Exploring our planet through SMART cables

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17/6/22

TNC22, Trieste

By U.S. Navy photo by Photographer's Mate 2nd Class Philip A. McDaniel - This image was released by the United States Navy with the ID 050102-N-9593M-040 (next), Public Domain, https://commons.wikimedia.org/w/index.php?curid=8241767

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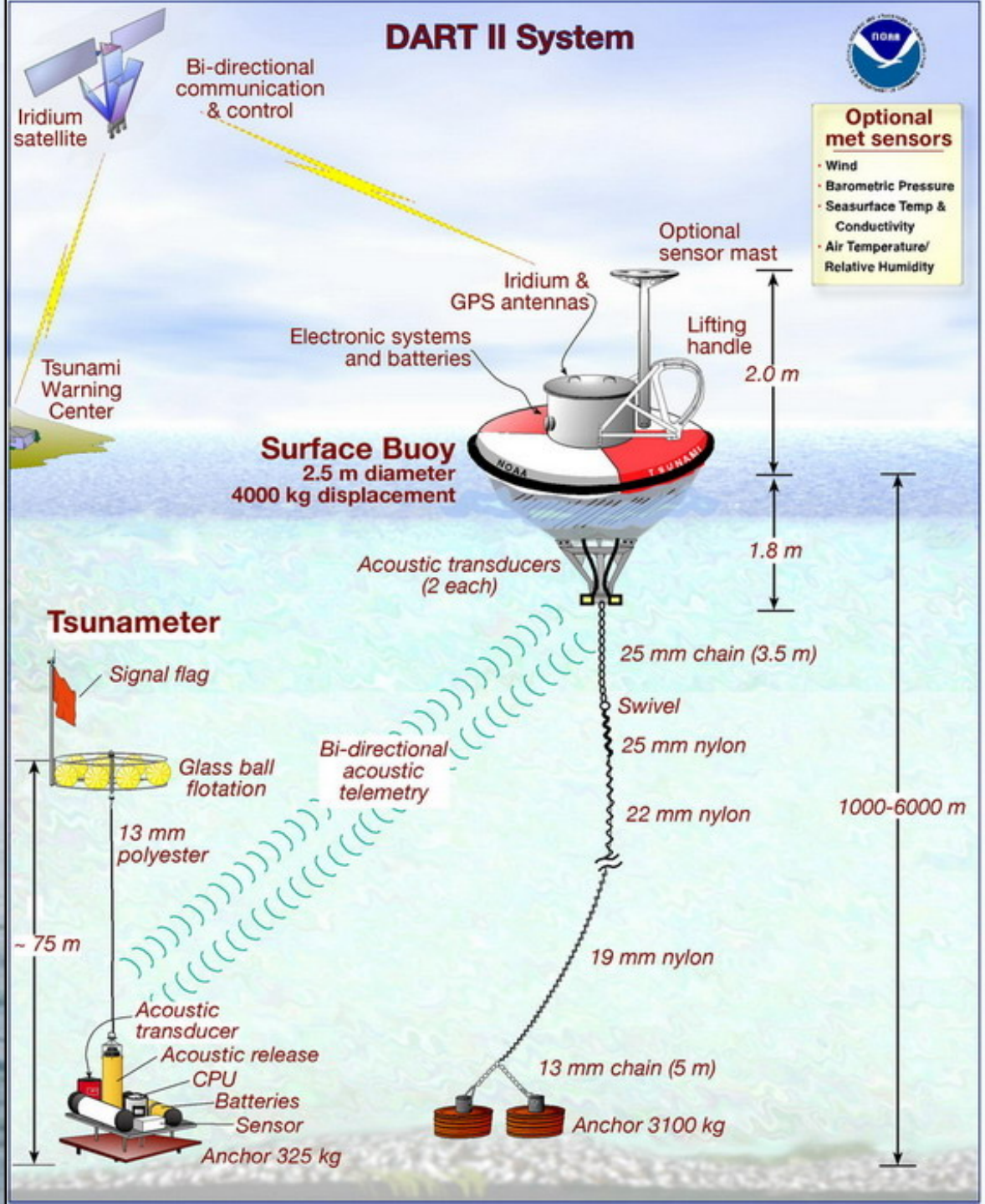
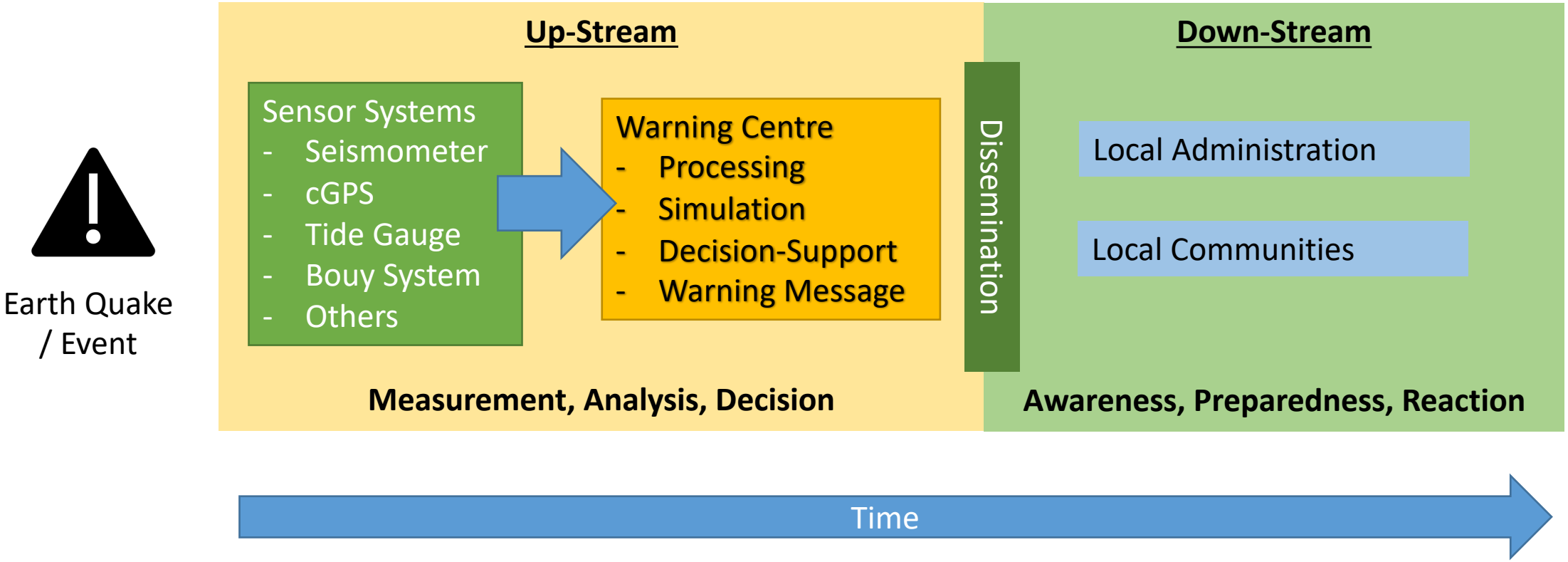
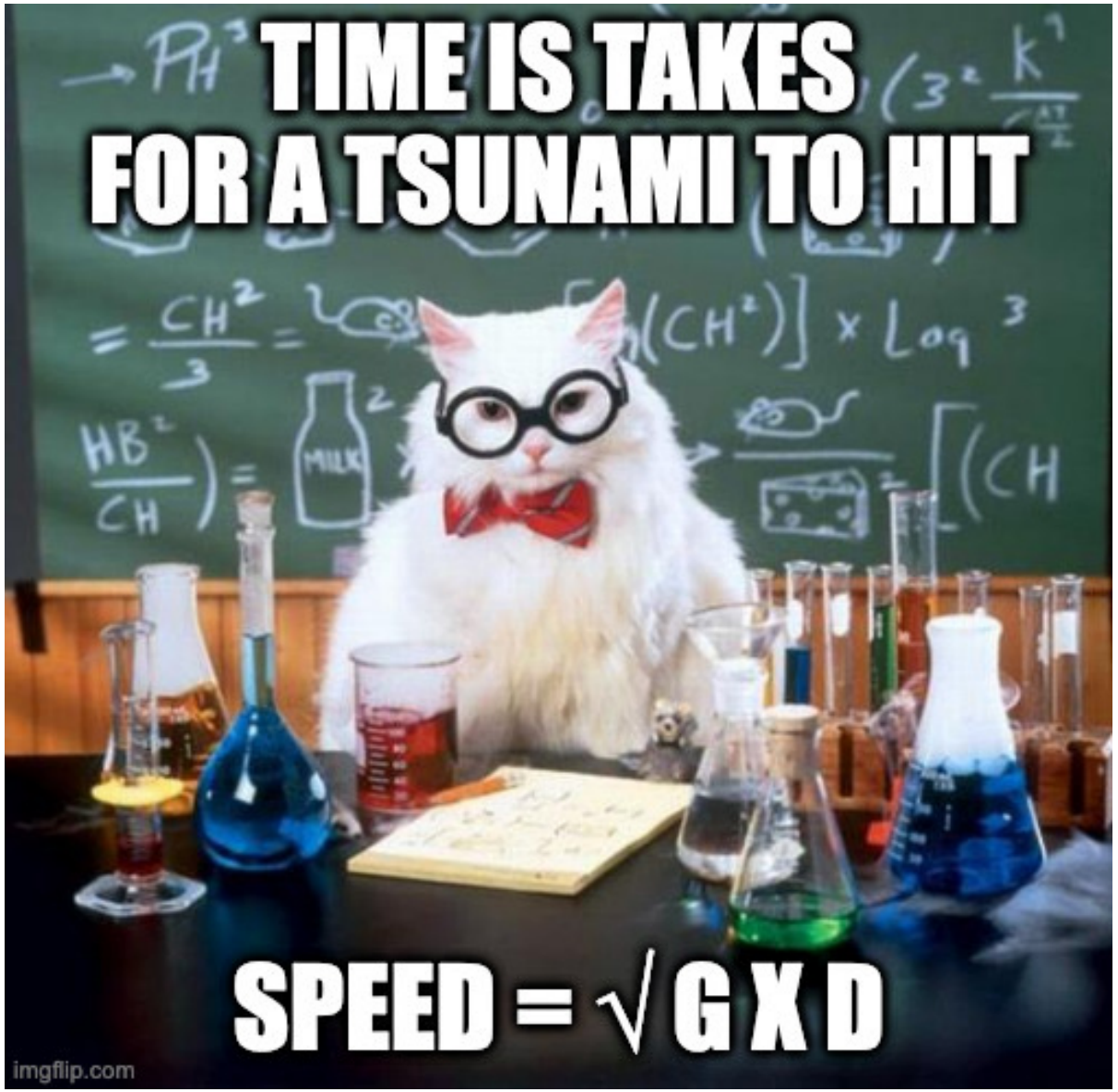


How Tsunamis are monitored and reported



Lauterjung, J., Letz, H. (Eds.) (2017): 10 Years Indonesian Tsunami Early Warning System: Experiences, Lessons Learned and Outlook, Potsdam: GFZ German Research Centre for Geosciences, 68 p.
DOI: http://doi.org/10.2312/GFZ.7.1.2017.001



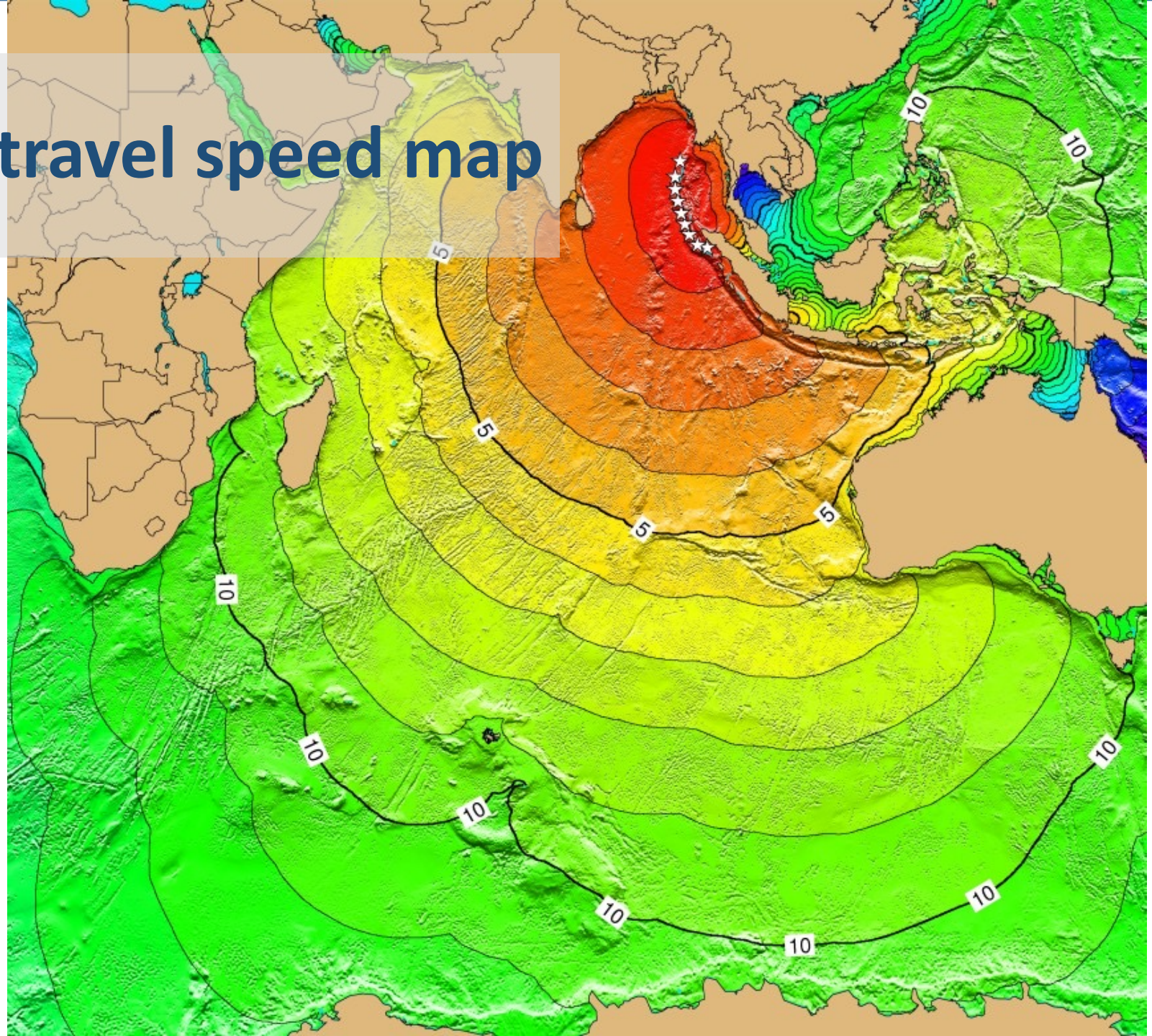
1000 meters water depth = 713 Km/s

4000 meters water depth = 198 m/s

g = 9.81

d = Depth of water

Tsunami travel speed map



Map contours: 1-hour intervals:
Red: 1-4 hour arrival times

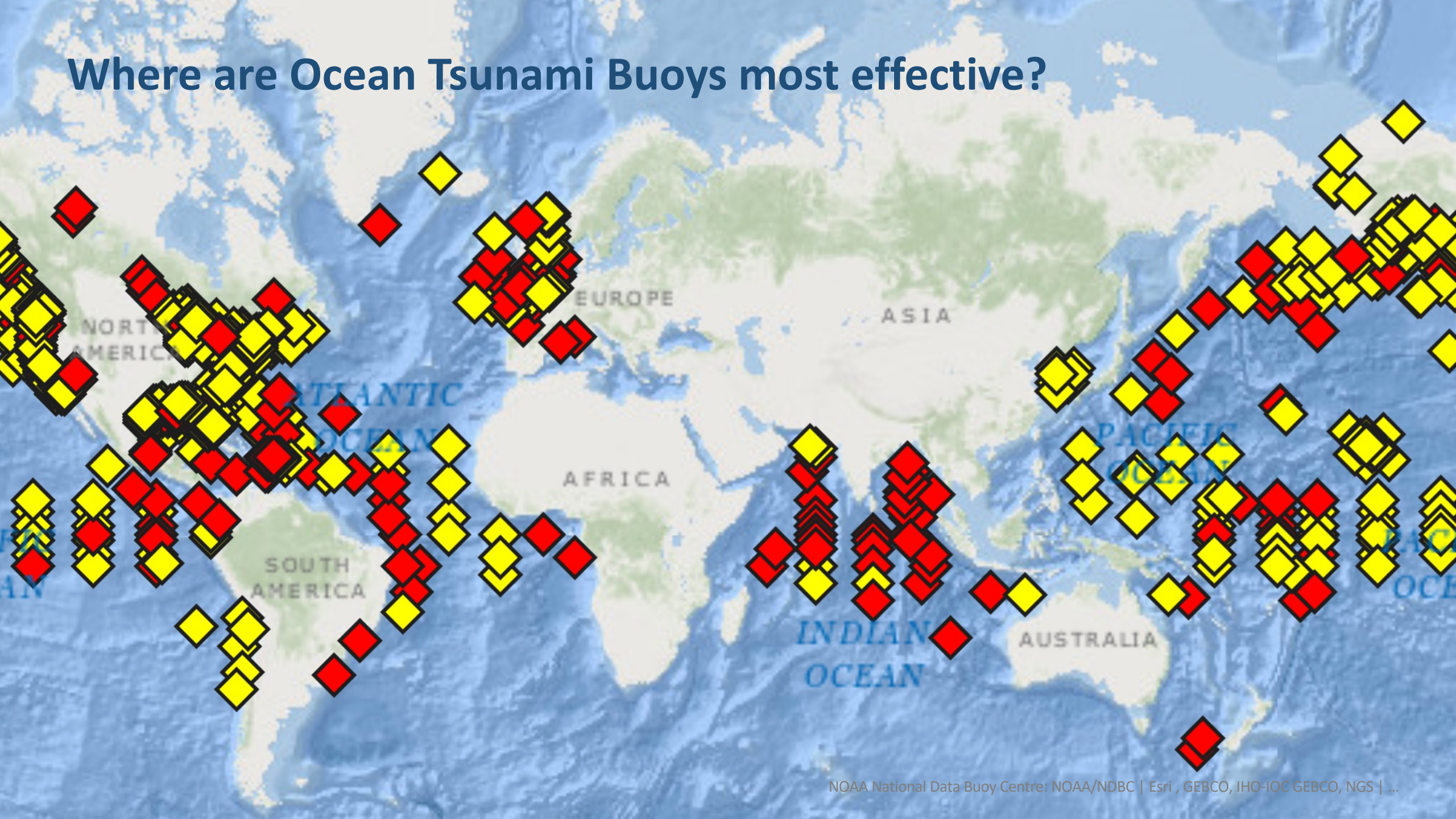
Yellow: 5-6 hour arrival times

Green: 7-14 hour arrival times

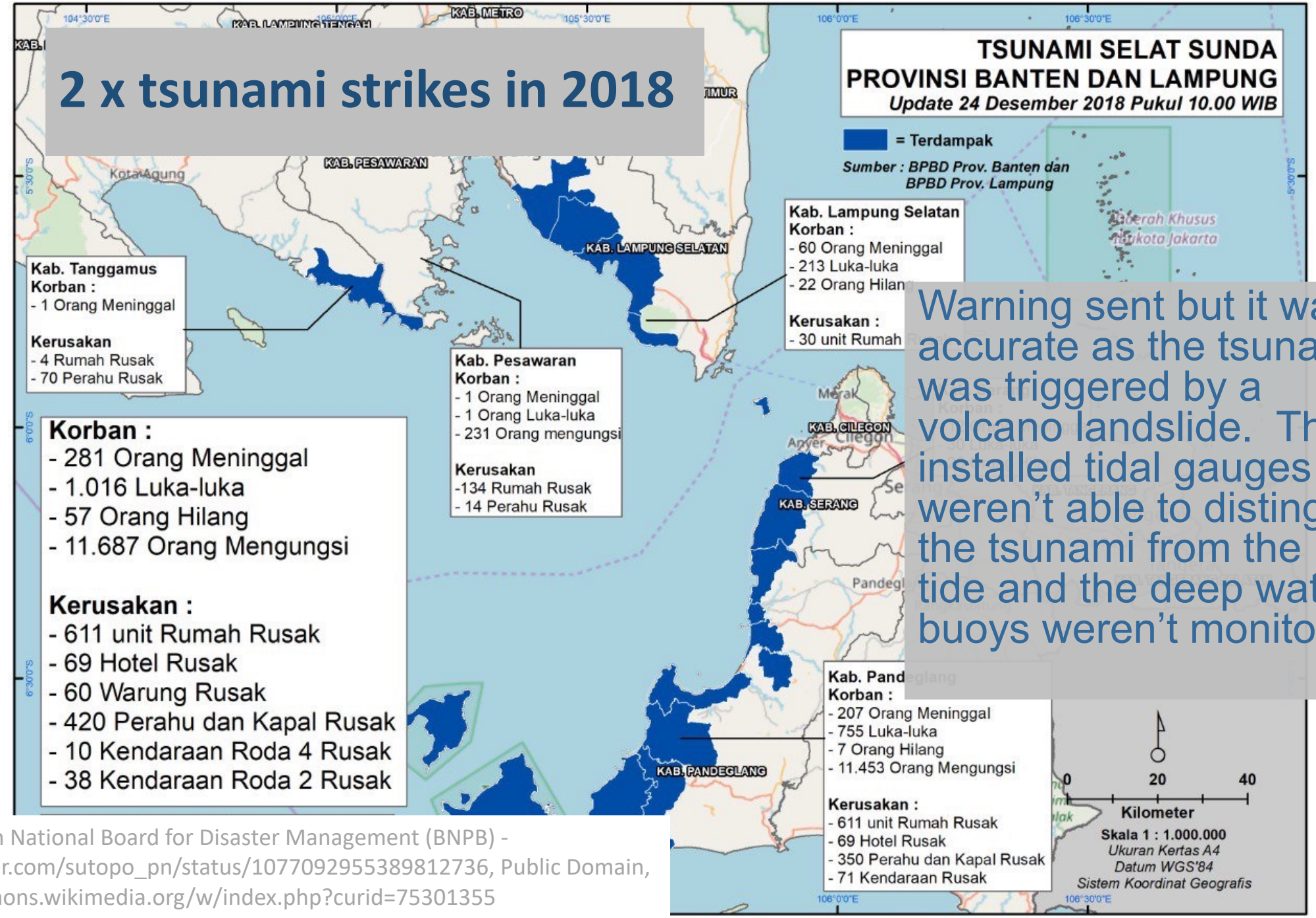
Blue: 15-21 hour arrival times

https://www.ngdc.noaa.gov/hazard/tsu_travel_time_events.shtml

Where are Ocean Tsunami Buoys most effective?

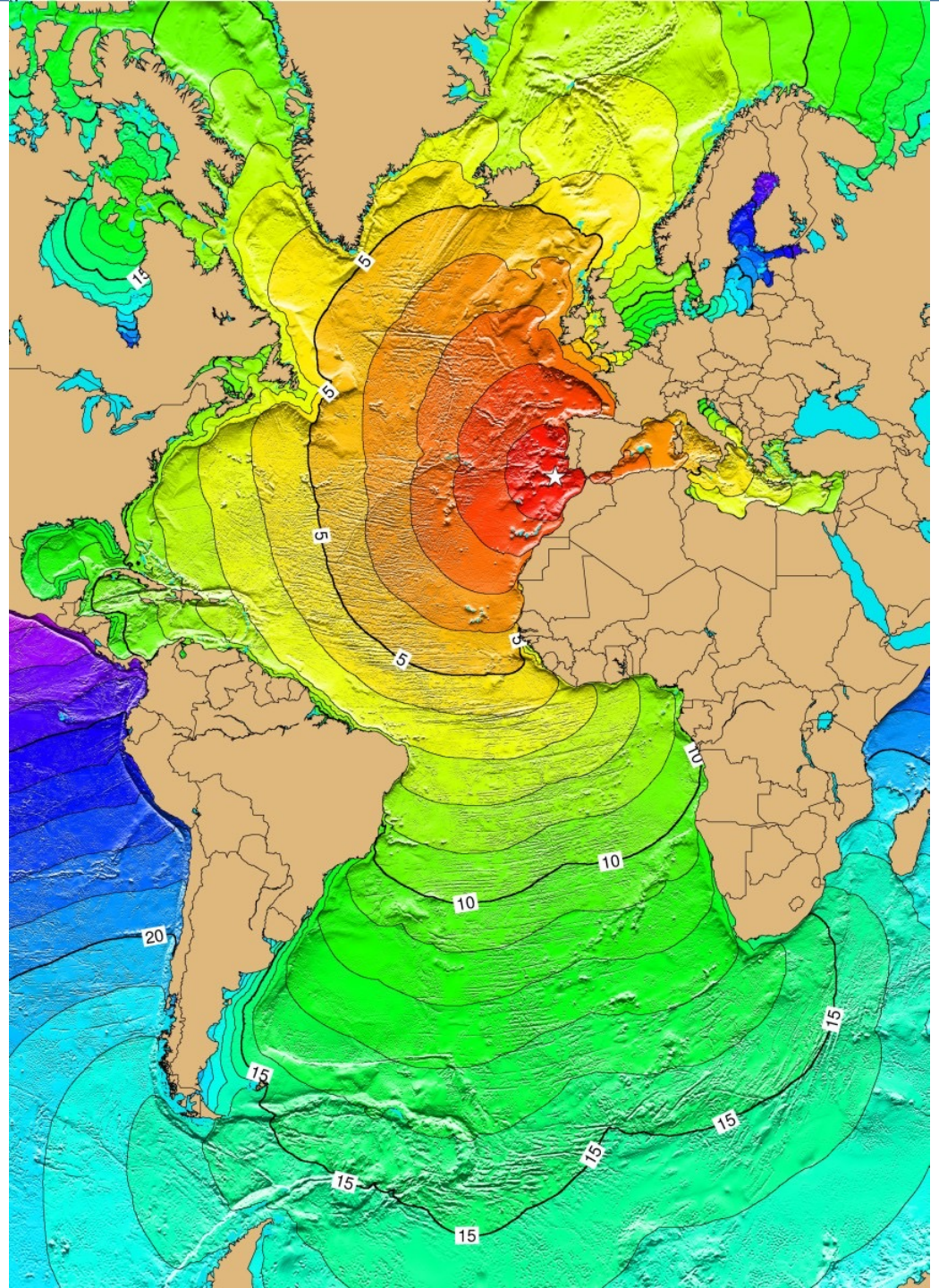


2 x tsunami strikes in 2018



Warning sent but it wasn't accurate as the tsunami was triggered by a volcano landslide. The installed tidal gauges weren't able to distinguish the tsunami from the high tide and the deep water buoys weren't monitoring.

Tsunami's in Europe



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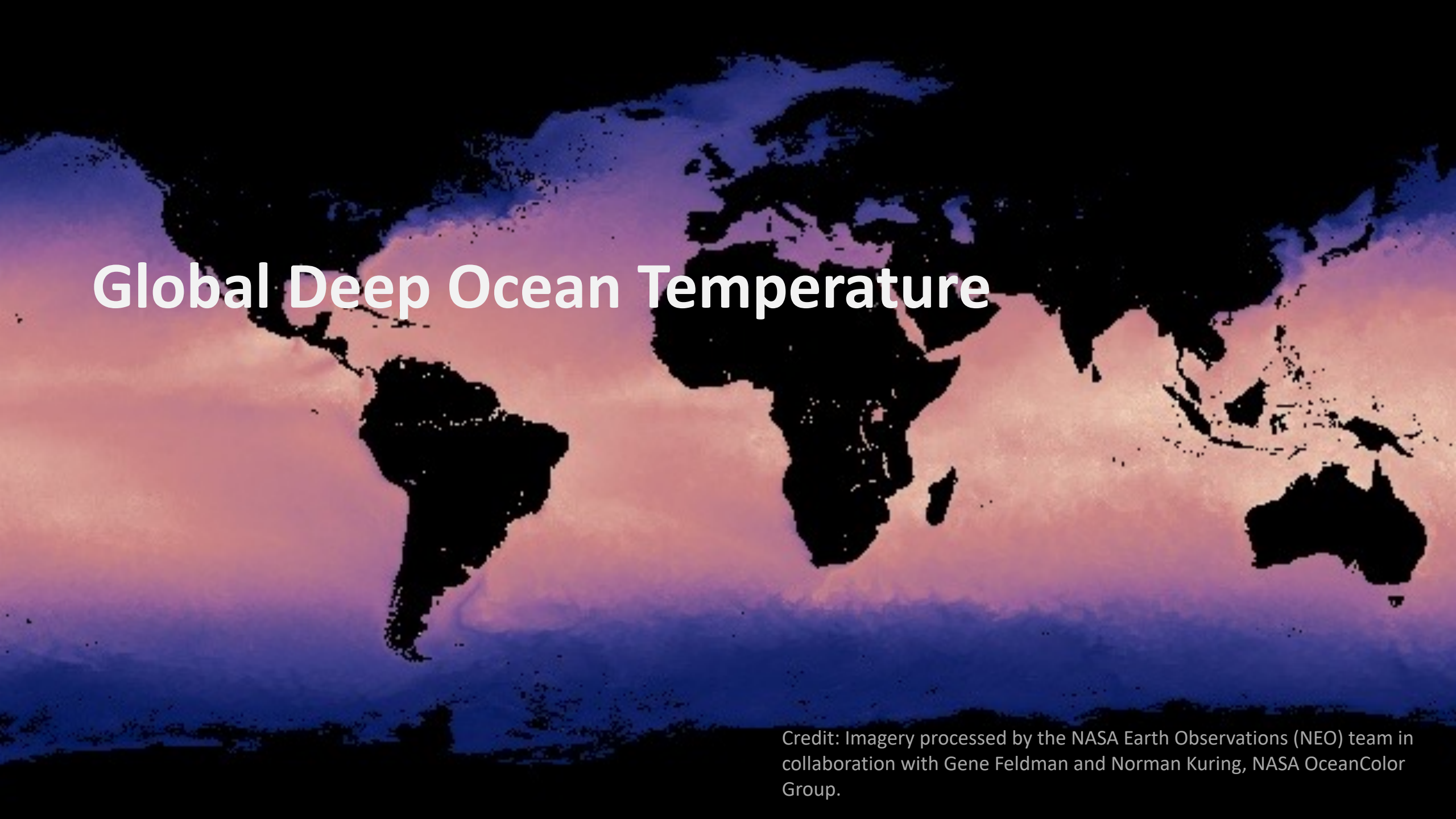
Another societal challenge from lack of deep ocean observations

Photo by Rob Curran on Unsplash

Global Deep Ocean Temperature



Credit: Imagery processed by the NASA Earth Observations (NEO) team in collaboration with Gene Feldman and Norman Kuring, NASA OceanColor Group.

We need more data!

Long term data sets for:

- Climate modelling
- Weather forecasting
- AI and all that

Photo by Snowscat on Unsplash

What about dedicated infrastructure?

By John Whitehead - Ocean Instruments, Public Domain, https://commons.wikimedia.org/w/index.php?curid=15663716

Expensive to install

Expensive to maintain

Photo by Ibrahim Boran on Unsplash

Who is responsible?

Photo by Frederic Köberl on Unsplash

emso ERIC

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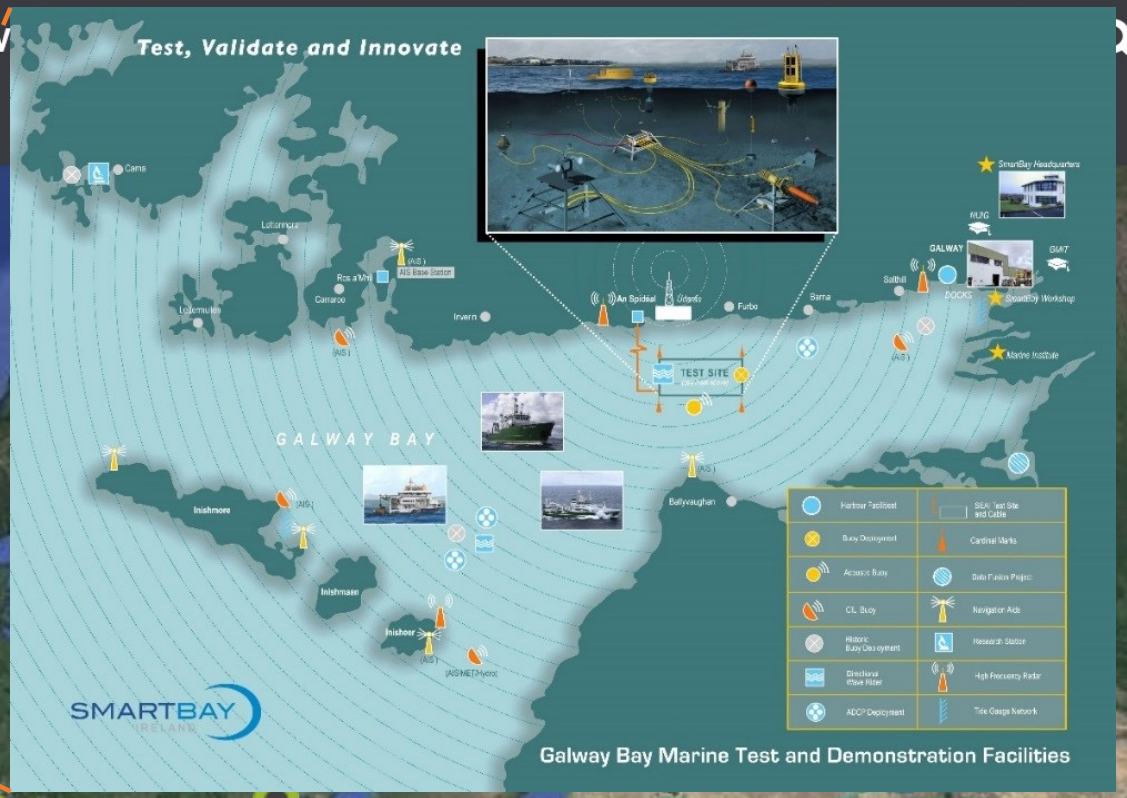

There have been dedicated cables and infrastructure installed!

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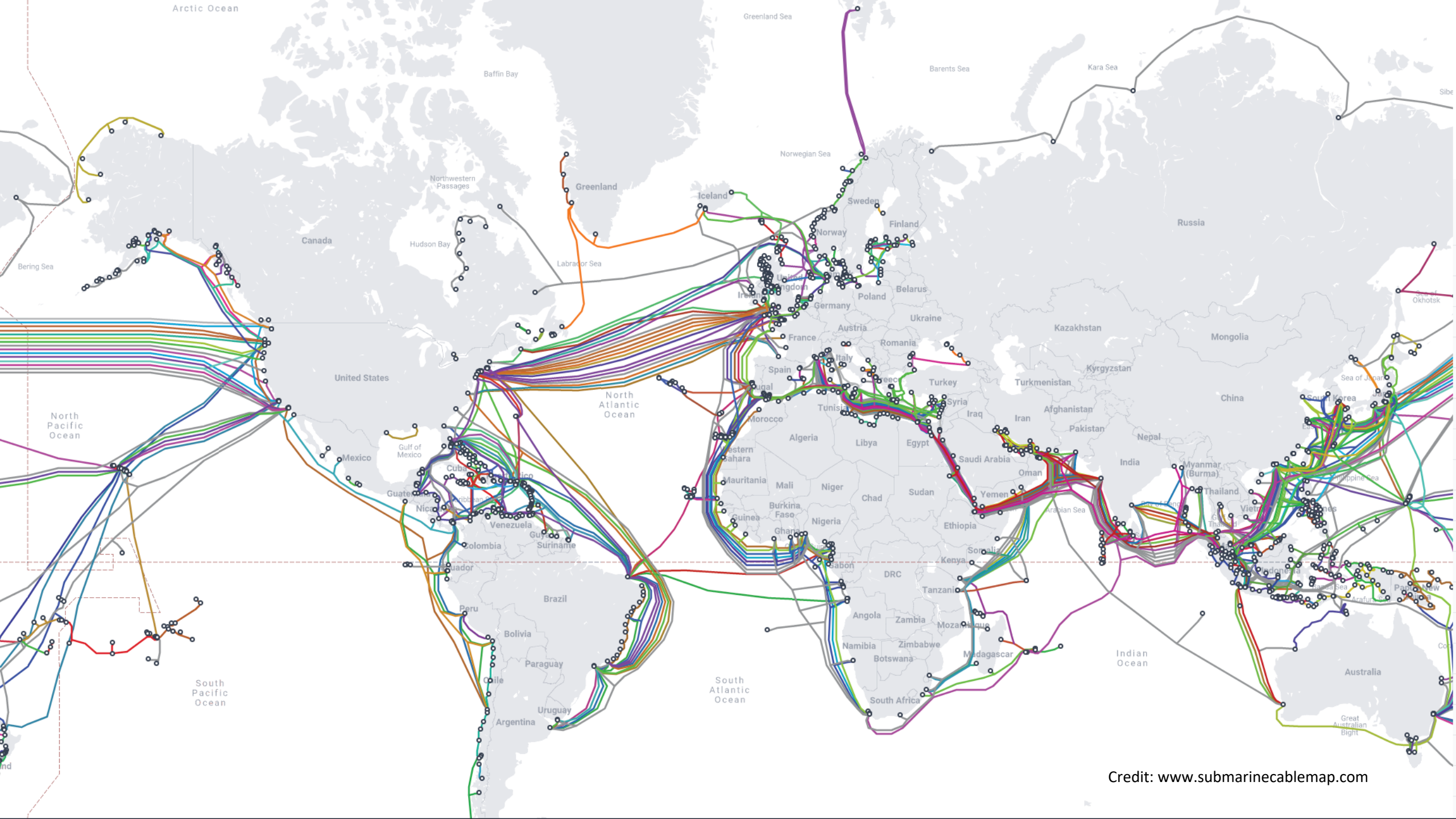
What about Space?

Photo by NASA on Unsplash

This isn’t just a theoretical problem

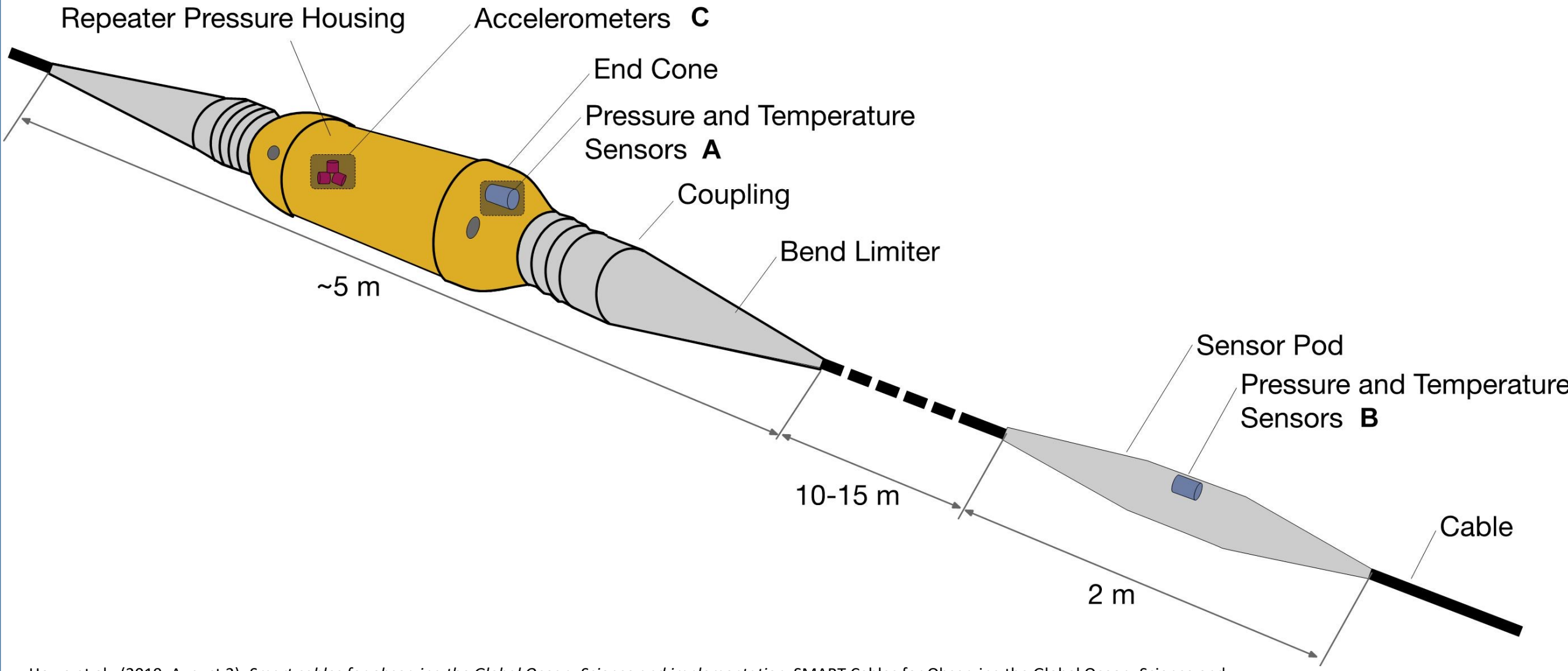


Credit: www.submarinecablemap.com

Science Monitoring And Reliable Telecommunications

SMART Cables Partner Organizations and Endorsements

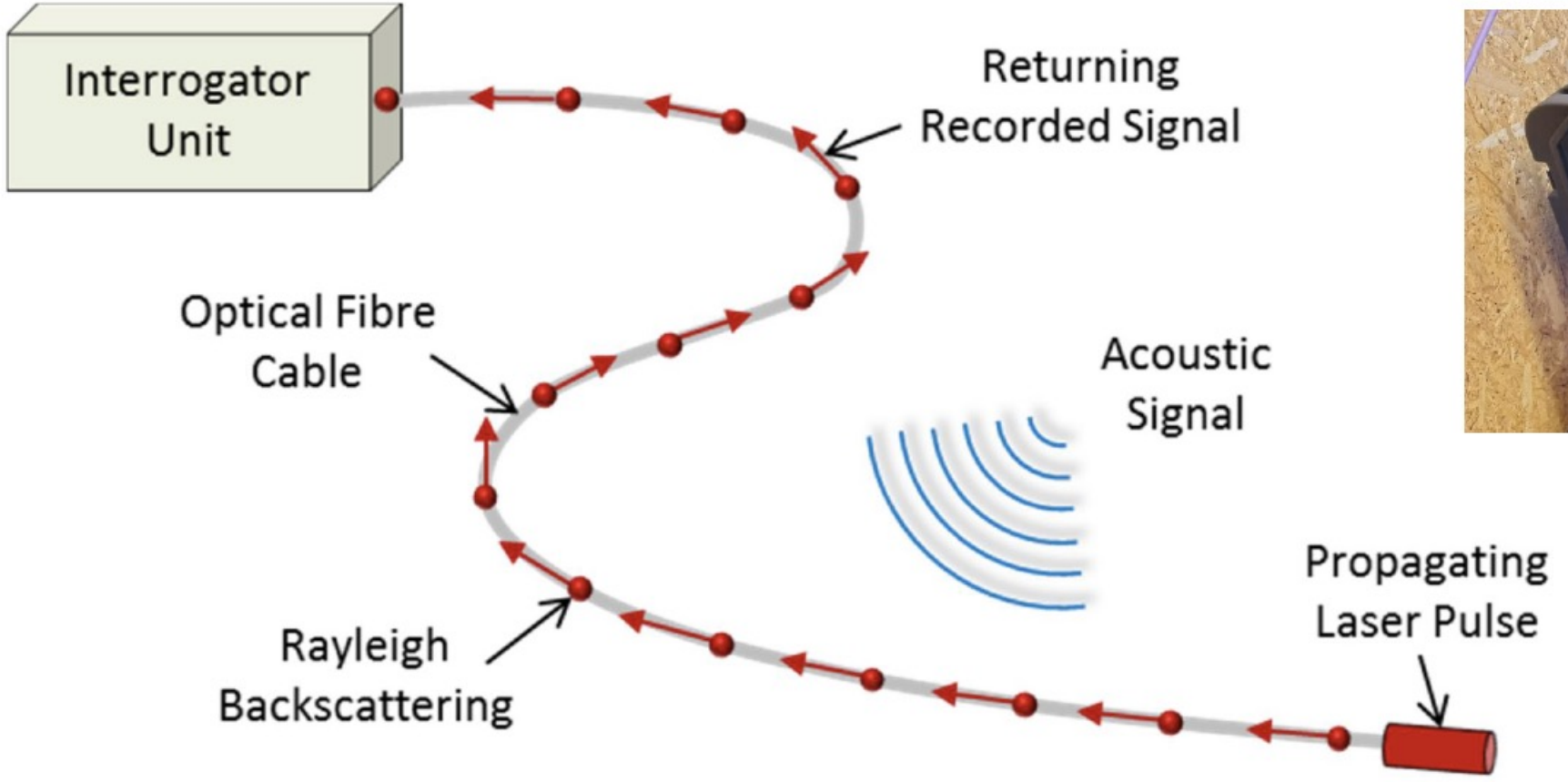
SMART Cable concept



Howe et al., (2019, August 2). *Smart cables for observing the Global Ocean: Science and implementation*. SMART Cables for Observing the Global Ocean: Science and Implementation. Retrieved June 10, 2022, from https://www.frontiersin.org/articles/10.3389/fmars.2019.00424/full


Is there another way?
Photo by Beth Macdonald on Unsplash

DAS: Distributed Acoustic Sensing



Can also measure transmitted signal or perform polarization analysis at the end of the fibre: SOP

Figure adapted from Wilks et al. , CLIMIT poster 2016

With thanks to Prof Martin Landrø, NTNU