Bridging Sea, Ground, Sky, and Space:

Using Underwater Acoustics for Global Navigation and Communication

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09 DEC 2025

AGENDA

DBV TECHNOLOGY
CUSTOM OCEAN INSTRUMENTATION

- Personal Introductions & Background
- Company snapshot
- Undersea Vehicle Navigation:
    1. Terminology
    2. Techniques
    3. Underwater Acoustic Positioning & Communication
- Case Study Examples:
    1. Undersea Tracking Range
    2. AUV Deep Seafloor Survey
    3. Seafloor Geodesy
    4. ROV Pipeline Survey

Personal Introductions & Background

Company snapshot - Overview

DBV TECHNOLOGY
CUSTOM OCEAN INSTRUMENTATION

- Custom ocean instrumentation specializing in underwater acoustic systems, navigation, positioning, and command & control
- Rapid prototyping – hardware, electronics and software
- Laser focused on reducing time and cost going from the Whiteboard to the Water
- Veteran Owned Small Business founded 2008
- 13 full-time, 1 part-time, and growing

Underwater Vehicle Navigation - Terminology

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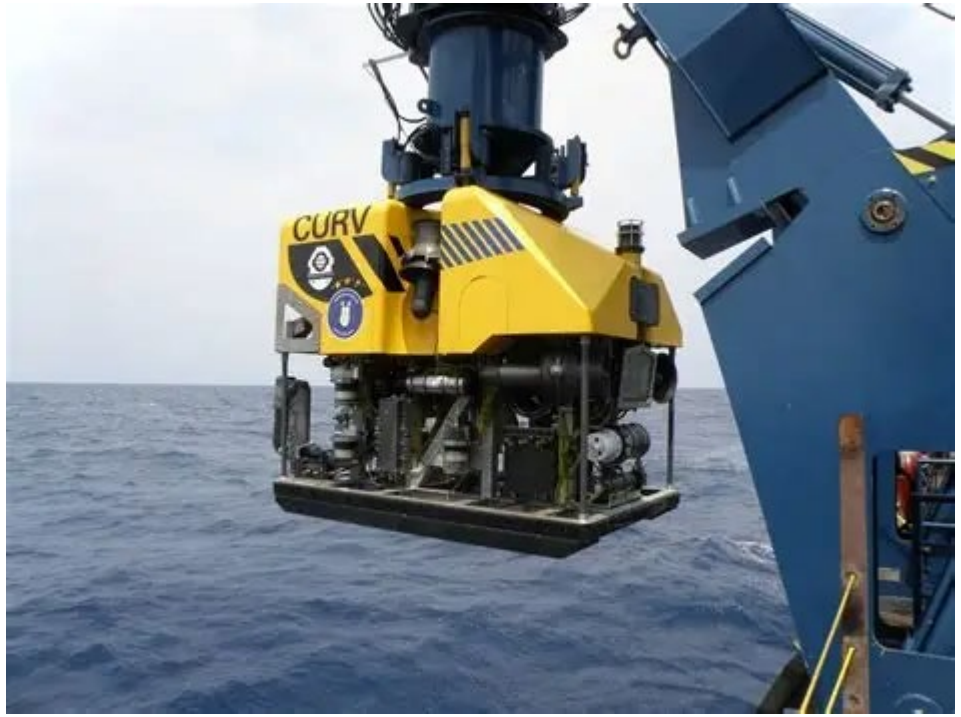
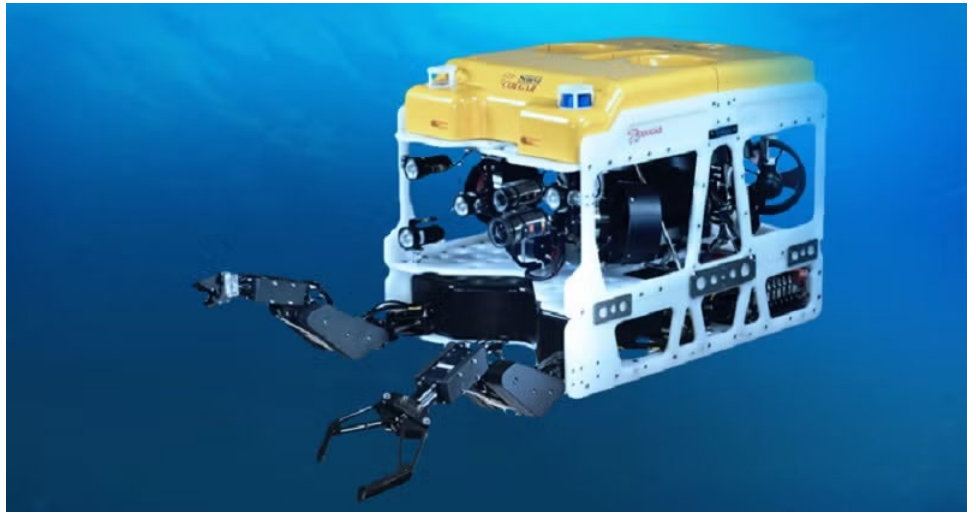
- UUV (Unmanned Underwater Vehicle)
- AUV (Autonomous Underwater Vehicle)
- ROV (Remotely operated Underwater Vehicle)
- LARS (Launch and Recovery System)
- TMS (Tether Management System)
- IMU (Inertial Measurement Unit)
- INS (Inertial Navigation System)
- GPS (Global Positioning System)
- GNSS (Global Navigation Satellite System)(GPS, Beidou, Galileo, GLONASS)
- DVL (Doppler Velocity Log)
- LBL (Long Baseline)
- SBL (Short Baseline)
- USBL (Ultra-Short Baseline)
- Transducer
- Transceiver
- Transponder
- Pinger
- Beacon

Positioning vs. Navigation

Underwater Vehicle Navigation - Terminology





ROV's

Underwater Vehicle Navigation - Terminology

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AUV's

Underwater Vehicle Navigation - Terminology

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AUV's

Underwater Vehicle Navigation - Techniques

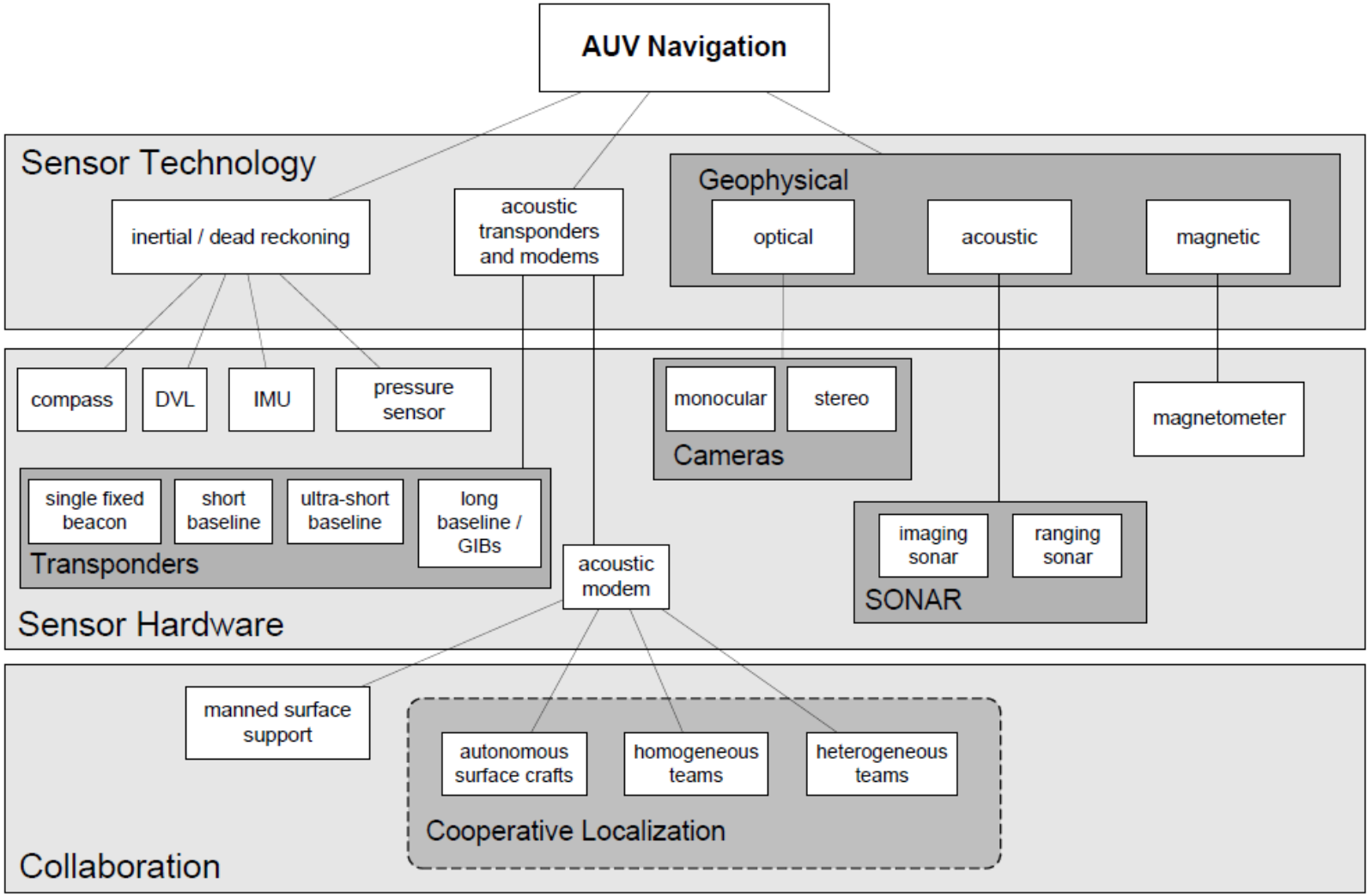

Fig. 1. Outline of underwater navigation classifications. These methods are often combined in one system to provide increased performance.

Underwater Vehicle Navigation - Techniques

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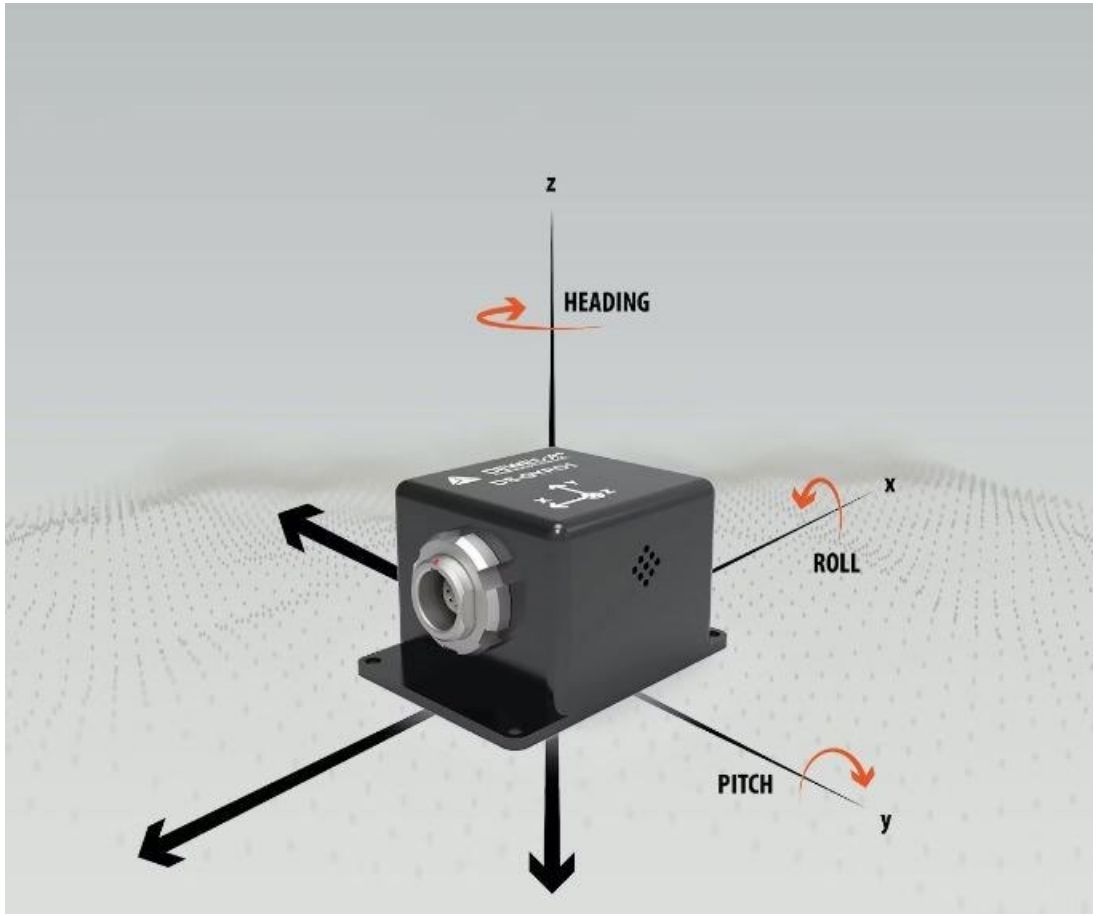

Inertial Measurement Unit (IMU)

Underwater Vehicle Navigation - Techniques

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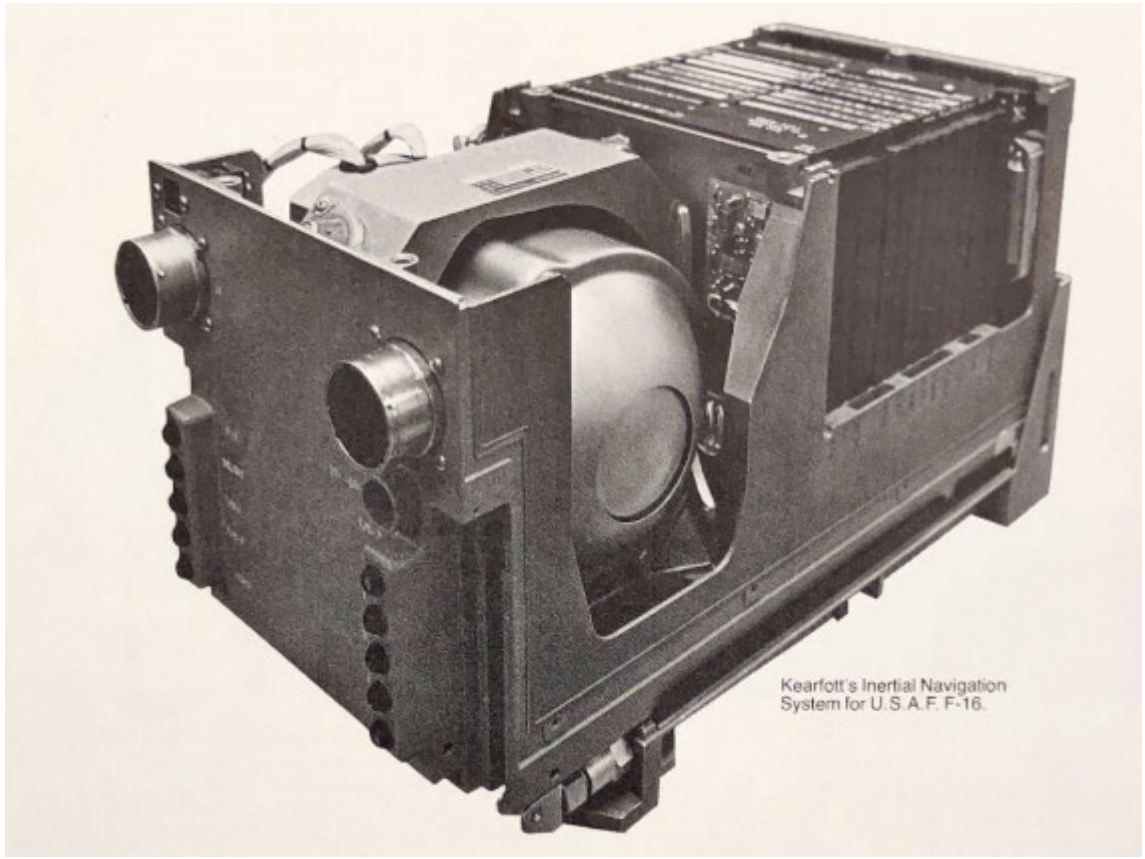
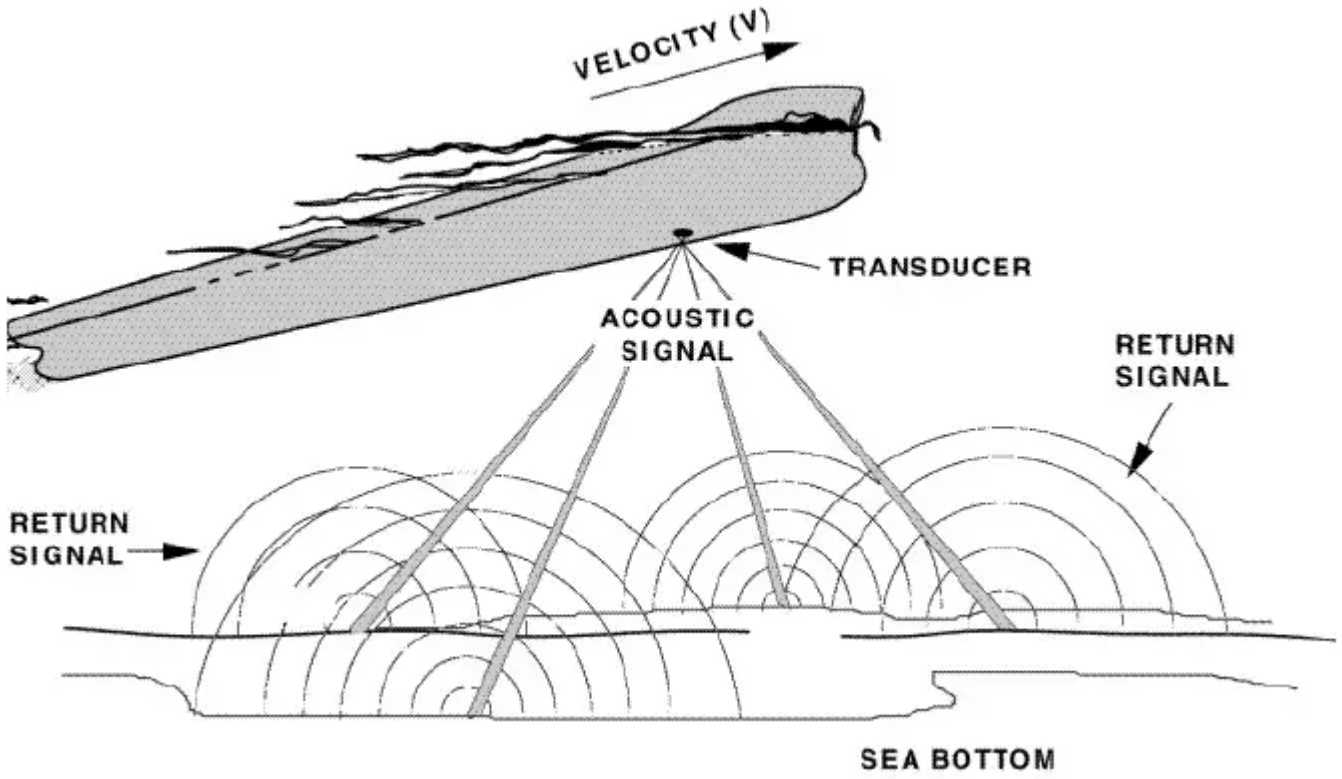


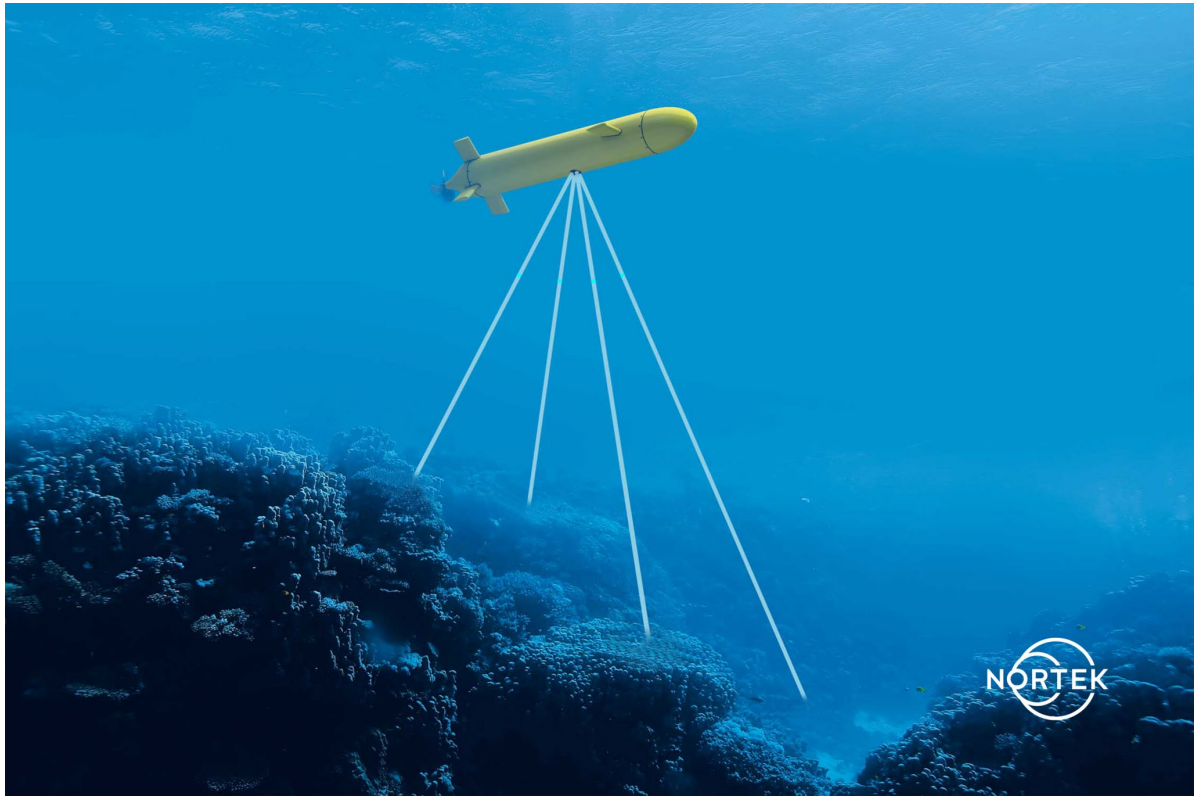
Inertial Navigation System (INS)

Underwater Vehicle Navigation - Techniques



Doppler Velocity Log (DVL)

Underwater Vehicle Navigation – Techniques



Inertial Navigation System (INS) and Doppler Velocity Log (DVL)

Underwater Acoustics – Signaling & Communications

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Frequency (Hz)	Range (m)	Latency (s)	Bandwidth (Hz)	Data Rate (Baud)
100	> 100,000	67	1-5 (1%-5%)	<10
1,000	50,000	33	100 (10%)	10-200
10,000	10,000-20,000	6-12	5,000 (50%)	300-3,000
100,000	100-200	.07-.13	50,000 (50%)	10,000-20,000
1,000,000	1-3	.00067-.002	200,000 (20%)	>50,000

DVL frequencies are 50 kHz (low) to 500 kHz (nominal)

Underwater Acoustic Positioning

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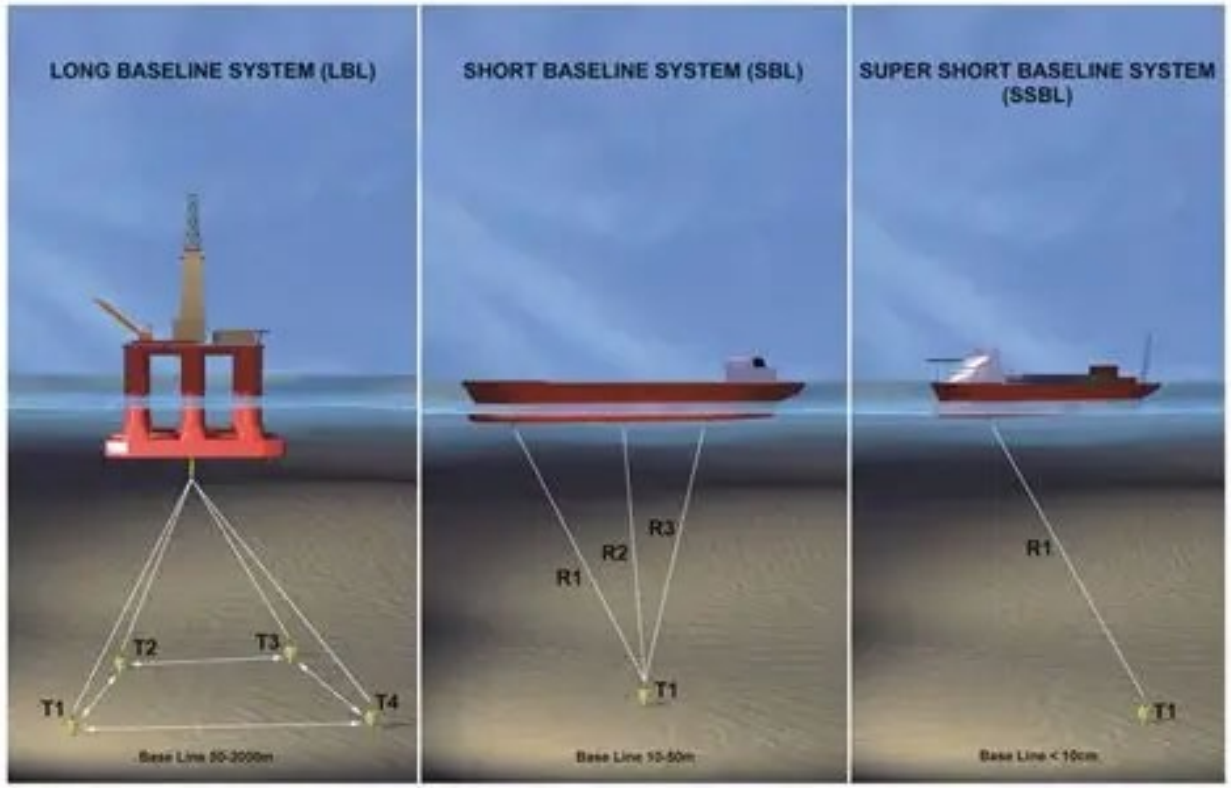
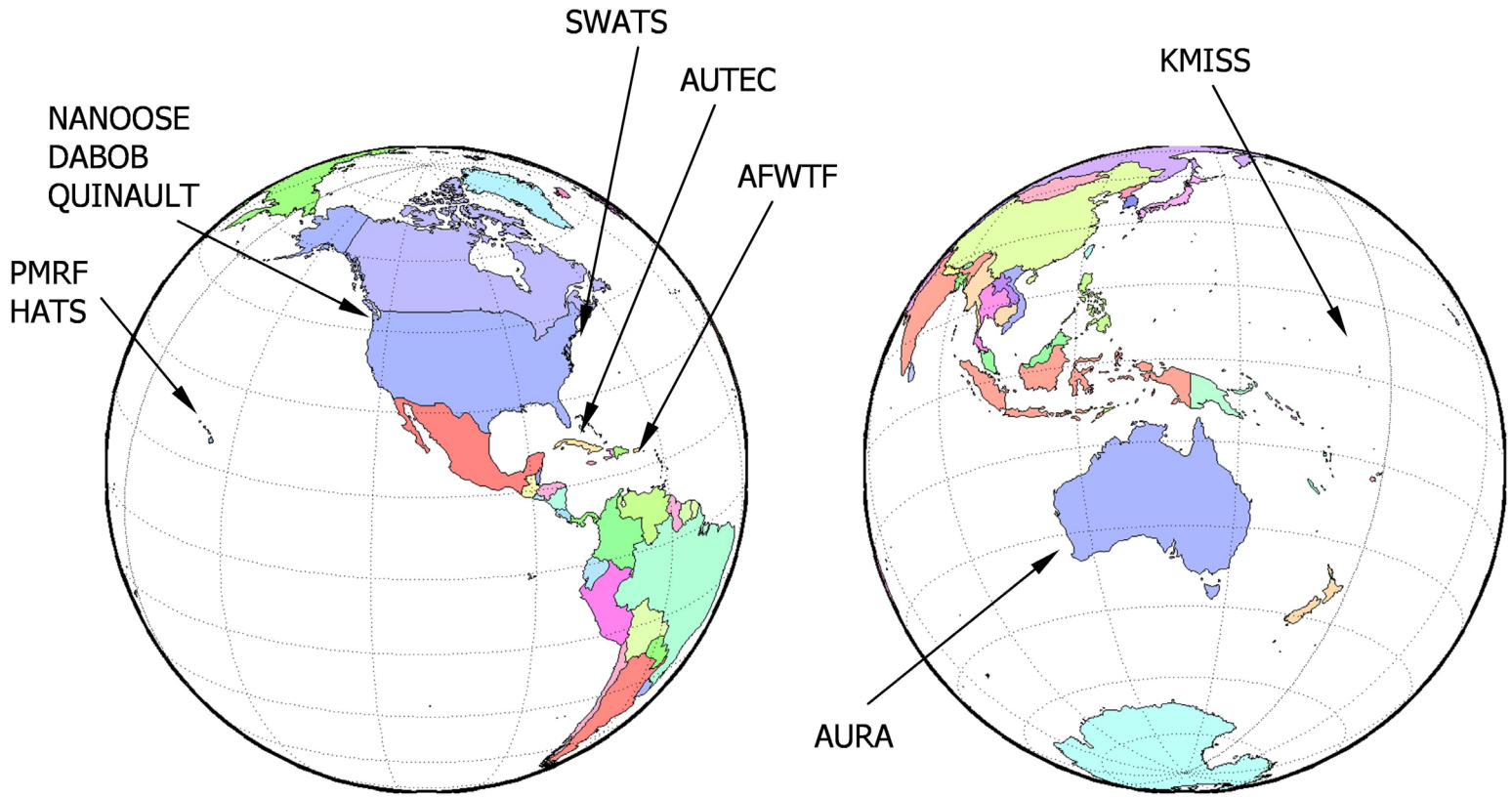


Undersea Tracking Range



Undersea Tracking Range

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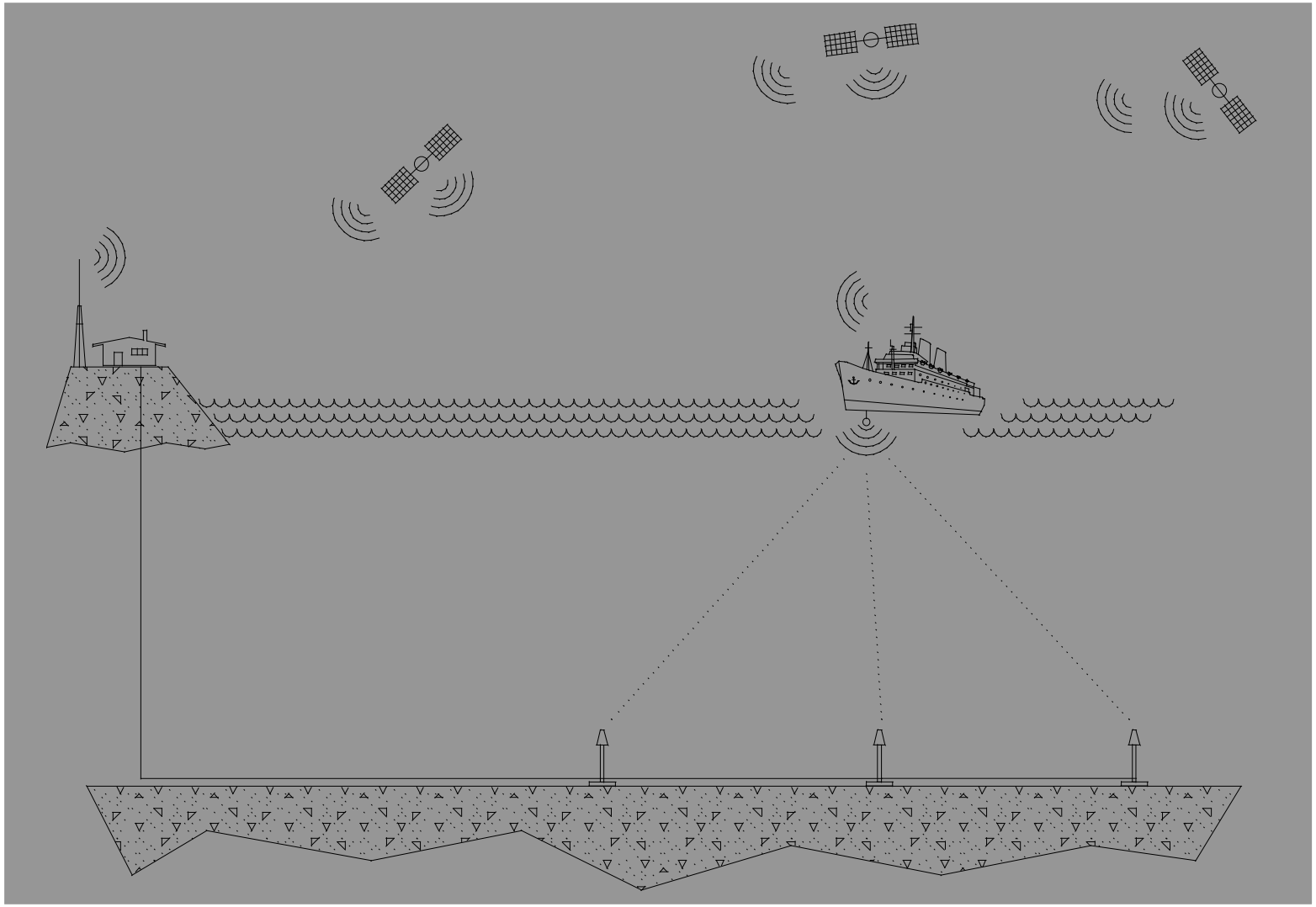

AUV Deep Seafloor Survey

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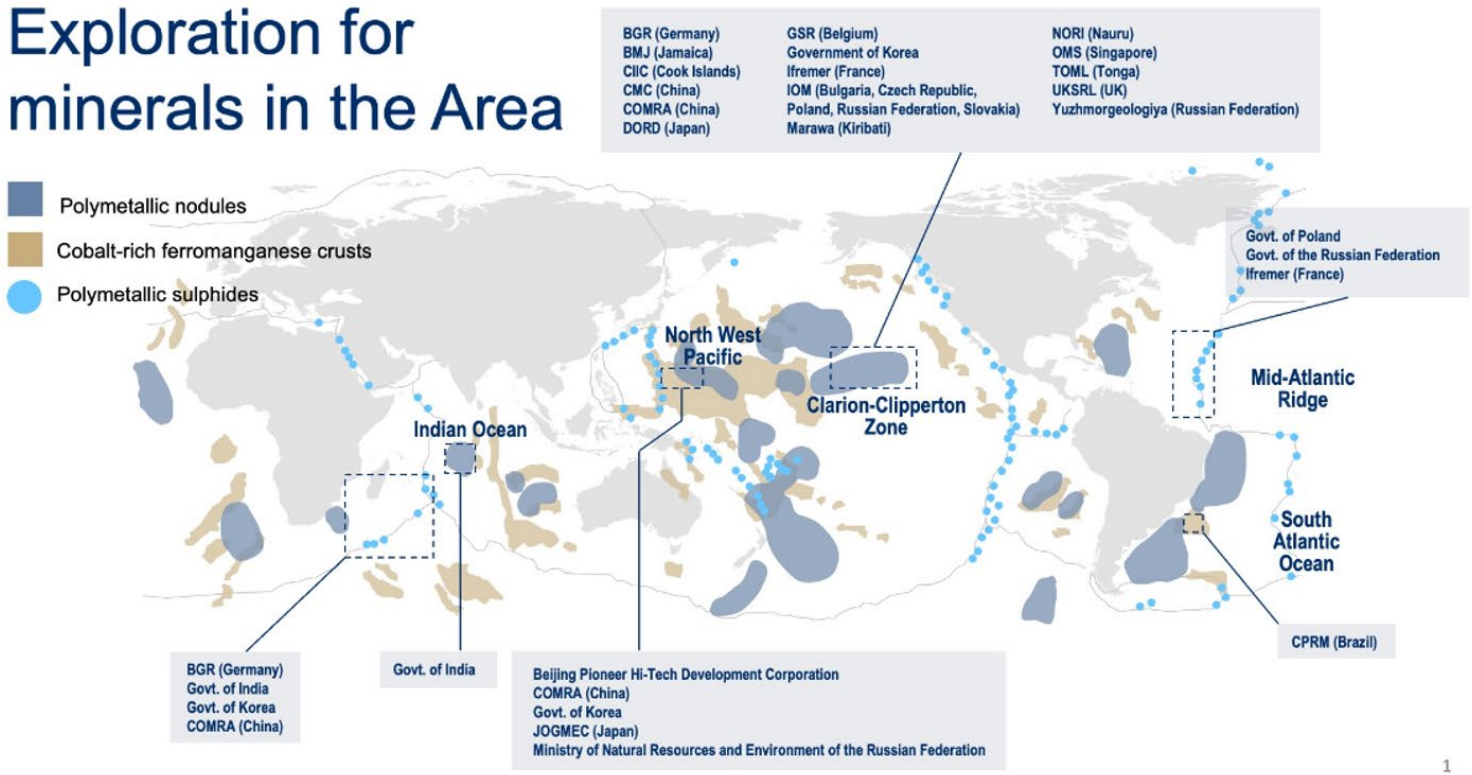
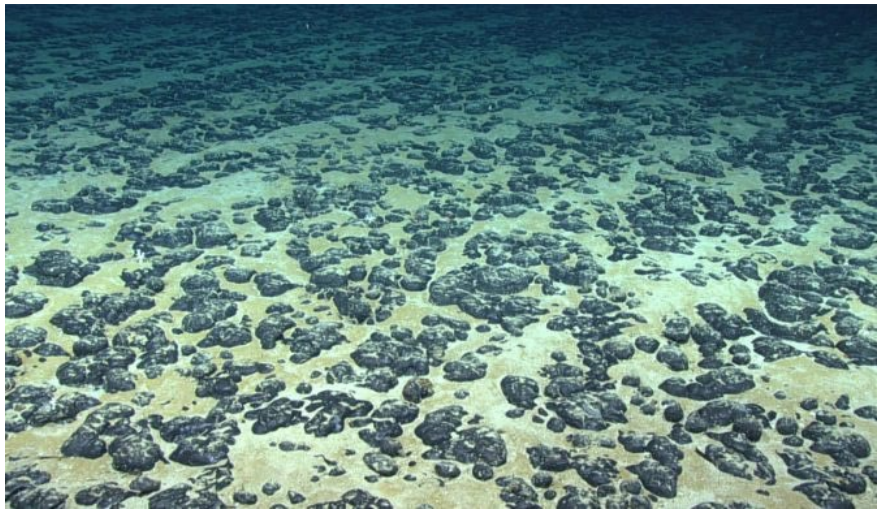
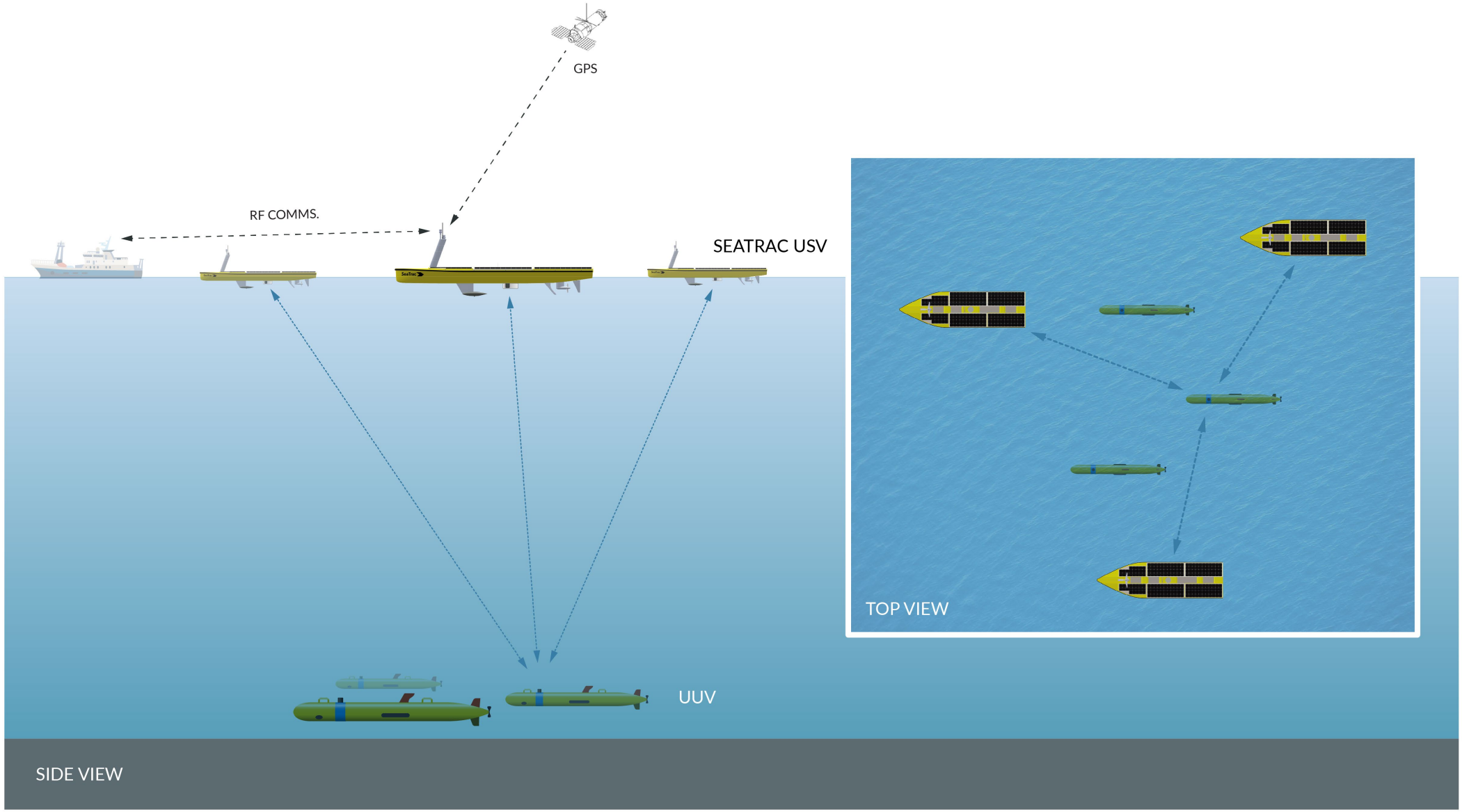




AUV Deep Seafloor Survey



AUV Deep Seafloor Survey

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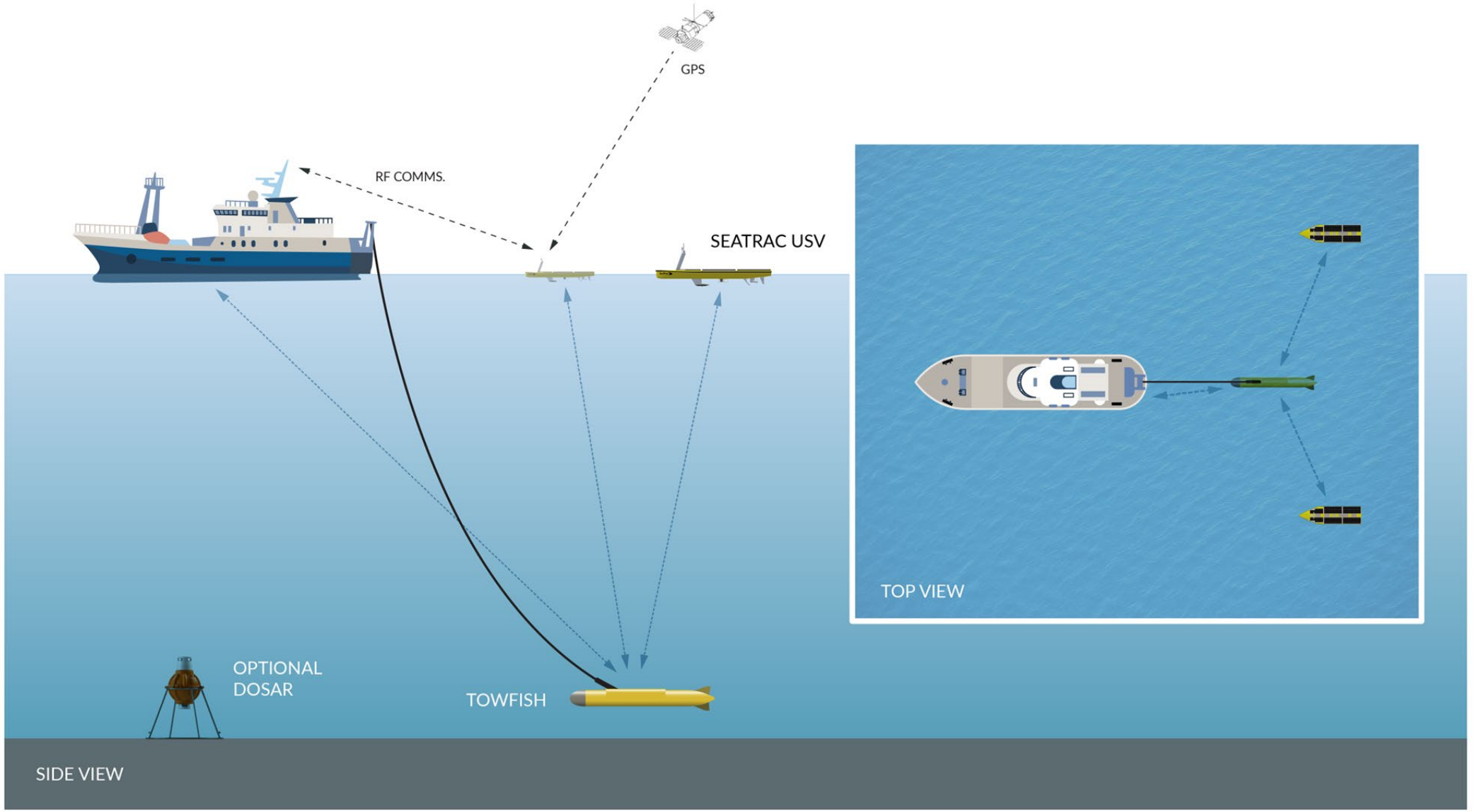

Seafloor Geodesy

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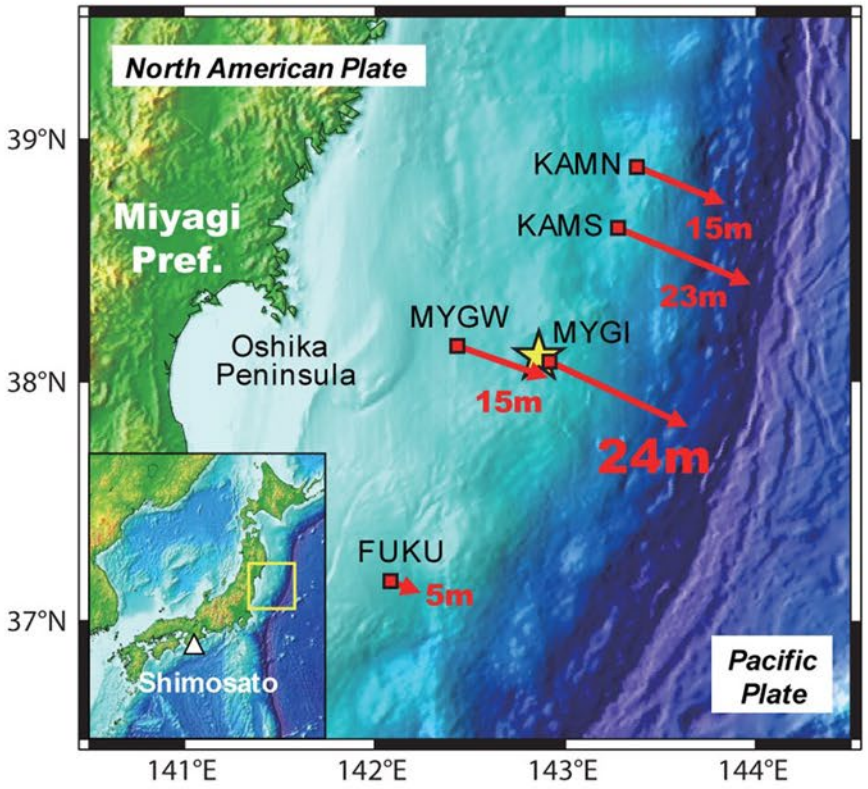
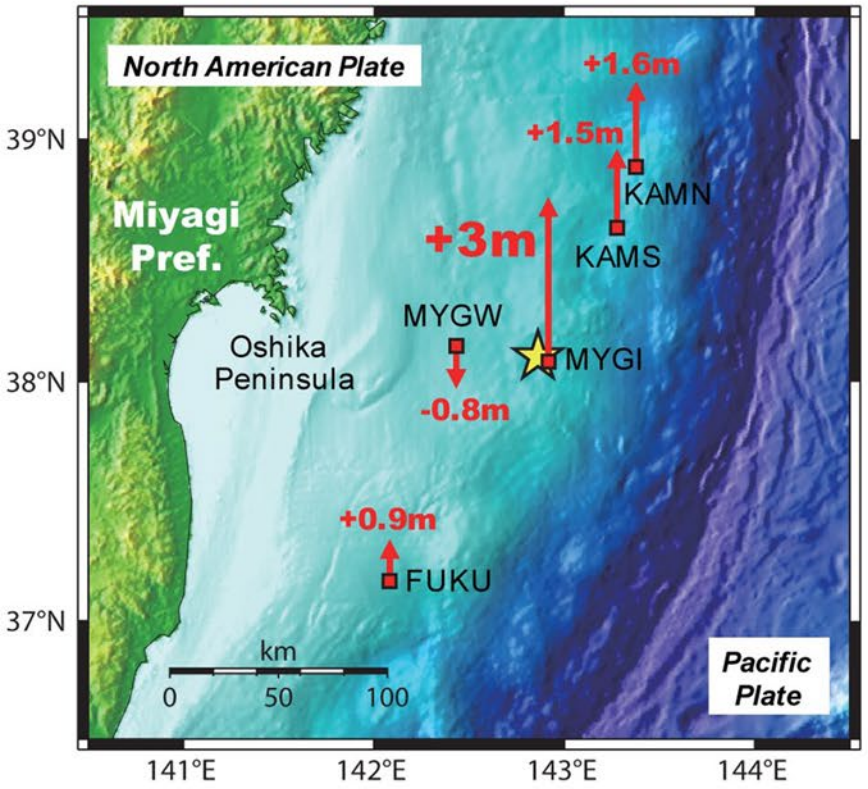
(A) Horizontal displacements



(B) Vertical displacements



Seafloor Geodesy

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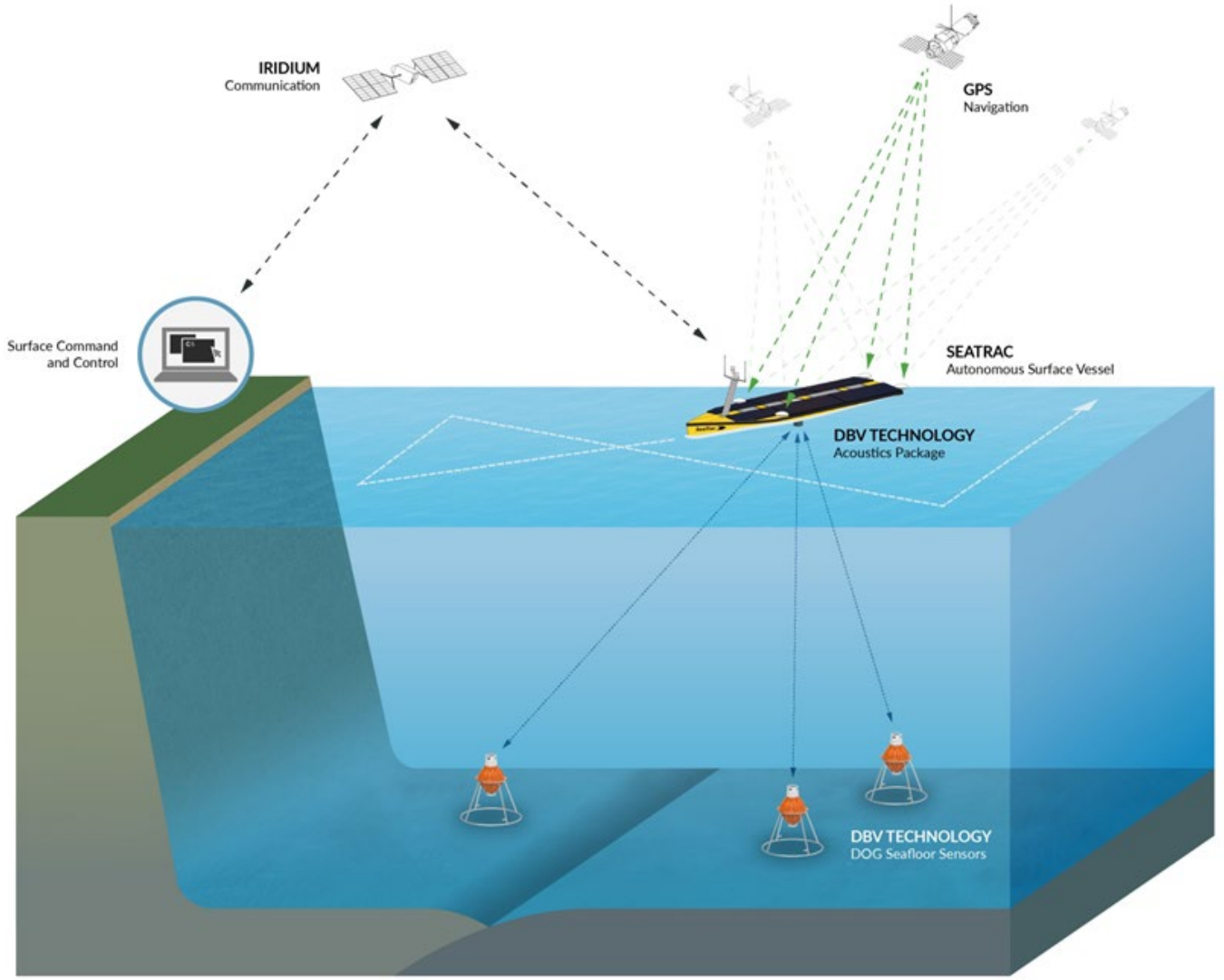
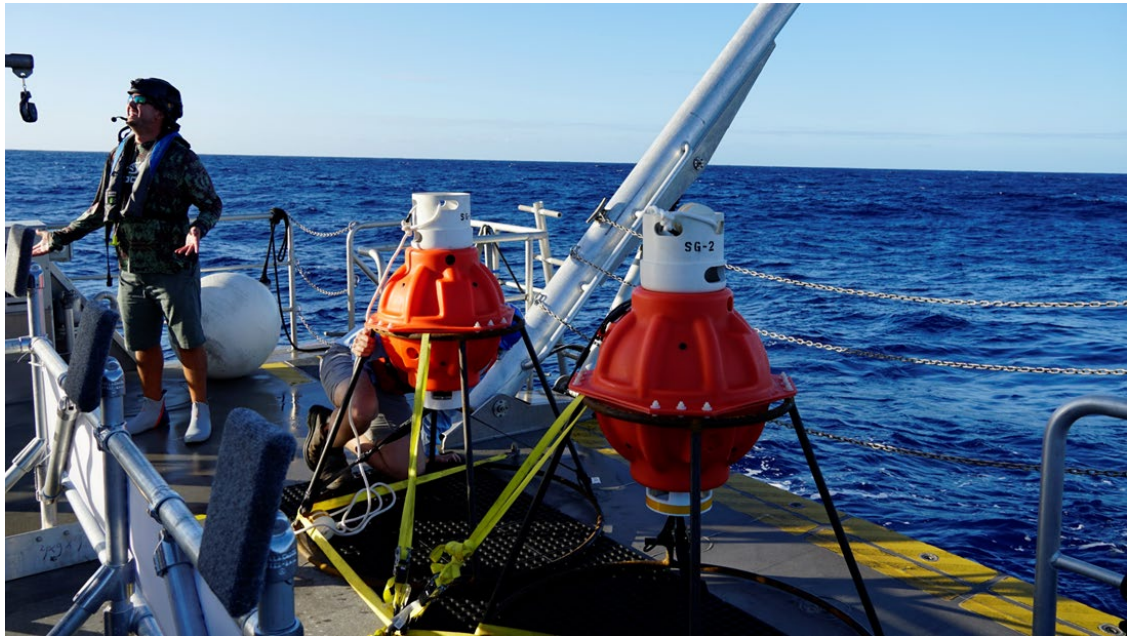
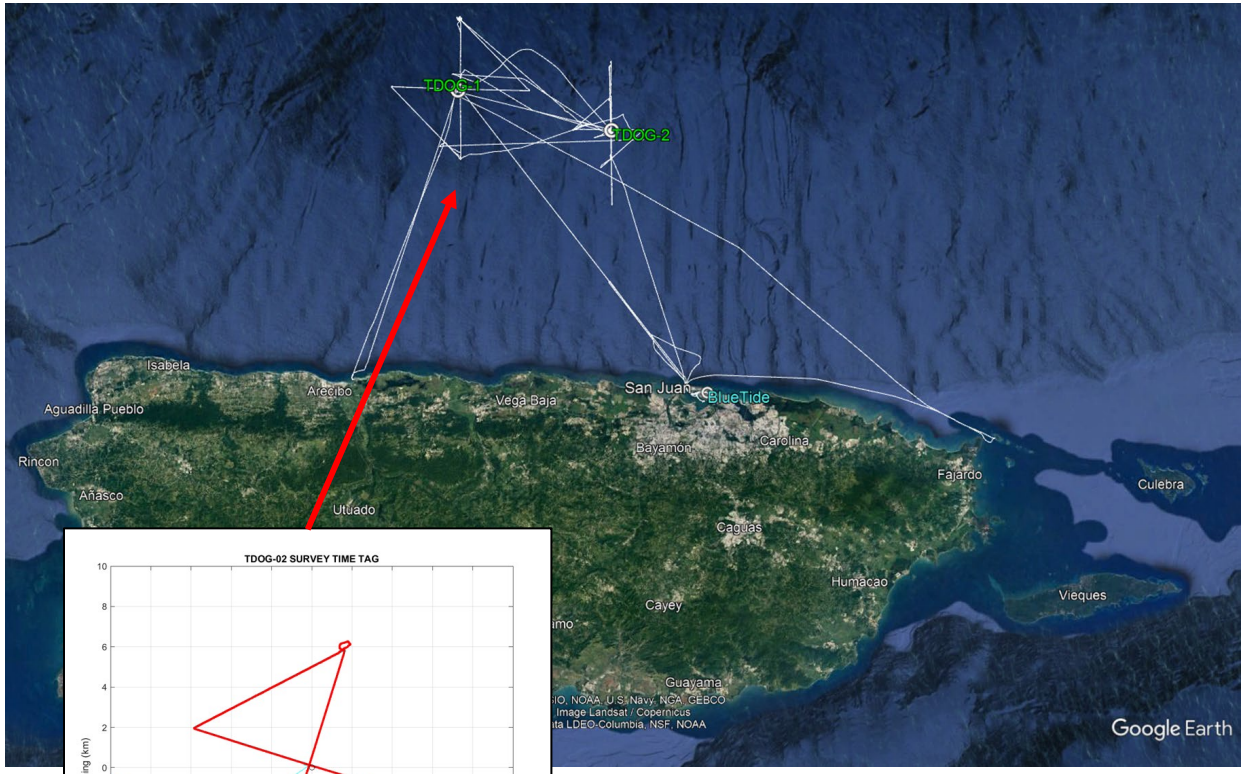
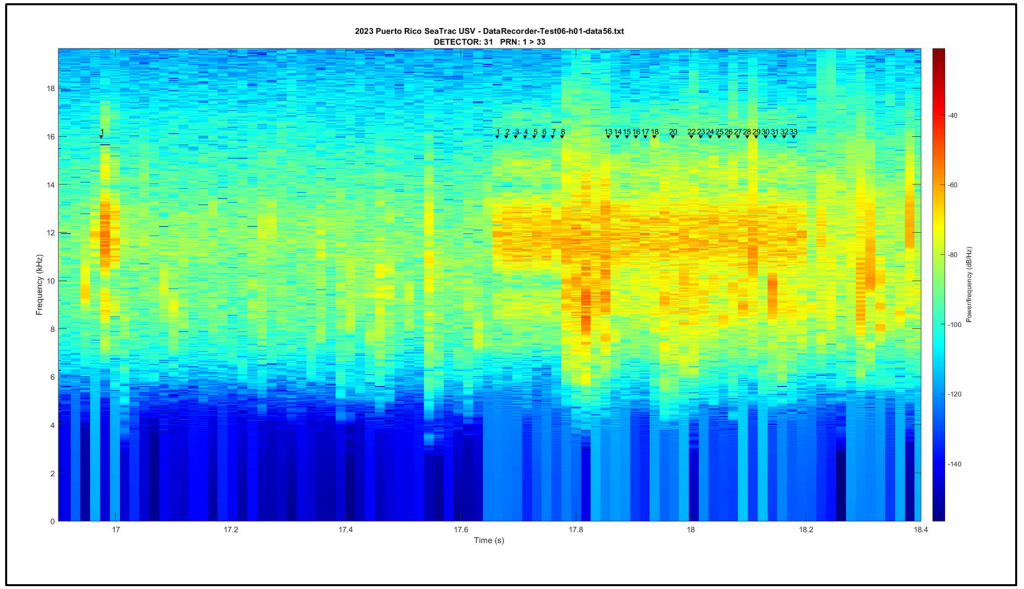


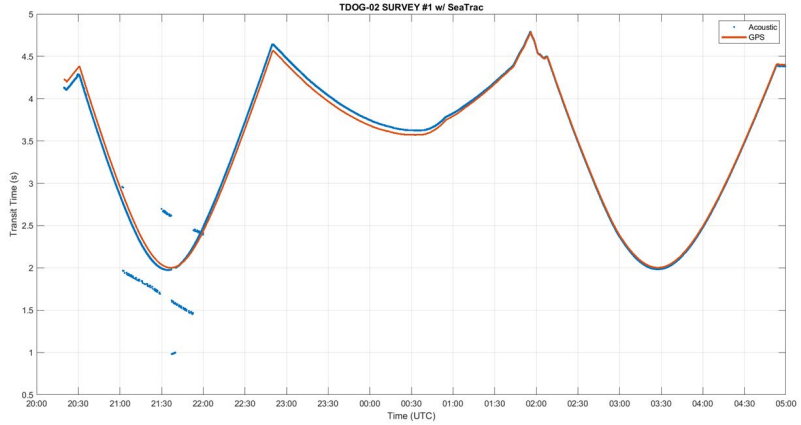
Seafloor Geodesy



Seafloor Geodesy







ROV Pipeline Survey

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