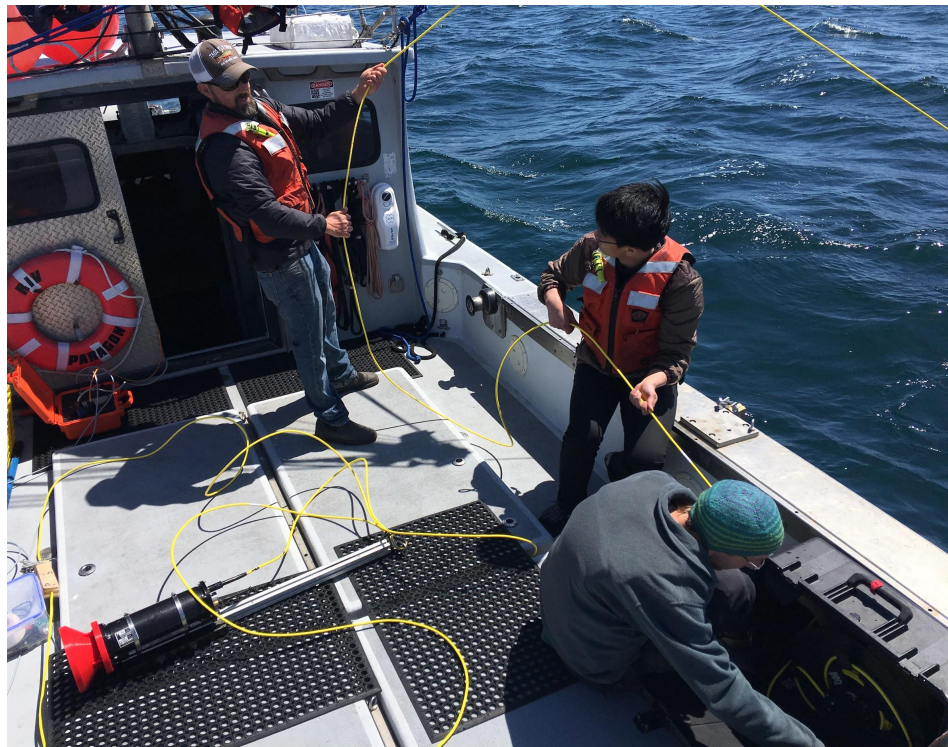


Wet WiFi: High-Speed Acoustic Modem Feasibility Study

Project Number: 901816

Project Status Review
July 26, 2018

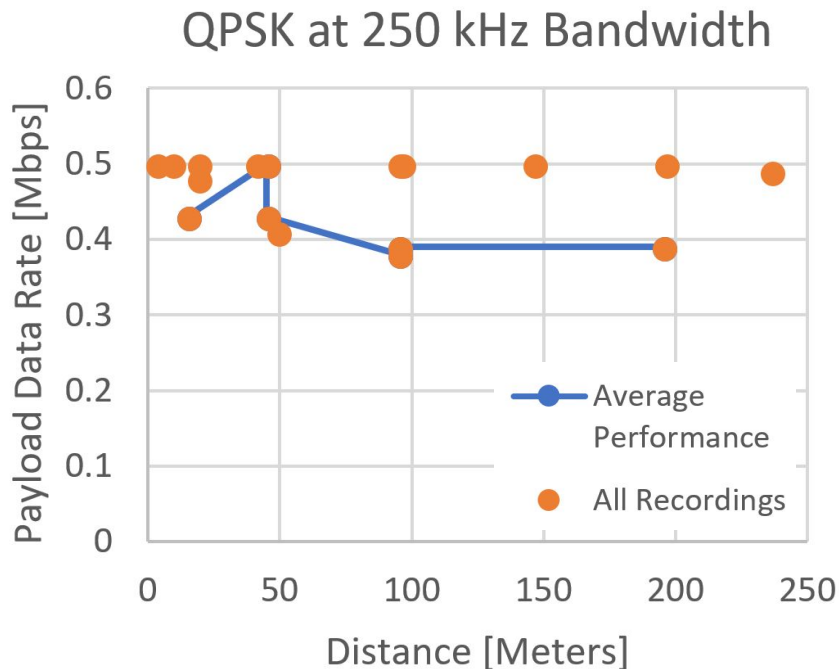
Monterey Bay Field-Tests



Highlights

4 days of successful data collection, no hardware or software failures.

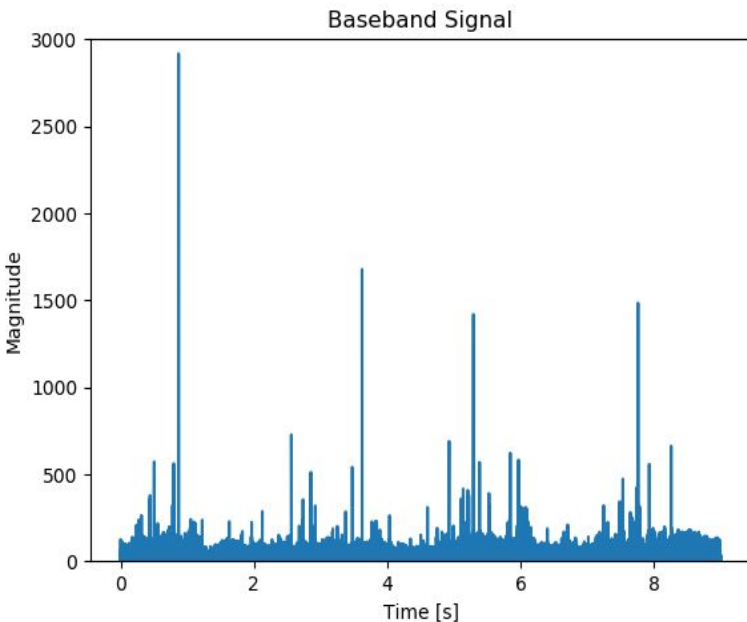
- No packet loss using QPSK modulation. All transmissions could be decoded.
- 400 kbps @ 200 meters w/o bit errors.
- Sea states between 2 and 4.
- Payload sizes tested:
59 Kb, 959 Kb, 3.9 Mb.
- Vertical communication
with off angles up to 45°.
- Relative platform speeds up to 0.7 m/s.



Challenges: Impulse Noise

The receiver picked up high energy impulse noise.

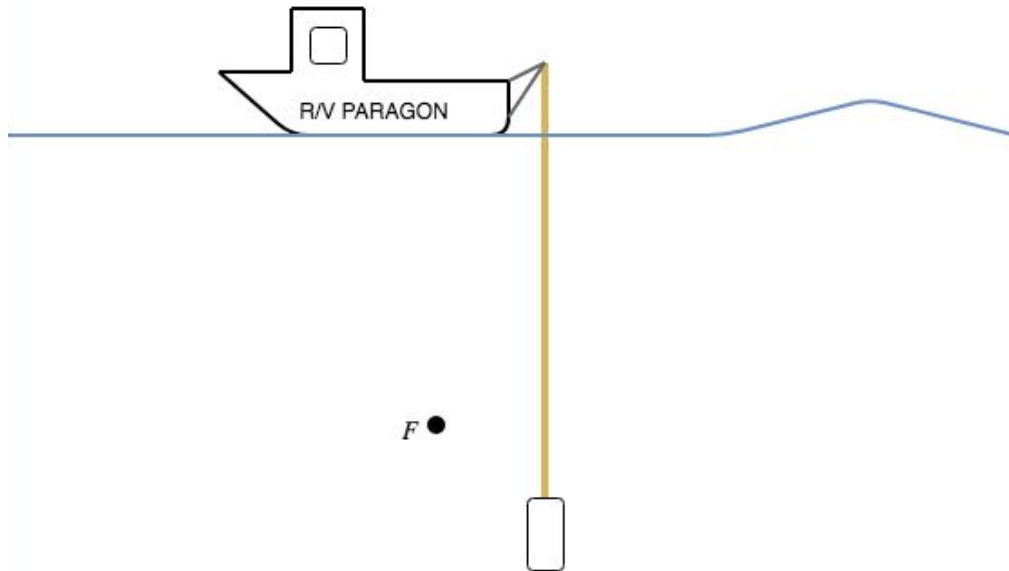
- This phenomenon was observed more frequently when the receiver was deployed at depth.
- This was an issue with our longer transmissions (3.9 Megabits), because the probability of an impulse occurring during such longer transmissions was much higher.



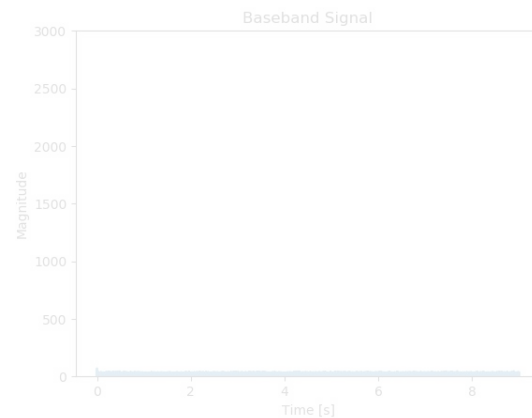
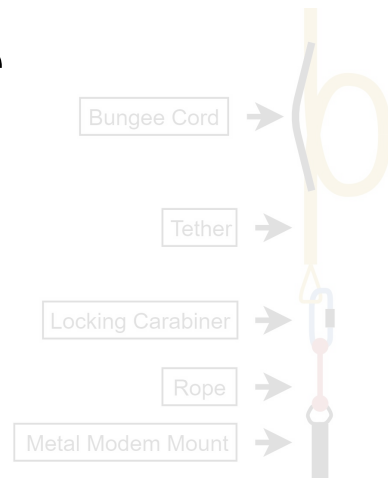
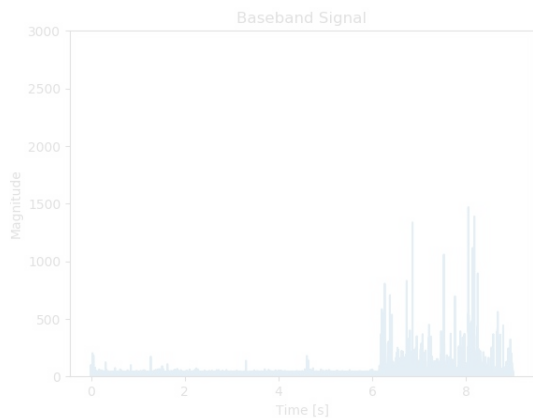
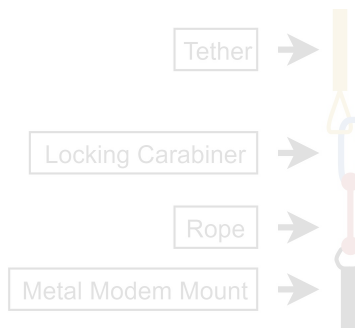
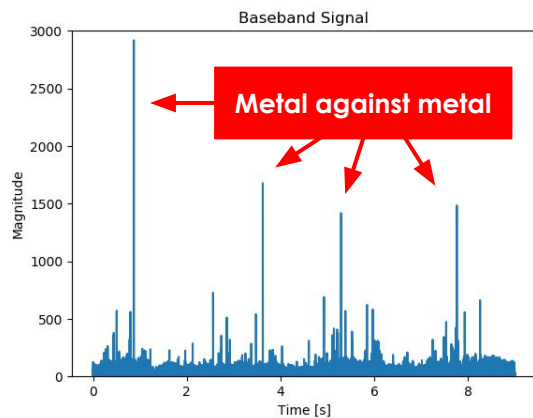
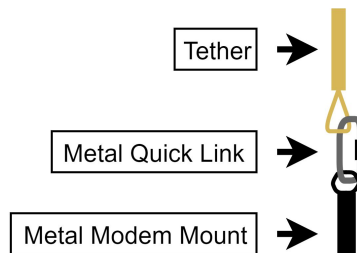
Challenges: Impulse Noise

No dampening system was used for deployment on the first two days.

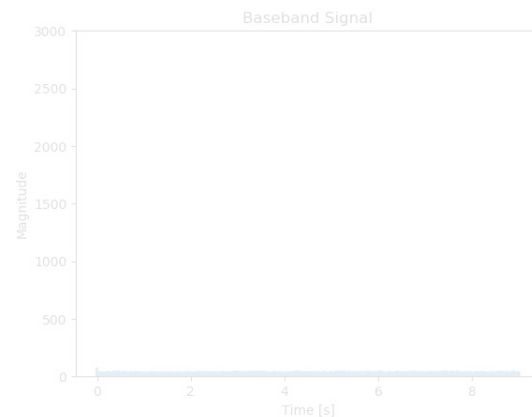
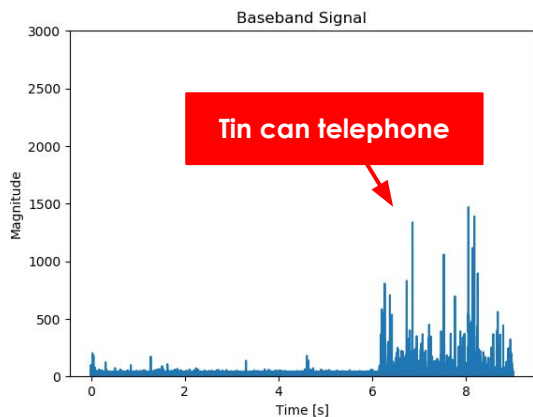
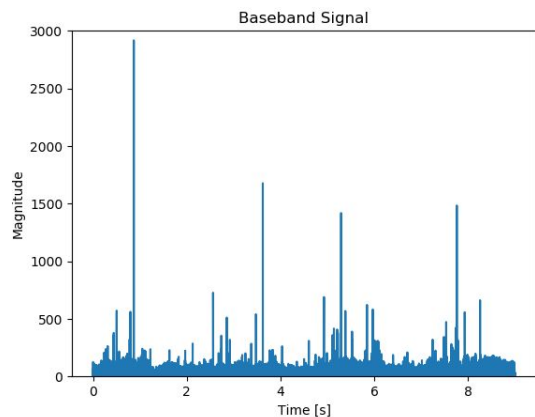
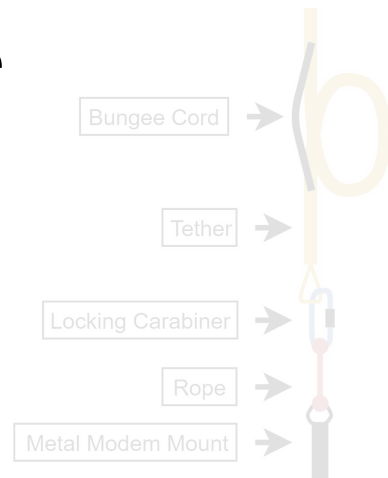
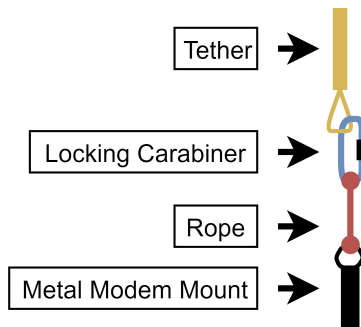
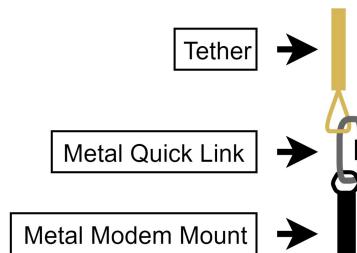
- Wave action would let the modems into freefall and then suddenly put tension on the tether. This caused harsh vibrations on the tether.
- If the deep modem was the receiver, this vibration was picked up as impulse noise.



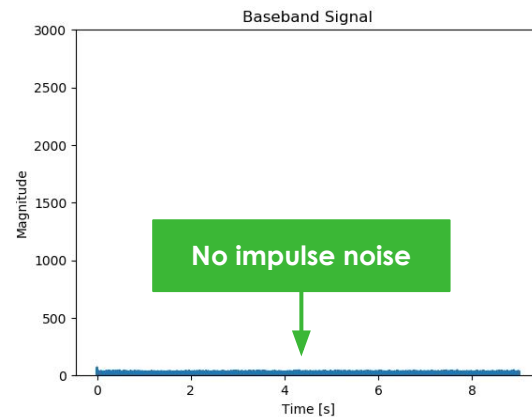
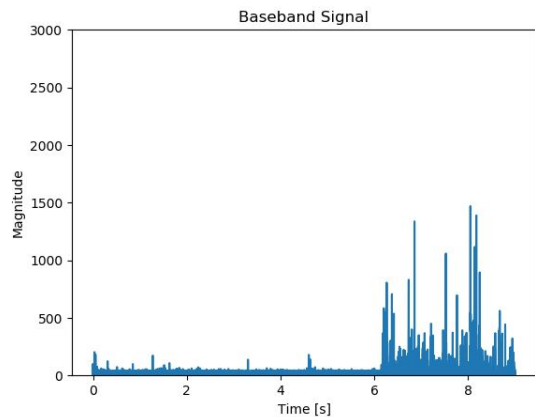
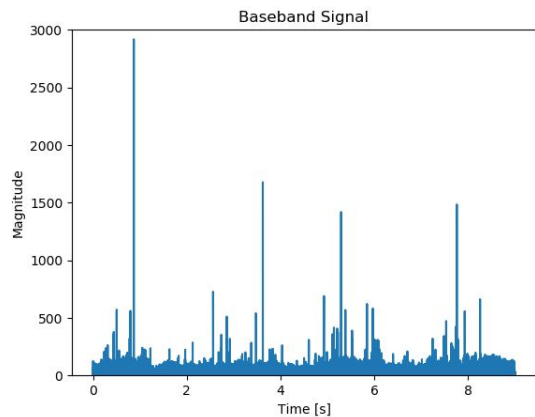
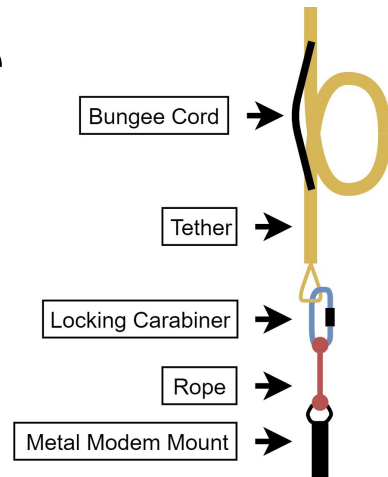
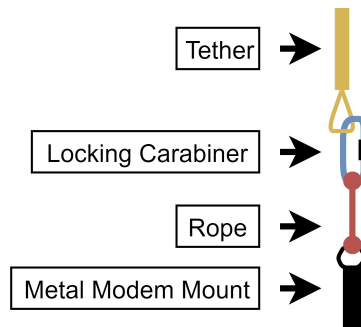
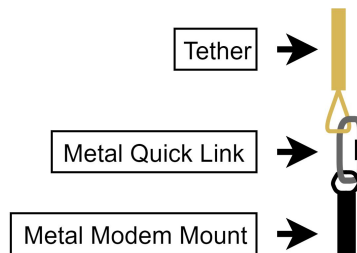
Challenges: Impulse Noise



Challenges: Impulse Noise

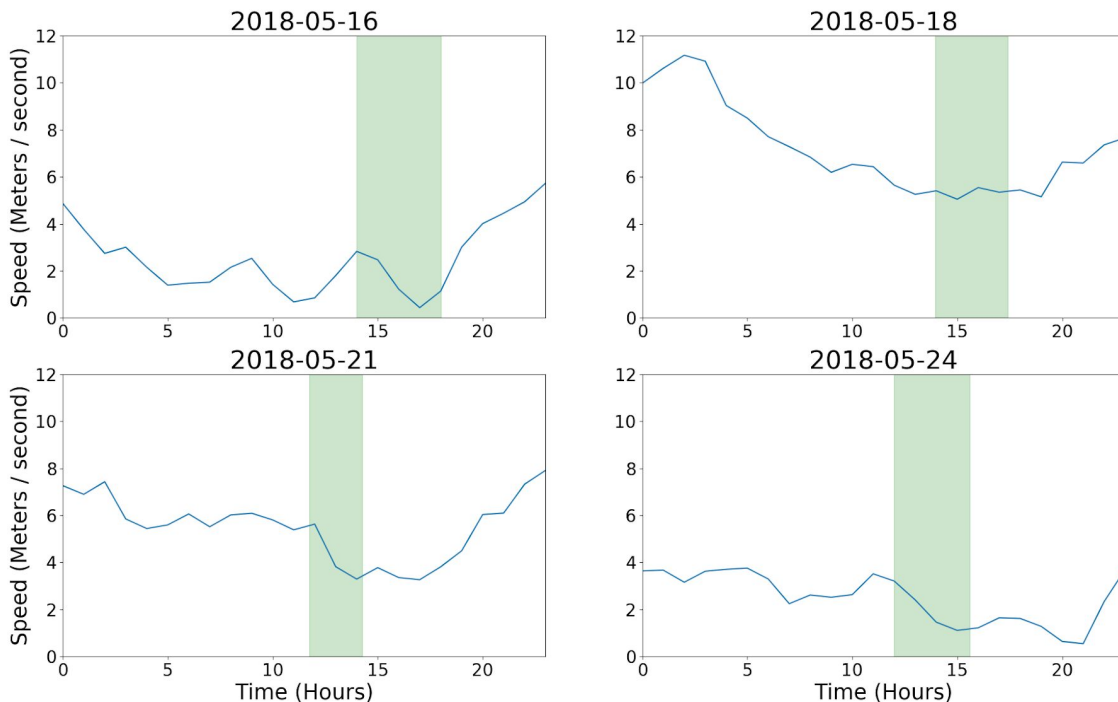


Challenges: Impulse Noise



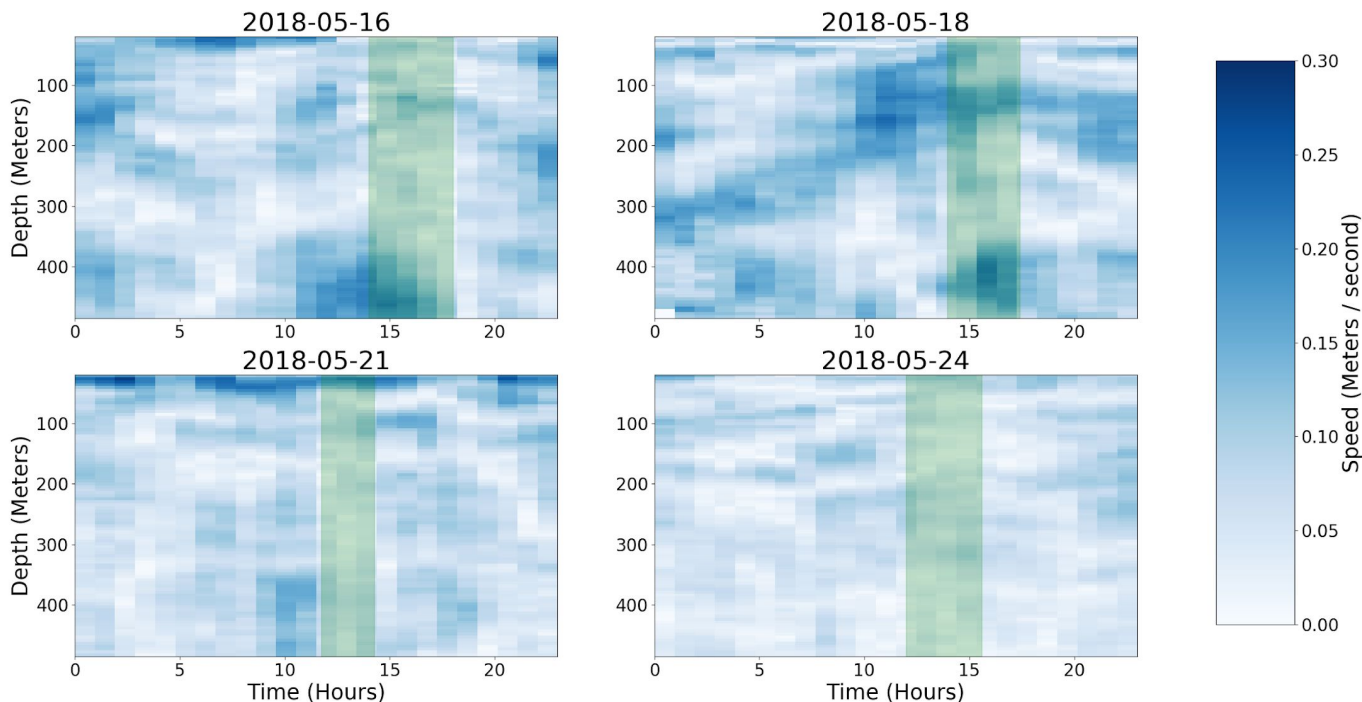
Environment: Wind Speed

Day 2 and 3 had the highest wind speeds, creating larger wind-waves, which put harsher acceleration on the modems due to lack of dampening system.



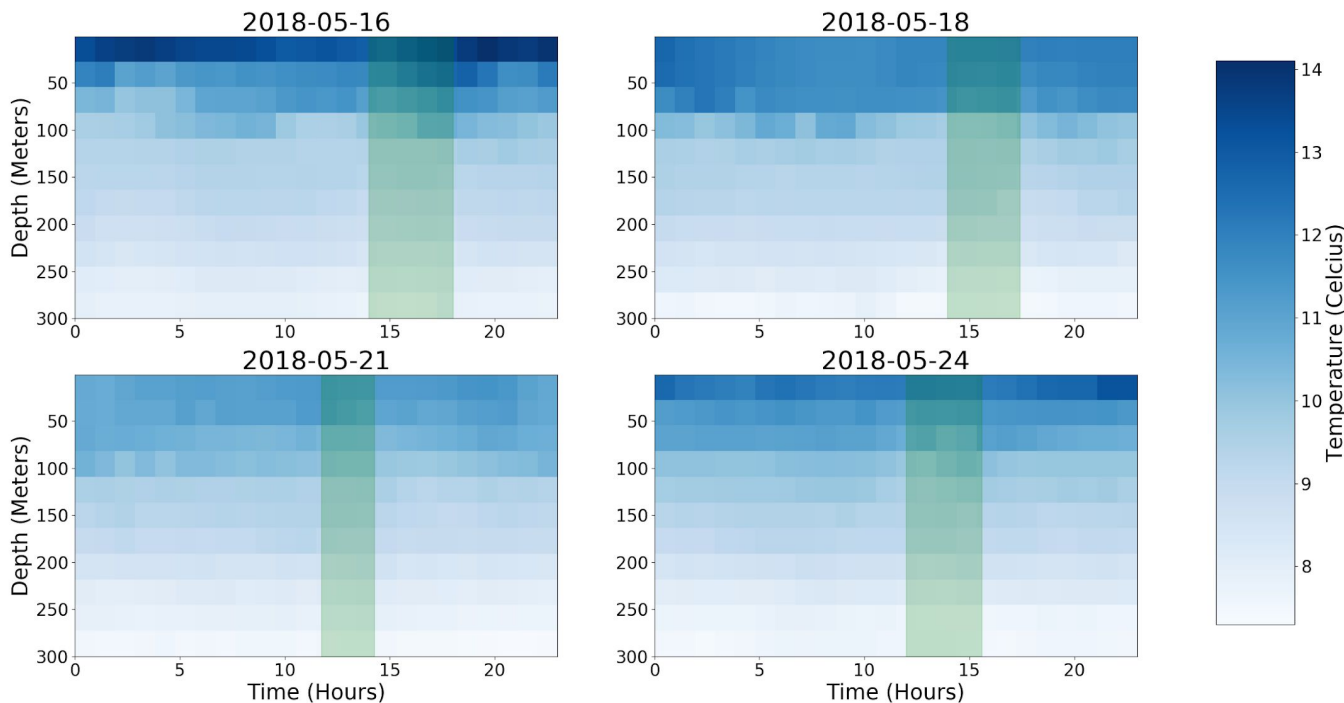
Environment: Water Speed

Water speed in the range of deployment depths on the second and third day caused the greatest off-angles.



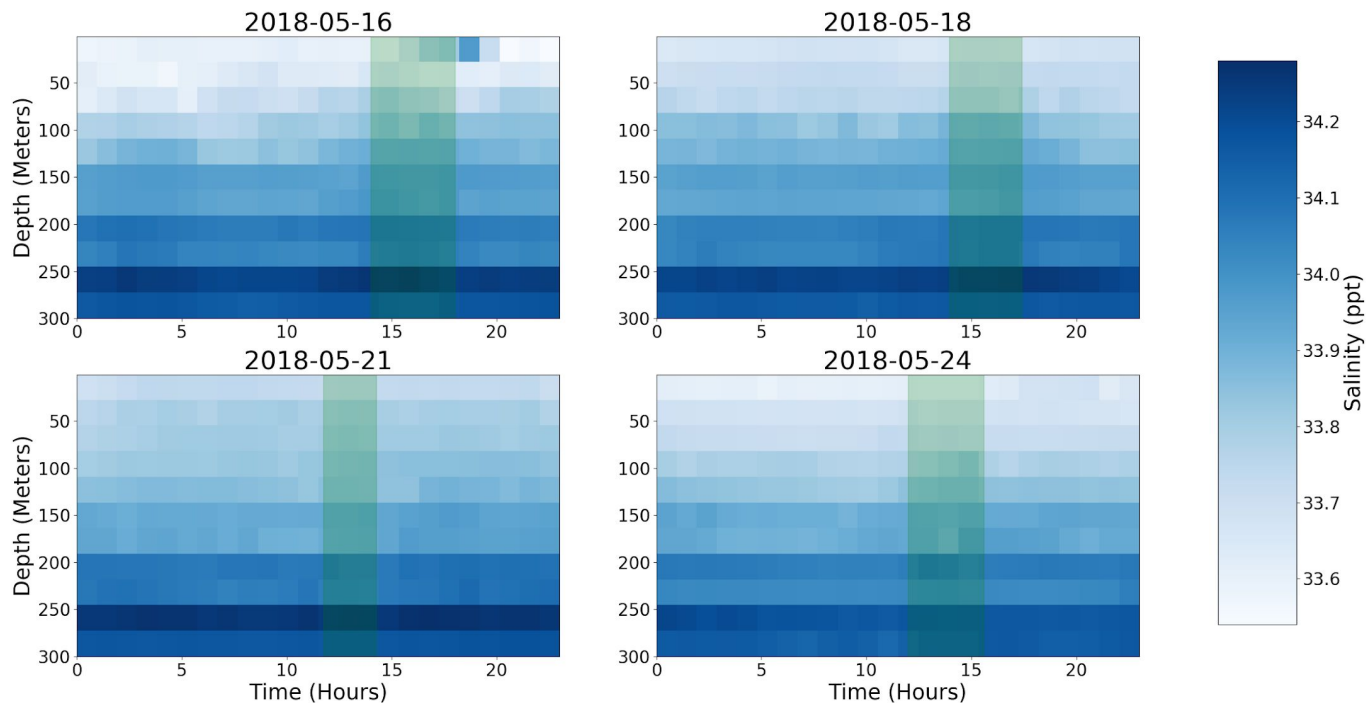
Environment: Water Temperature

Communicated across ~7° Celsius thermocline.



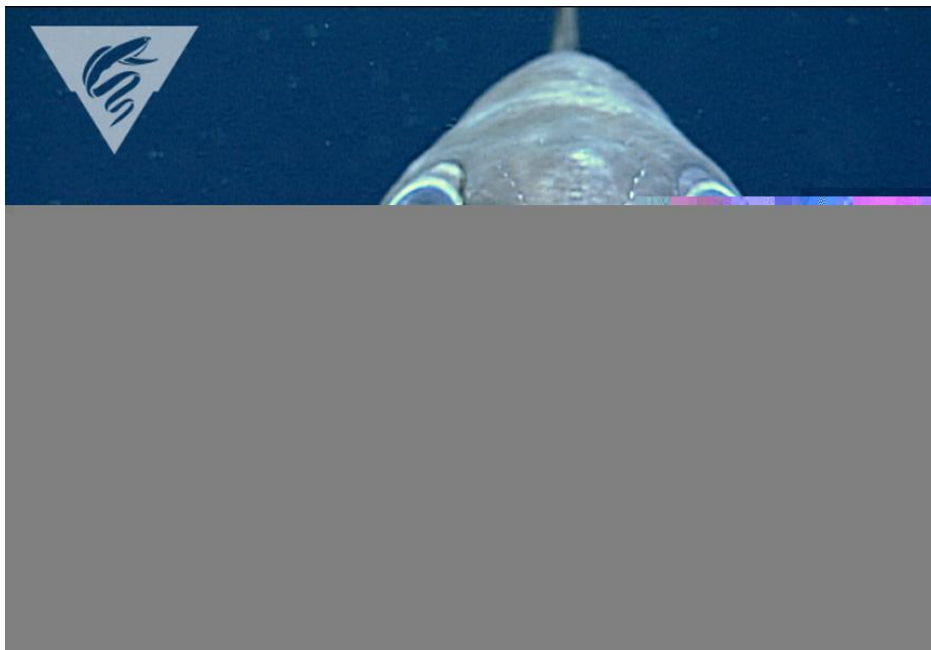
Environment: Water Salinity

Communicated across ~ 0.72 ppt salinity gradient.



UNSOLVED ISSUES

File transfer code for arbitrary payloads was hacked together while at MBARI, and contained a bug that was not discovered until it was first used in the field.



Next steps

- Update deployment rig to address aforementioned impulse noise challenges.
- Order new transducers that natively have 90 degree beamwidth and will no longer need 3d-printed shade.
- Test longer communication distances. (We have already ordered and received a custom ~600 meter subsea cable.)
- Continued software development.
- **Perform a second round of ocean tests in Q4 2018 to verify that we sufficiently addressed aforementioned physical layer challenges.**