#### **BCA** Services

Beaver Creek Analytical, LLC (BCA) has decades of experience in *in situ* dissolved gas analysis and cold seep characterization campaigns.

We provide consulting services for

- Pre-cruise risk and site assessment analysis
- Deployment platform development
- Survey and sensor integration
- Sensor-triggered discrete sample collection
- On-site shipboard sample analysis
- Shoreside support and training
- Real-time software integration
- Data interpretation
- Comprehensive reporting



## Research and Development

We are always working to expand our products and services. Contact us to if you are interested in exploring our latest sensing technologies:

- Ultra low detection limit for C<sub>1</sub>-C<sub>3</sub> hydrocarbons
- Real-time detection of *in situ*  $\delta^{13}$ C-CH<sub>4</sub> isotopes
- Simple sensors for real-time  $C_1/C_2$  analysis



- Dissolved methane, ethane, and more
- $C_1/C_2 \rightarrow$  Thermogenic vs biogenic
- Sensor-triggered discrete sampling
- Seep hunting and characterization
- Shipboard isotopes and GC
- Cold seep campaign management

# Beaver Creek Analytical LLC



# In Situ Sensing

Reduce ship-time with adaptive cruise strategies Assured collection of target samples



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### **Underwater Mass Spectrometry**

BCA's membrane inlet underwater mass spectrometer (UMS) continuously quantifies dissolved gases species and operates for months at depths up to 3,000 m.

#### Simultaneous detection of

- Natural gas (alkanes, cycloalkanes, aromatics)
- Air  $(N_2, O_2, Ar)$
- VOCs. BTEX
- $CO_2$  and  $H_2S$
- Hydraulic fluids
- Mineral oils
- He and  $H_2$

### **Analytical Specifications**

- 30 nM Det. Lim. (CH<sub>4</sub> by  $3\sigma$ ). Leak and seep detection.
- $10^6$  linear dynamic range. Ratiometrics e.g.,  $C_1/C_2$ .
- 20-40 s response times (T90). High-res chemical mapping.
- 8 s data reporting period. Adaptive sampling.
- Rapid signal return to baseline. Rapid site execution.
- On demand spectral scans. Detection of exotic volatiles.

## **Operational Specifications**

- Depth Rating: 3,000 m
- Power: ~65 W using dual 18-60 VDC and 110-250 VAC
- **Dimensions**:  $\emptyset = 202 \text{ mm} (8 \text{ in}), l = 526 \text{ mm} (20.7 \text{ in})$
- Weight: 34 kg in air, 17 kg in seawater
- Software: Real-time plotting, mapping, logging, API
- Subsea Network: UMS provided 12 W and RS-485



#### In Situ Calibrations

BCA's dissolved gas standards and subsea stream selector uniquely provide in situ calibration for accurate and verifiable results.

## Sensor-Triggered Sampling

The UMS triggers collection of 30 to 500 mL discrete samples for shipboard analysis. The system precisely directs target samples into lossless, gas-tight vessels.



### **Shipboard Services**

- Near real-time offshore  $\delta^{13}$ C-CH<sub>4</sub> analysis
- Compositional analysis of dissolved gas by GC
- analysis (e.g.,  $\delta^2$ H-CH<sub>4</sub> and  $\delta^{13}$ C-C<sub>2</sub>H<sub>6</sub>) at accredited laboratories



With real-time  $C_1/C_2$  and near real-time  $\delta^{13}C$ -CH<sub>4</sub> cold seep genesis can be estimated on-site using a Bernard diagram.

#### Cold Seep Characterization

The UMS can assess the probability of a thermogenic seep using  $C_1/C_2$  data while 100s of meters away. Critical effluent from the UMS can be collected for shipboard or lab analysis.



Pinpoint a seep using the UMS and sonars, and detect thermogenic compounds with full spectral scans.

- C4-C7 alkanes and cycloalkanes
- Benzene
- Toluene

The real-time information from the UMS enables adaptive sampling strategies that reduce ship-time and improve sampling success rates.

# Applications

# scan for mo

#### Leak Detection and Composition

• Infrastructure and seafloor monitoring of hydraulic fluid, air, natural gas, and carbon storage

#### Hydrogen

• Detection of dissolved white hydrogen emissions

#### Spill Response and Plume Assessment

• Define and track hydrocarbon plume and byproducts

#### Software

Underway<sup>TM</sup> logs and visualizes UMS data in real time. It is fully customizable for your offshore needs.

- Multi-axis timeseries
- Depth profiles
- 2D scatter and contour
  - 3D visualization
- Multi-sensor data integration
- Real-time georeferencing • Complex calculations
- UDP output

- - Preservation and shipping of samples for post-cruise