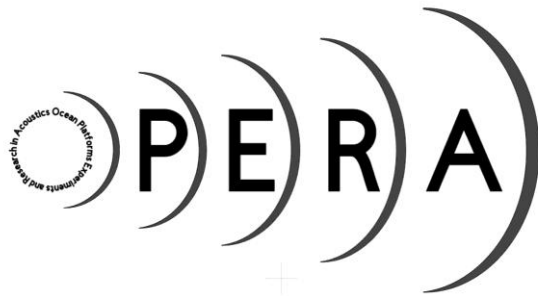


Acoustic Sensing on Autonomous Underwater Platforms

Part I: Advantages and Challenges

14 OCTOBER 2026

THE
UNIVERSITY
OF RHODE ISLAND
COLLEGE OF
ENGINEERING



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UNCREWED VEHICLES

Underwater (UUV)

Aerial (UAV)

Surface (USV)

Remotely Operated
Vehicles (ROV)

Autonomous Underwater
Vehicles (AUV)

Wind Powered
Wave Powered

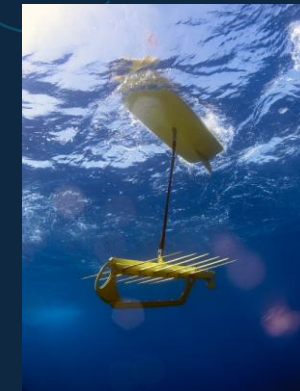
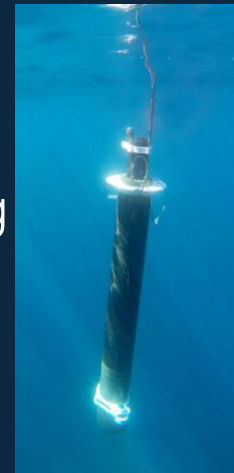


Propelled AUV



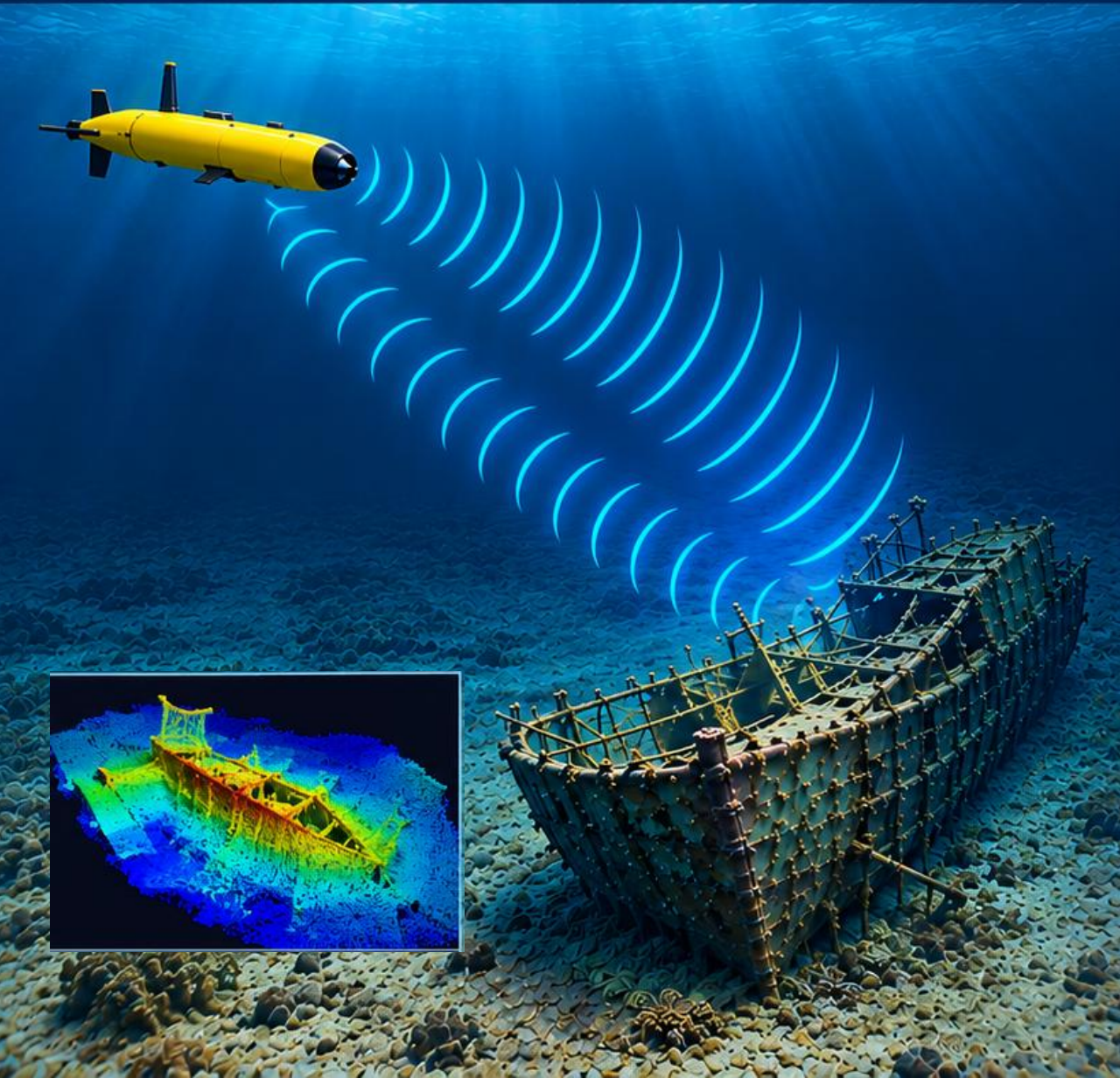
Underwater
Glider

Profiling
Float

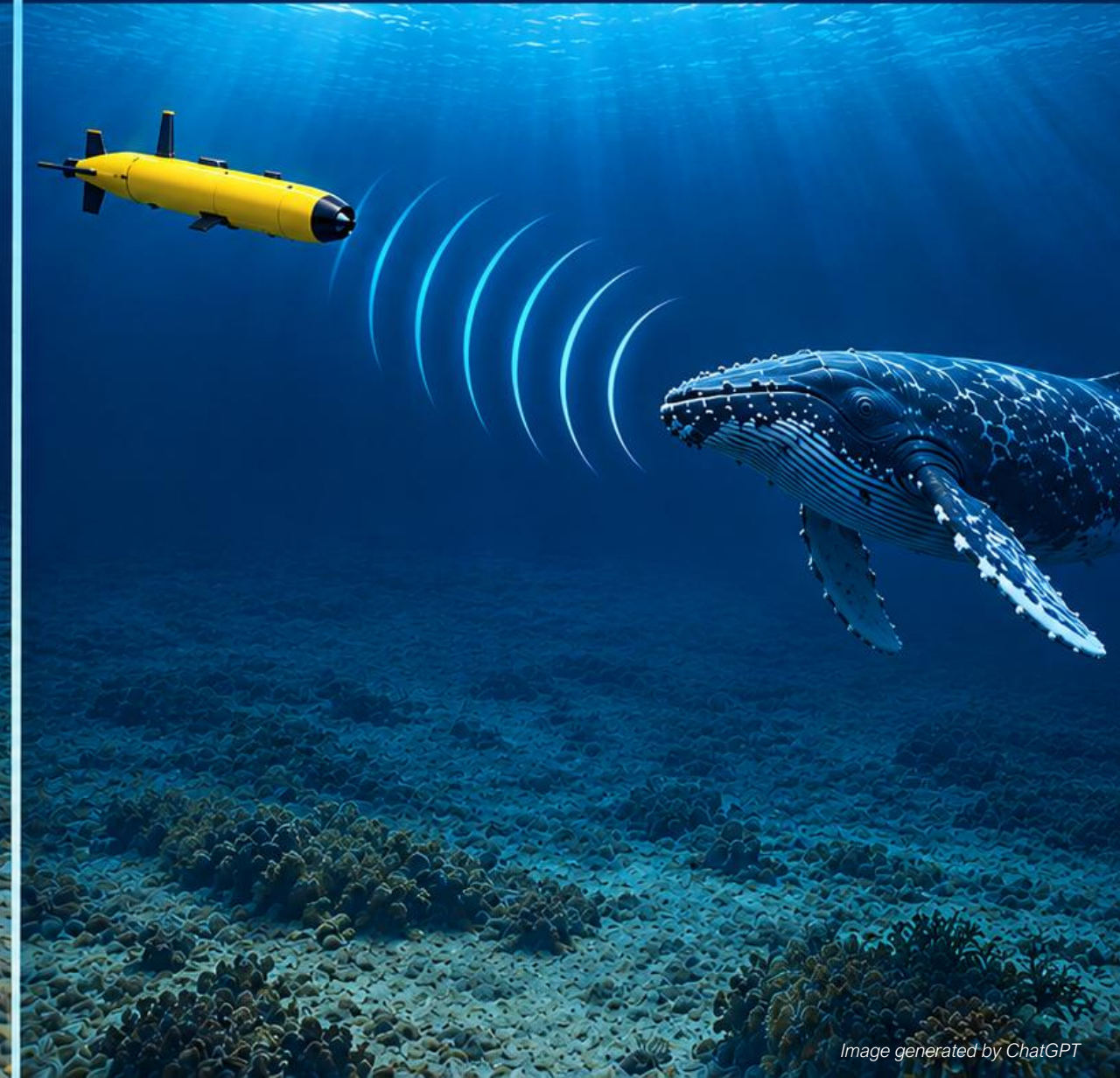




Active Acoustics



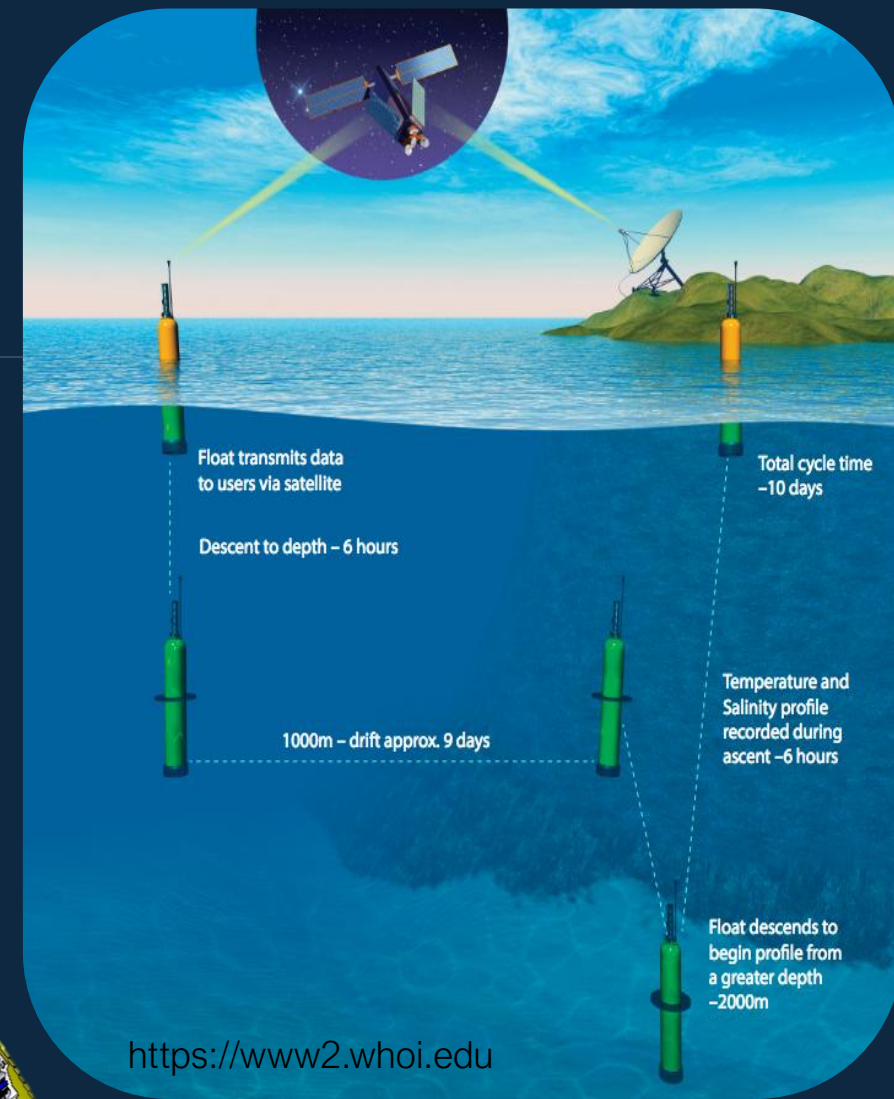
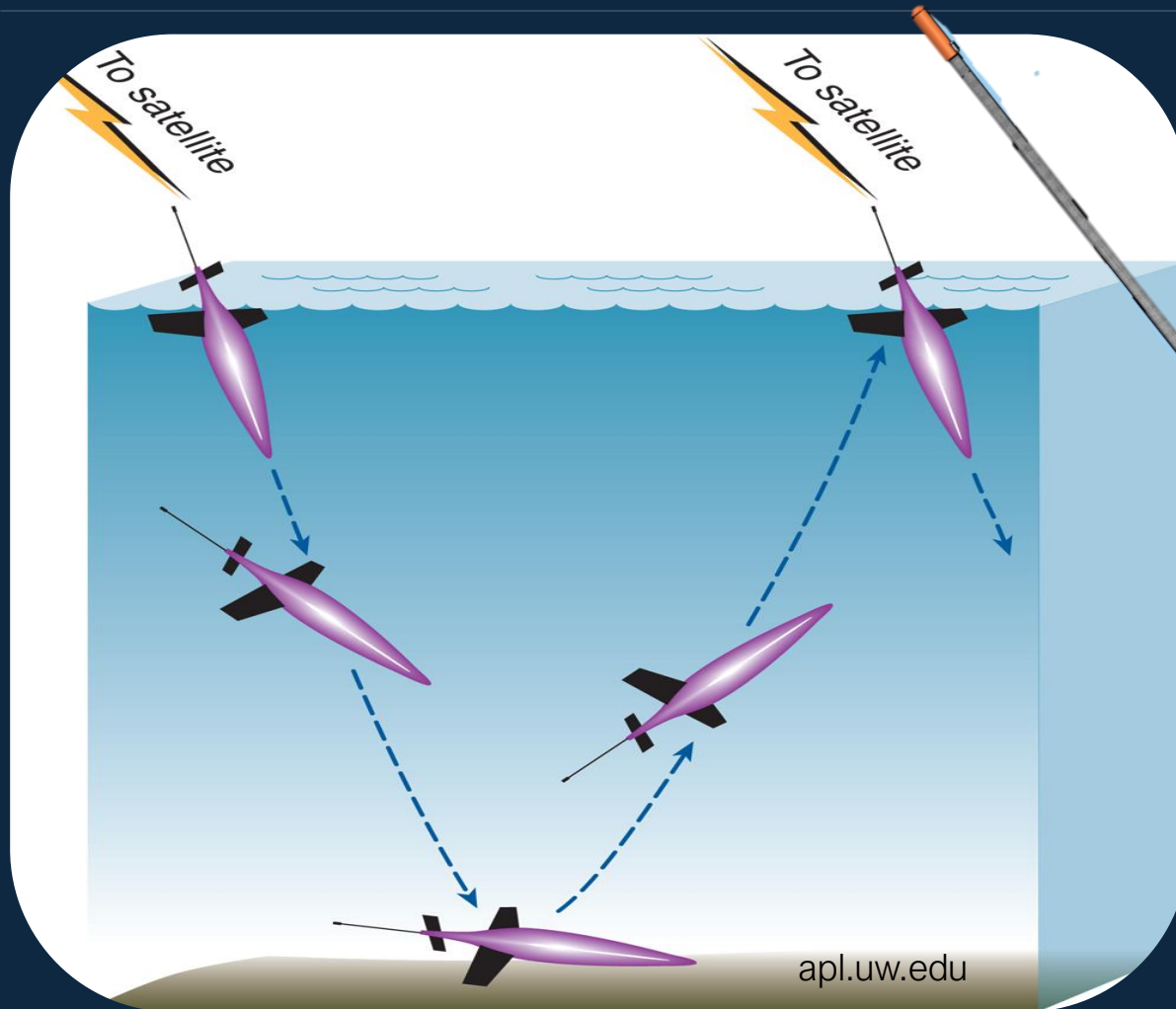
Passive Acoustics



AUVs are well suited for Active Acoustic Applications and Buoyancy Platforms for Passive Acoustics

 Vehicle	 Propulsion	 Speed	 Endurance
 AUVs	 Propeller	 ~1.7 – 2.5 m/s	 Hours - days
 Gliders	 Buoyancy Engine	 ~0.25 m/s	 Weeks - months
 Profiling Floats	 Buoyancy Engine	 Dependent on ocean currents	 Months - years

Buoyancy-Driven Platforms: Gliders and Profiling Floats



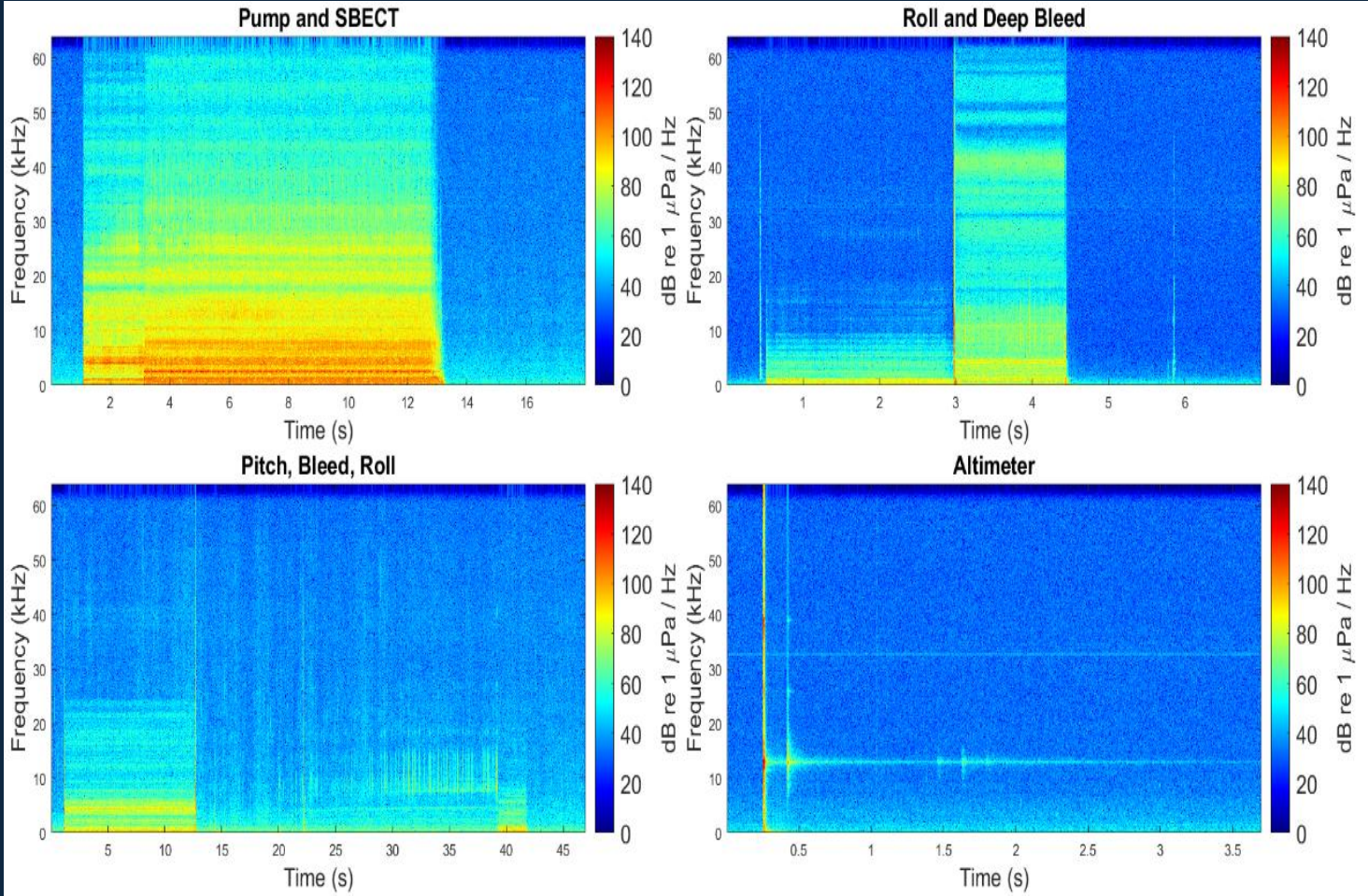


Advantages

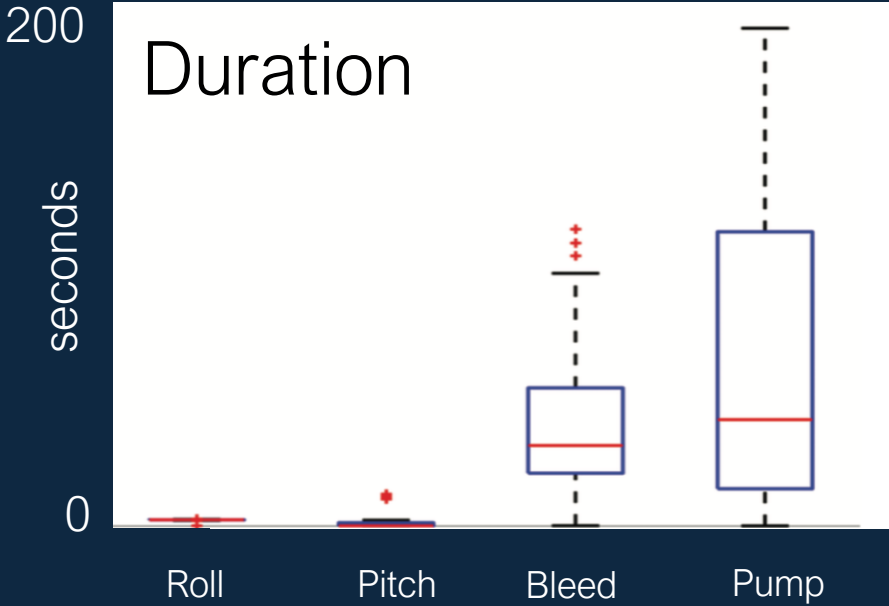
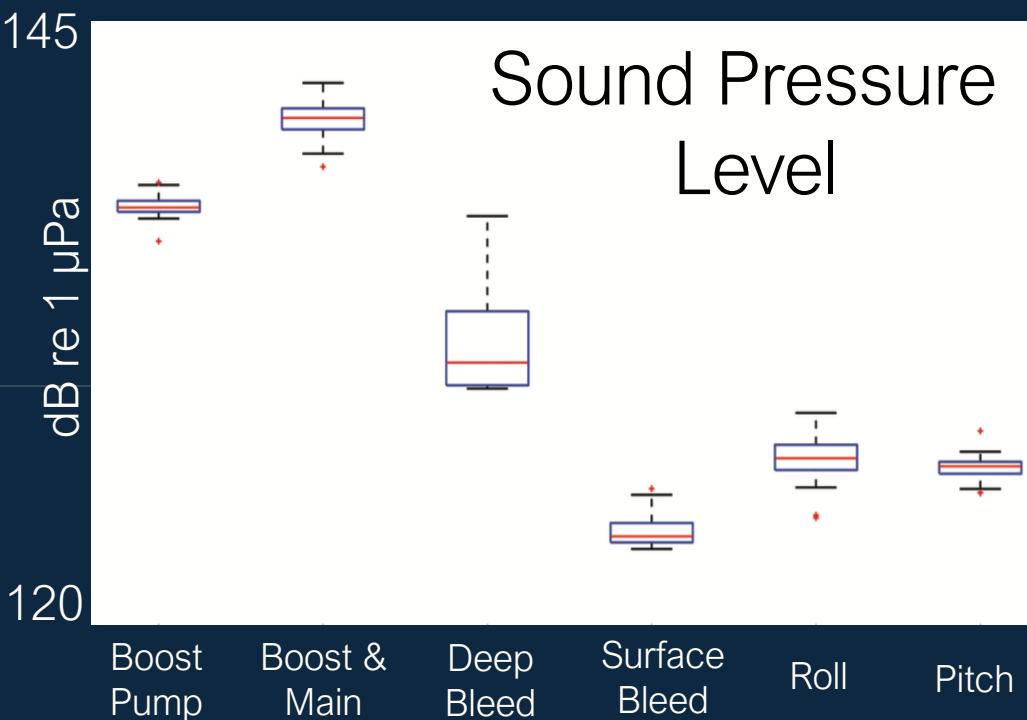
of using AUVs for Acoustic Applications

- Long-duration/Persistent Observations
- Spatial Coverage
- Collect environmental profiles
- Relatively inexpensive
- Relatively easy to transport and deploy
- Reduced noise contamination from ship
- Reduced flow noise due to slow speeds

Seaglider Self-Noise



Grasso, Pomales, and Van Uffelen, MTSJ, 2023





Challenges

with using AUVs for Acoustic Applications

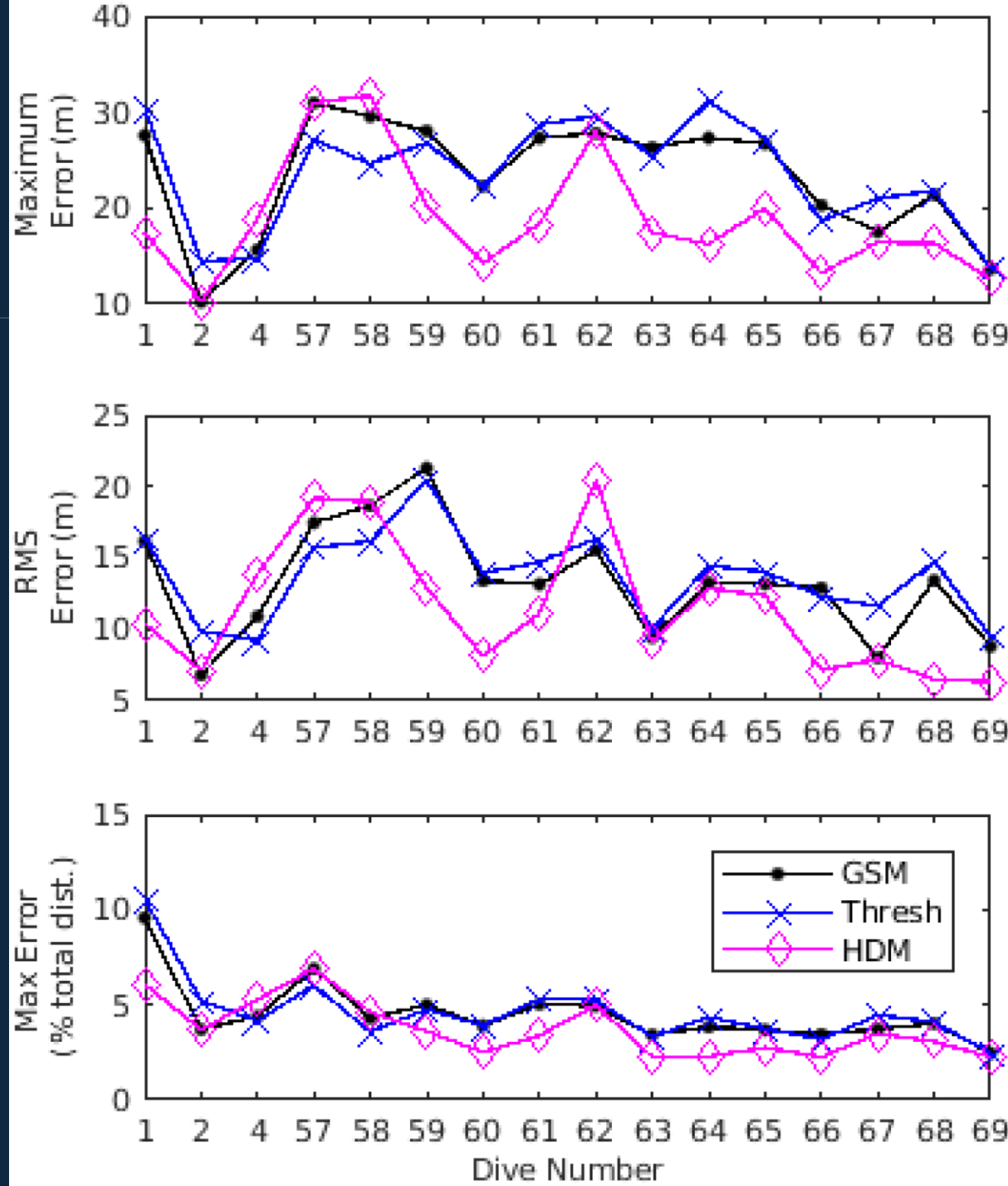
- Power limitations
- Payload limitations
- Limited data telemetry bandwidth
- Subsea positioning
 - No Doppler Velocity Log (DVL) in mid-water
- Polar operations: ice cover limits access to GNSS and satellite communication

Subsea Vehicle Localization: Tracking at Dabob Bay

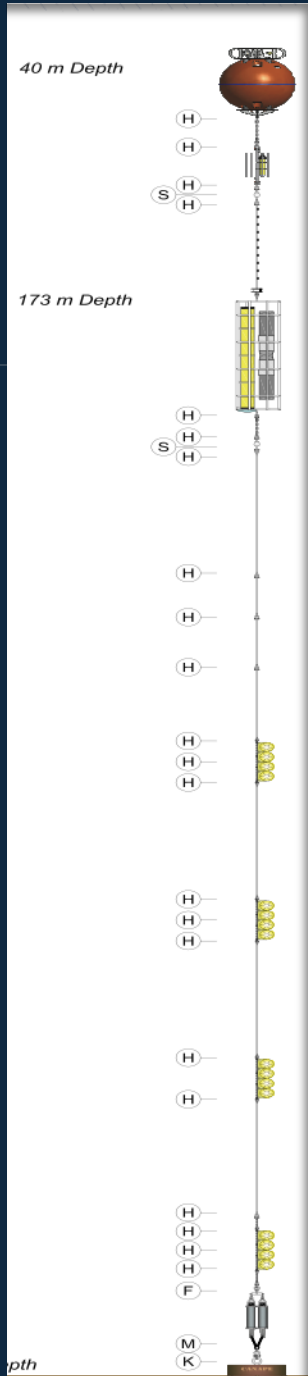
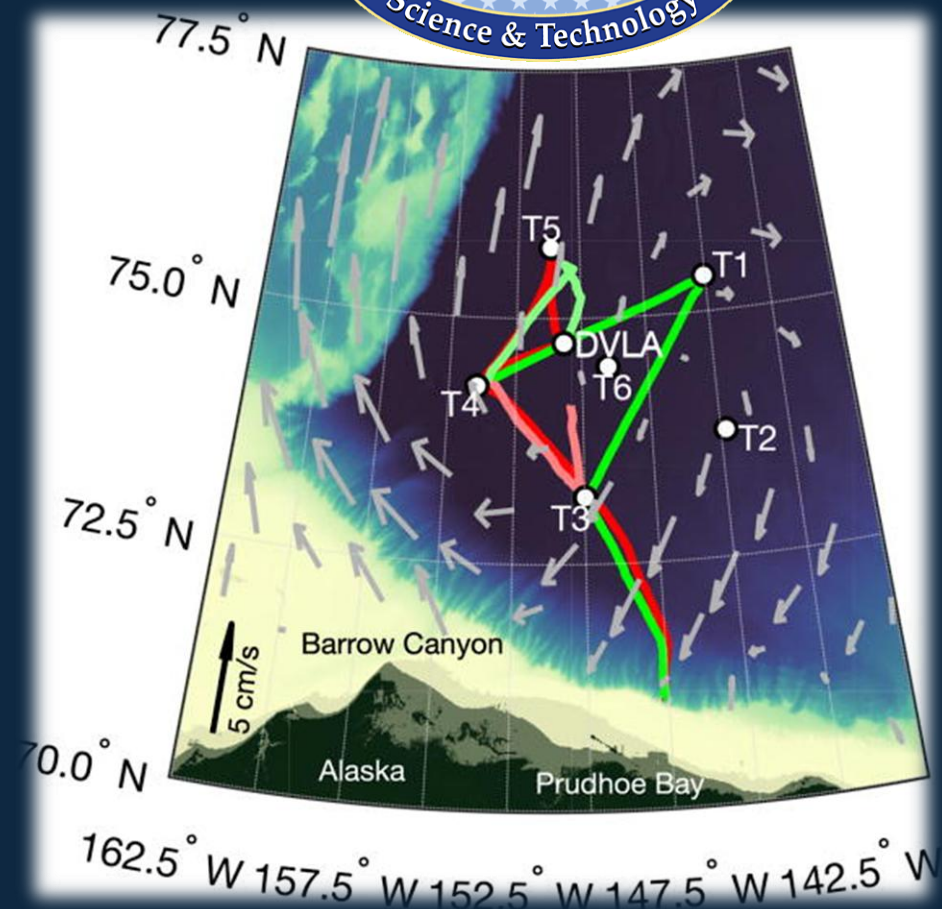
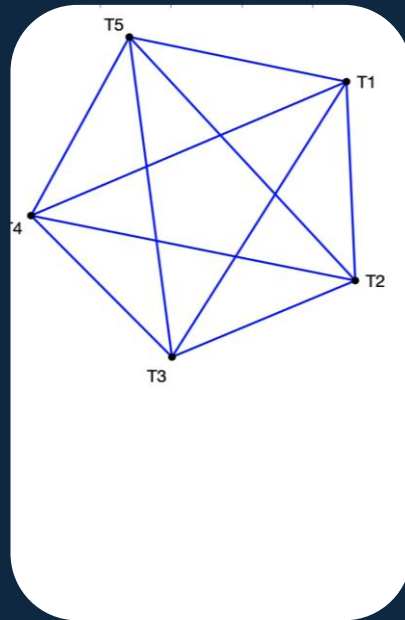


“Performance of a MEMS IMU for localizing a
Seaglider AUV on an acoustic tracking range”

Snyder, Renken, and Van Uffelen, JOE, 2023

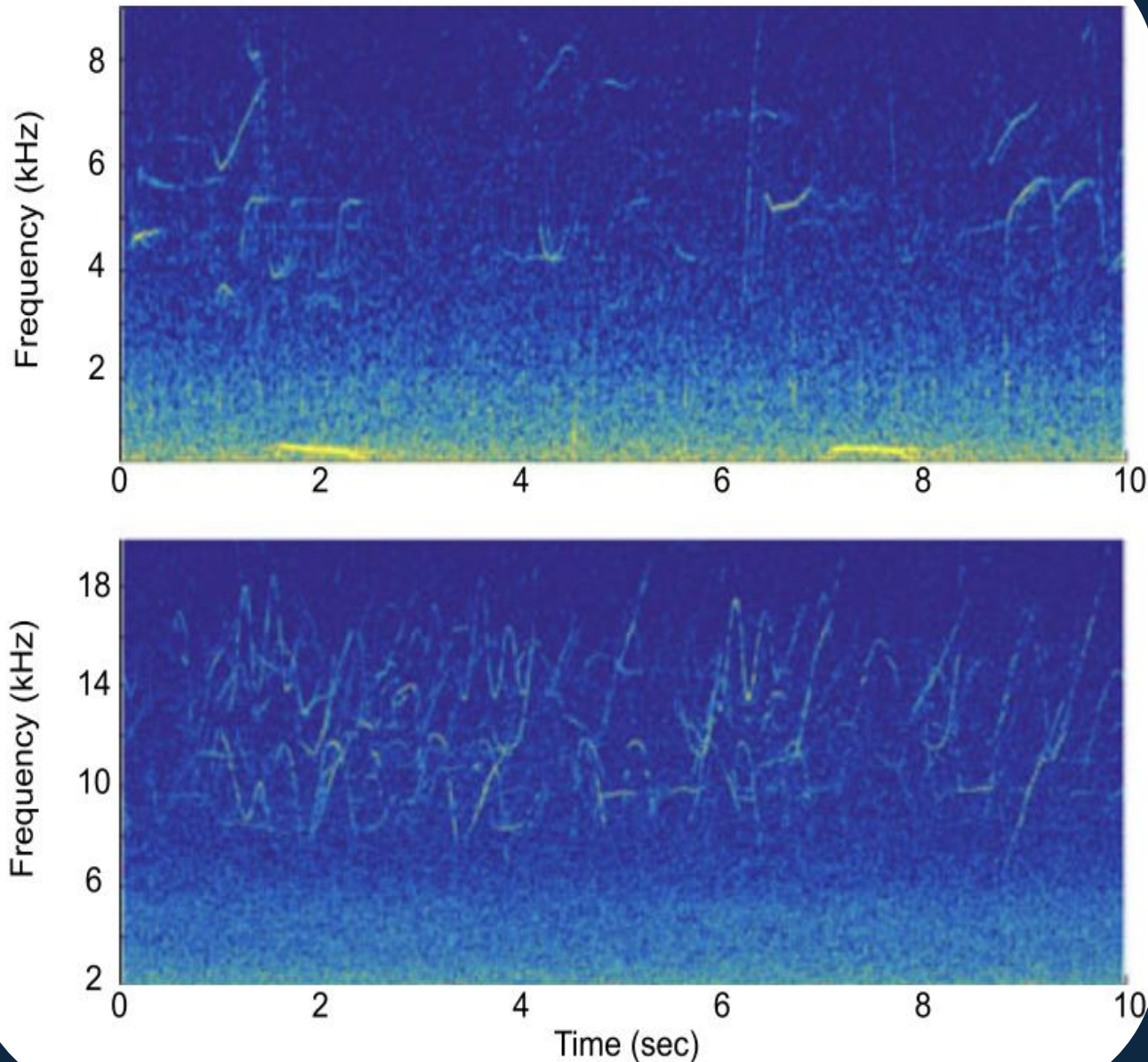


A polar projection map of the Arctic region. The map shows latitude lines from 85°N to 35°N and longitude lines from 150°W to 150°E. A red circle is drawn around the area between 75°N and 85°N latitude. Labels on the map include 'Arctic Circle', 'Antimatter', 'Primesburg', 'US Dept of State Geography', 'Tropic of Cancer', '© 2009 GeoBasis-DE / BGK', 'Data SIO, NOAA, U.S. Navy, NGA, GEBCO', and 'Imagery Date: 4/9/2013'. The map also shows the outlines of North America, Europe, and Asia.



Depth

Acoustic Applications



- Receiving acoustic signal transmissions at many ranges relative to source for ocean acoustic propagation studies
- Measuring in-situ sound-speed profiles
- Environmental Monitoring/ Soundscape analysis
- Bio-acoustic signal detection

Looking to the Future

- Low-power acoustic sensors and systems
- Low-cost, expendable platforms and sensors
- Onboard processing, compression, and real-time telemetry

