Deep-sea DAS Sensing

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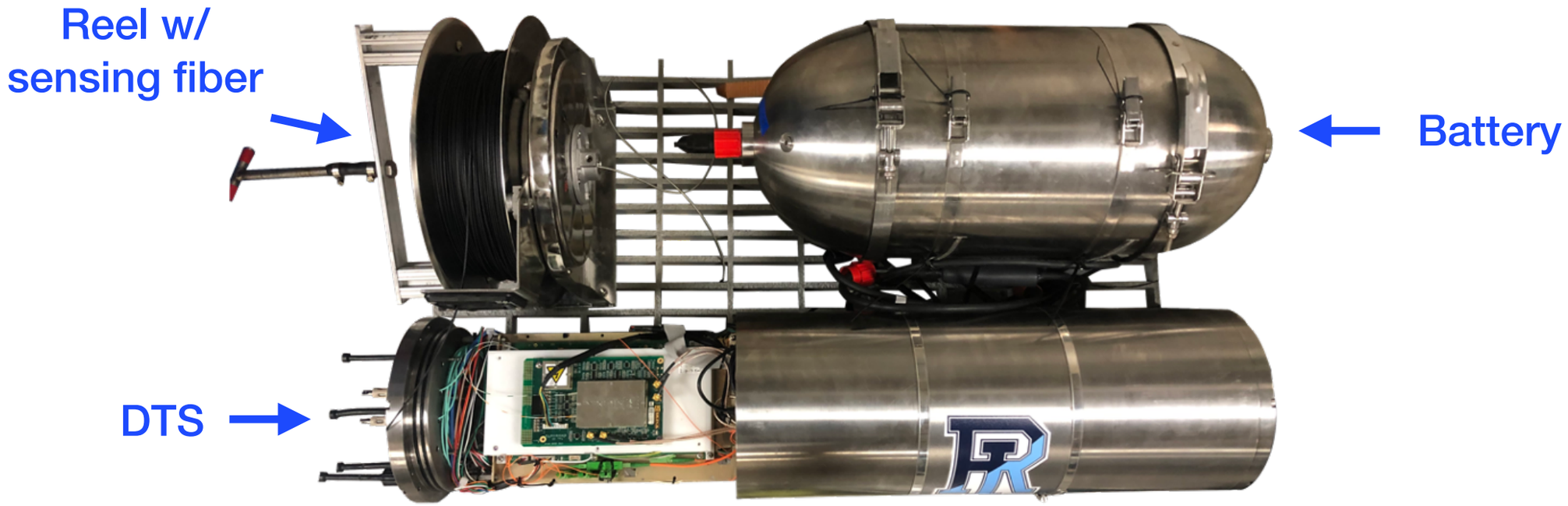
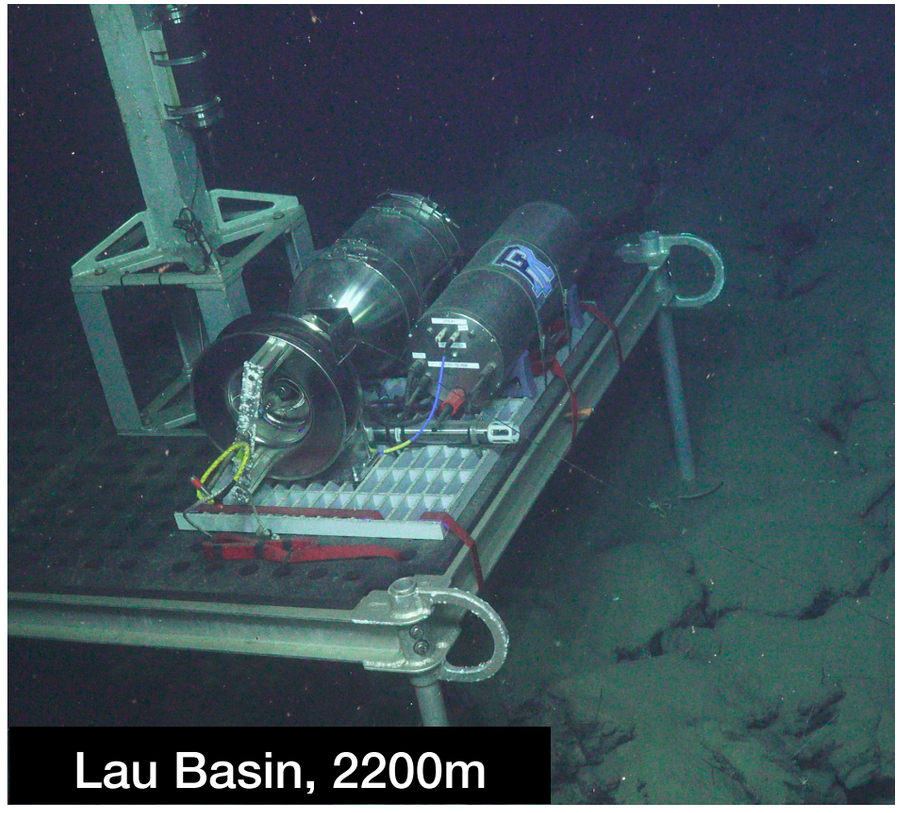
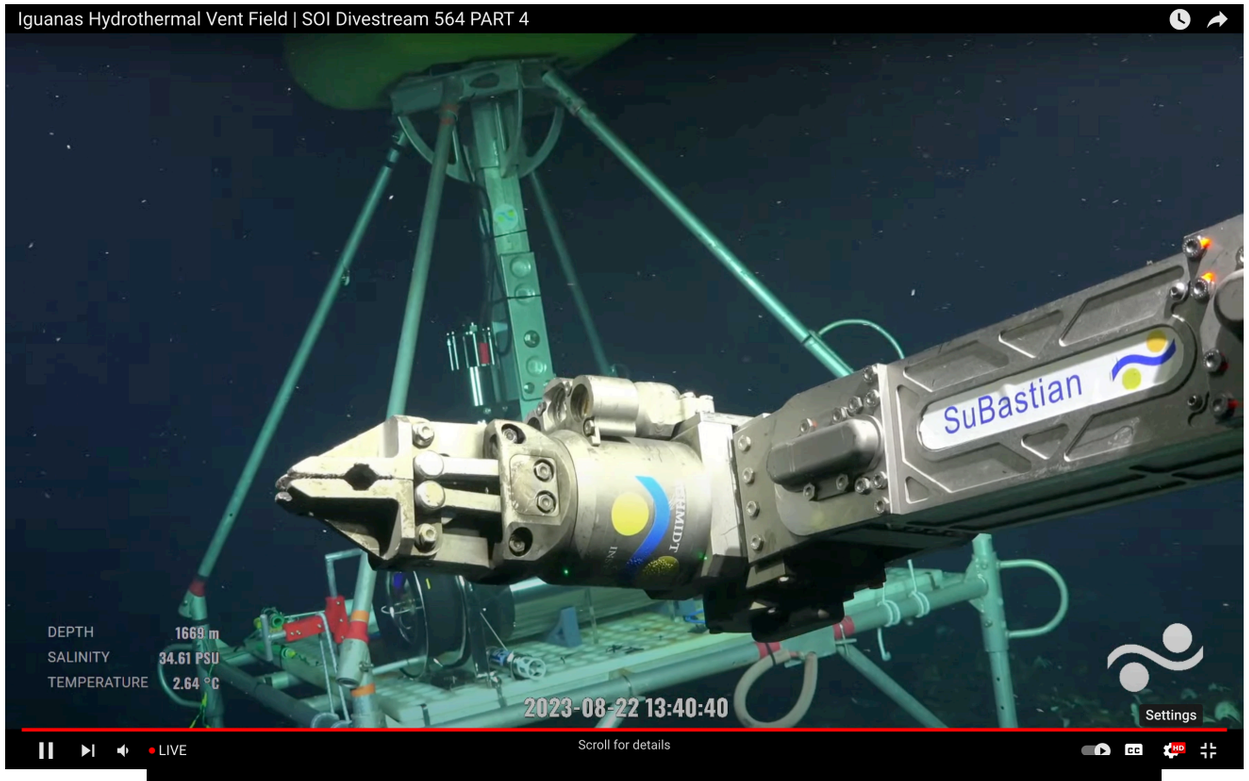
Quick Review: Deep-sea DTS



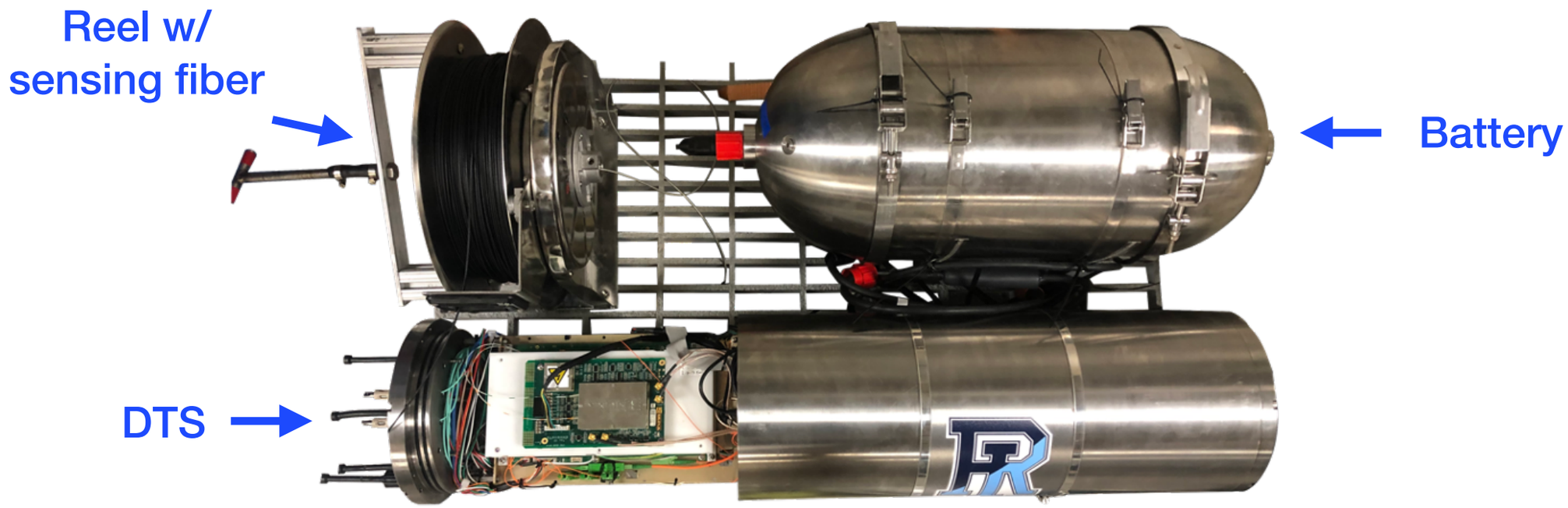


Lau Basin, 2200m



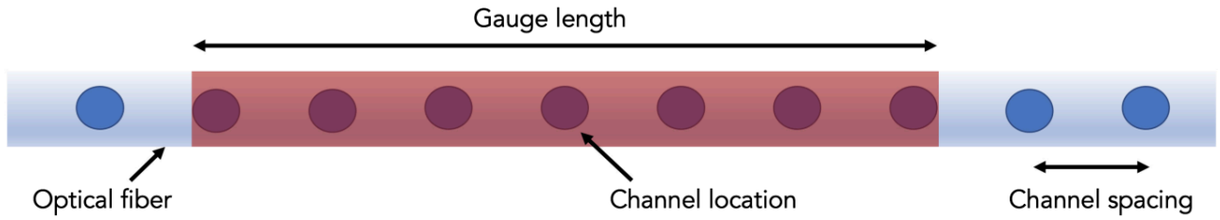
Galapagos Spreading Center, 1600m

Quick Review: Deep-sea DTS



- Based on Silixa XT-DTS unit
- Titanium housing (6000m rated)
- Utilizes multimode sensing fiber(s), up to 4 channels
- Draws ~40W while sensing, Gig-E interface
- Collects data on the order of 80-100 MB/day

New challenges with deep-sea DAS



Farghal et al. 2022

- Will use Silixa iDAS-MG unit

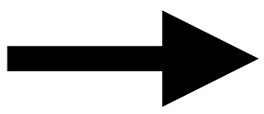
- Utilizes singlemode fiber (1 fiber), up to 40km total length (gauge length and channel spacing is user-defined… e.g. 3-30m gauge length, channel spacing 0.25m or longer)

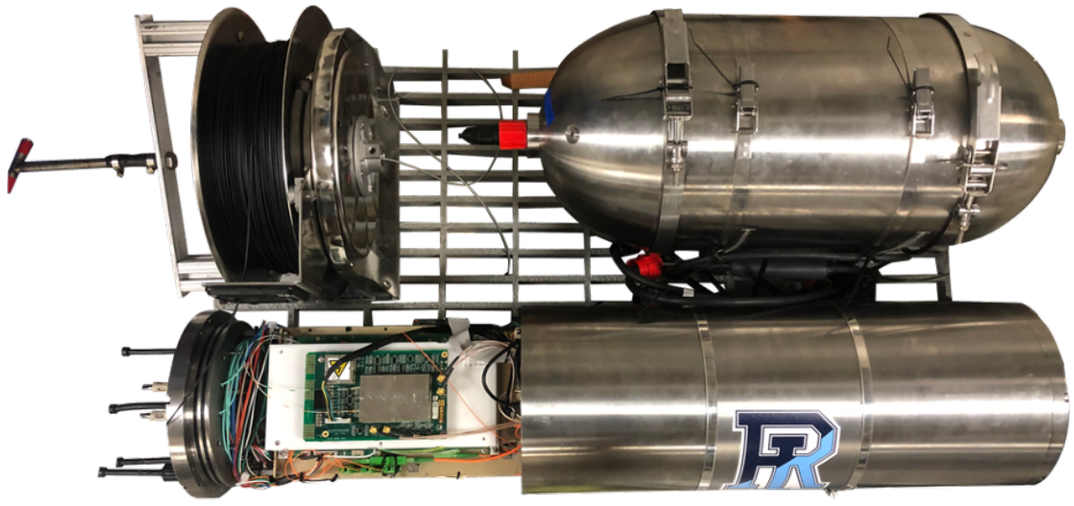
- Draws 240W (6x DTS), Gig-E interface AND 10GE interface (via SFP)

- Gets much hotter —> need to explore heat pump/exchanger, beryllium housing

- Collects data on the order of 170MB+/day

New challenges with deep-sea DAS





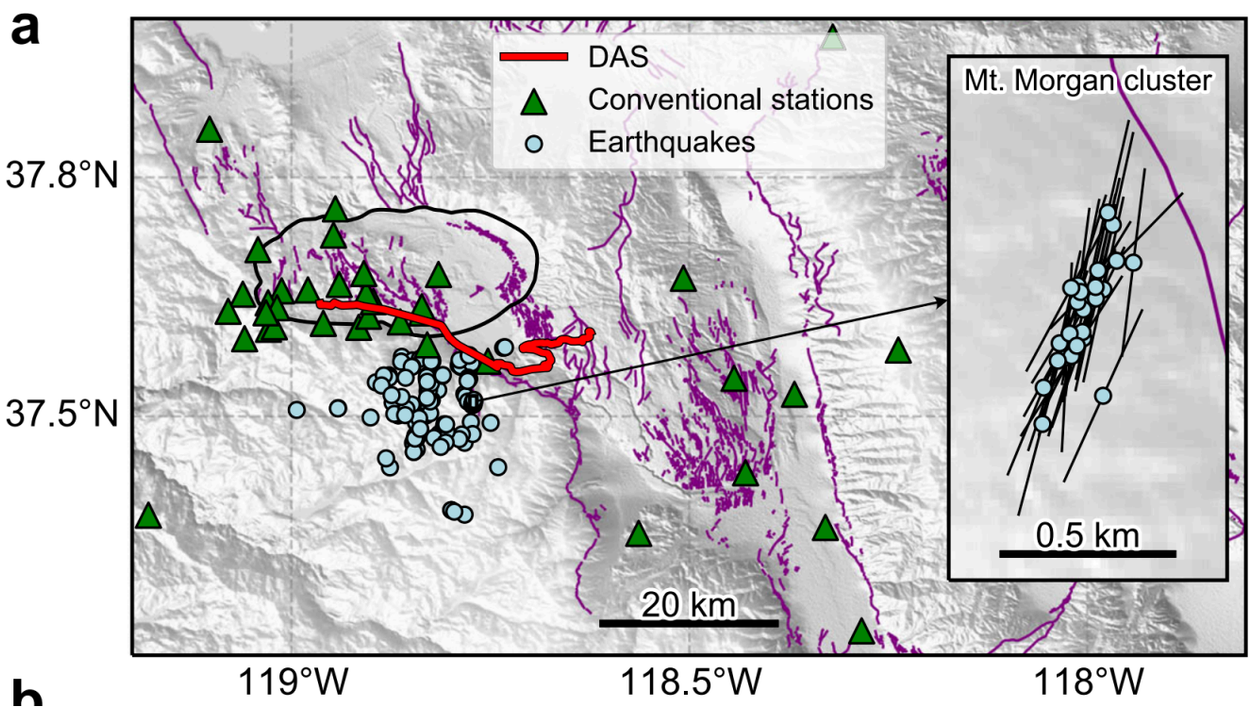
➡ Don’t have funding for DAS (yet), but students and travel are funded for next 3 years

➡ Will draw much more power, will be physically bigger and heavier than DTS

➡ Data output will be higher than DTS (could be resolved with a fiber comms solution)

➡ But, can be integrated into existing singlemode fibers (not limited to multimode cables deployed specifically by ROV)

Also…



Li et al. 2023 *Nature*

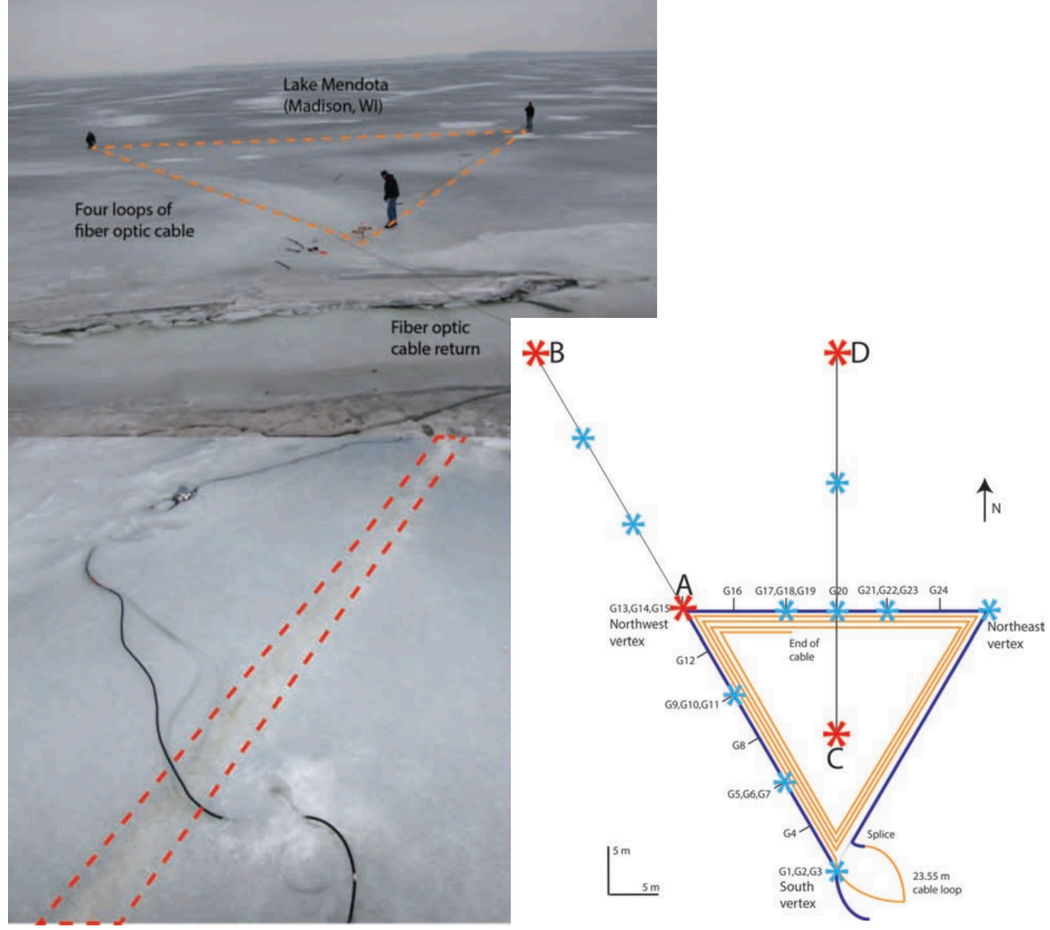


Figure 1. Top: Photo of the fiber-optic cable array being deployed on the ice in frozen Lake Mendota. Each person is standing roughly at a vertex of the equilateral triangular array. The dashed line in the background highlights the array. Bottom: Photo of one of the array sides showing uniform cable-to-ice coupling located within dashed trapezoid.

Castongia et al. 2017 *J. EEG*

➡ Cable geometry is important, as are instrument settings (gauge length, channels, etc. compared to seismic wavelengths). Note that the entire DAS array can be tuned in near-real time.

➡ Data post-processing is not trivial, involves advanced computational resources

➡ Best to be integrated within a network of sparse seismometers