	< 0.2	1.0 - 1400	0.005 - 6.4	1.57
LWCC-4100	100	< 0.5	2.5 - 1400	0.006 - 3.2	3.1
LWCC-3050	50	< 0.1	0.5 - 1400	0.002 - 6.4	0.125
LWCC-3100	100	< 0.2	1.0 - 1400	0.002 - 3.2	0.250
LWCC-3250	250	< 0.5	2.5 - 1400	0.002 - 1.2	0.625

The useful absorption range calculation is based on the absorbance detection limits of the LWCC, considering a wavelength range of 300—700nm.

System Configurations

The CDOM-FRESH System > 4 m^{-1}			
LOW VOLUME		**HIGH VOLUME**	
Product Description	**Item #**	**Product Description**	**Item #**
LWCC, 50 cm pathlength	LWCC-3050	LWCC, 10 cm pathlength	LWCC-4010
Photo Diode Array (PDA) Spectrophotometer System, UV/VIS (190-720nm), integrated D2H Lamps	505067	PDA Spectrophotometer System, UV/VIS (190-720nm), integrated D2H Lamps	505067
(2) UV-Enhanced Fiber Optic Cables, 1 m, 600 µm Core	FO-600-SMA1M	(2) UV-Enhanced Fiber Optic Cables, 1 m, 600 µm Core.	FO-600-SMA1M
Ministar Peristaltic Pump	MiniStar	PeriStar Pro Pump	PeriPro-4LS
LWCC Injection System	89372	Injector Kit	72100
TTL Control Module for Ministar and/or Peristar	503120	TTL Control Module for Ministar and/or Peristar	503120
UV-Enhanced Fiber Optic Cable	FO-200-SMA1M	UV-Enhanced Fiber Optic Cable	FO-200-SMA1M
(2) SMA Bulkhead feed through Connector/Coupler	13395	(2) SMA Bulkhead feed through Connector/Coupler	13395