

# ITU/WMO/UNESCO IOC Joint Task Force on SMART cables

Climate Monitoring and Disaster Warning  
Using Submarine Cables

*Hiroshi OTA, ITU/TSB*

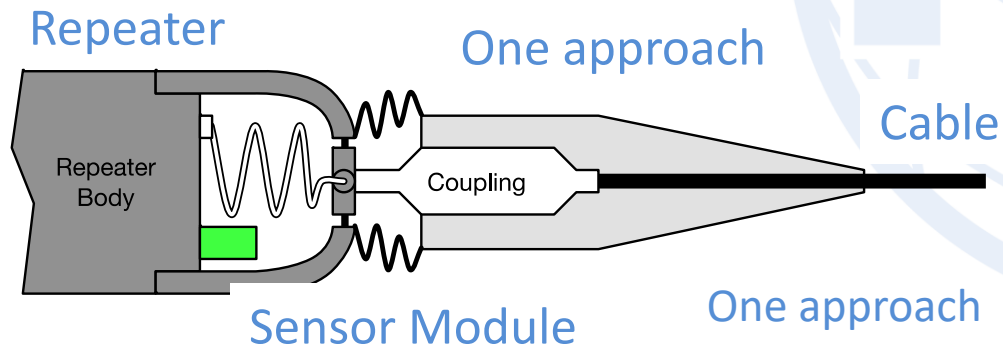
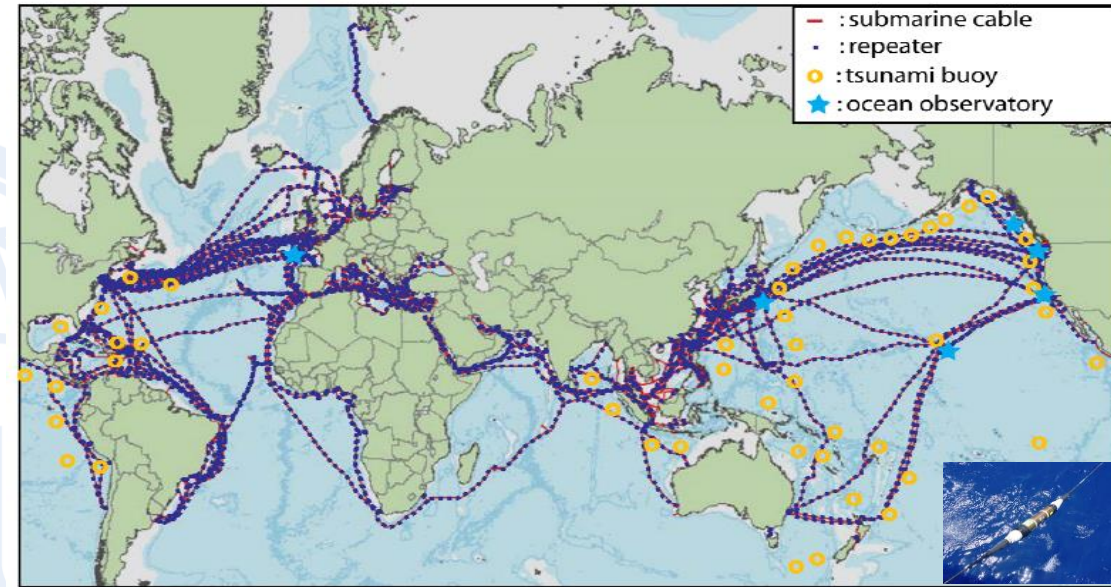




# SMART Cables - Basic Concepts

## SMART (Scientific Monitoring And Reliable Telecommunications) cable systems for Climate Monitoring and Disaster Mitigation

*SMART cables: first order addition to the ocean-earth observing system, with unique contributions that will strengthen and complement satellite and in-situ systems*



Install routinely on new cables  
Deploy by cable ship, no maintenance

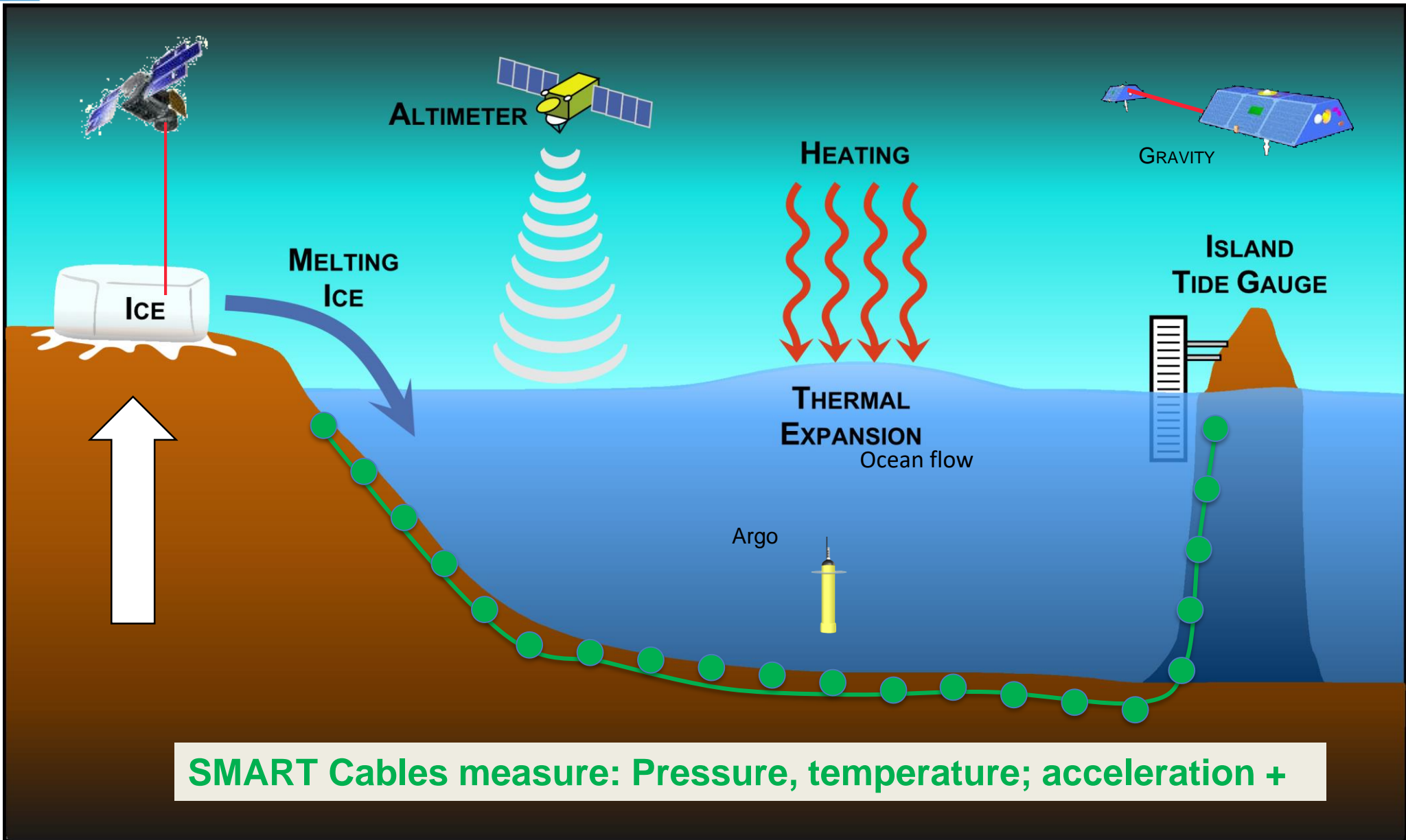
- Telecom + science, shared infrastructure, \$ ↓
- Cable repeaters host sensors, not to interfere
- Potential: global spanning, trans-ocean, 1+ Gm  
~10,000+ repeaters (~100 km)  
10-25 year refresh cycle
- Initially: **bottom pressure, temperature and seismic acceleration**; supplement later
- Share data internationally

John You, Nature, 2010 – Harnessing telecoms cables for science

<https://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx>



# SMART cable system

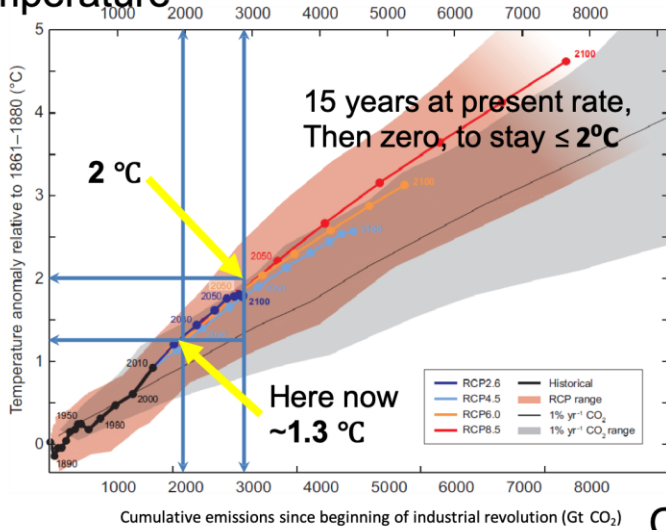




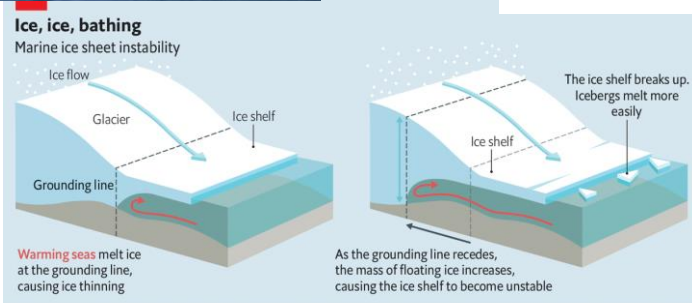
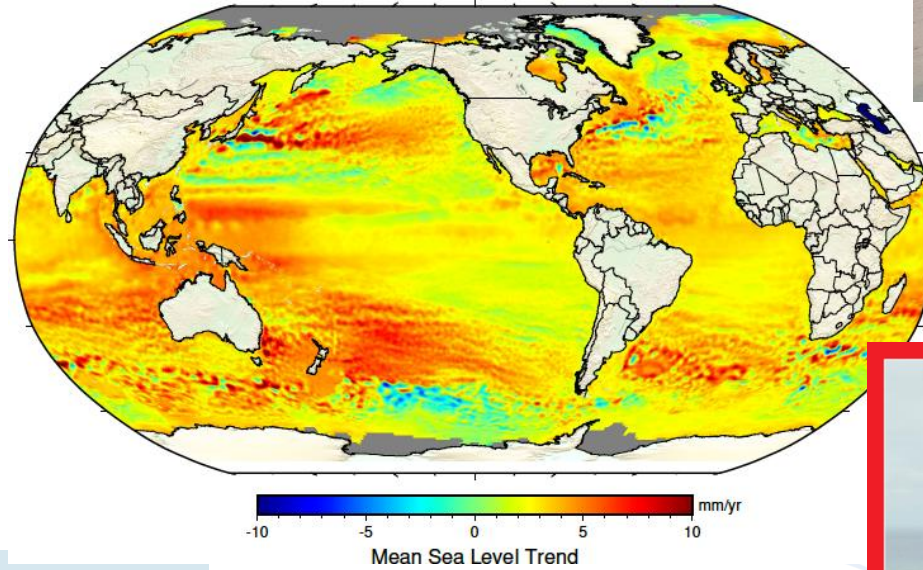
# Climate Change – Global warming – Sea level



## Temperature



Climate change is a remorseless threat to the world's coasts  
Economist, August 2019



The Economist

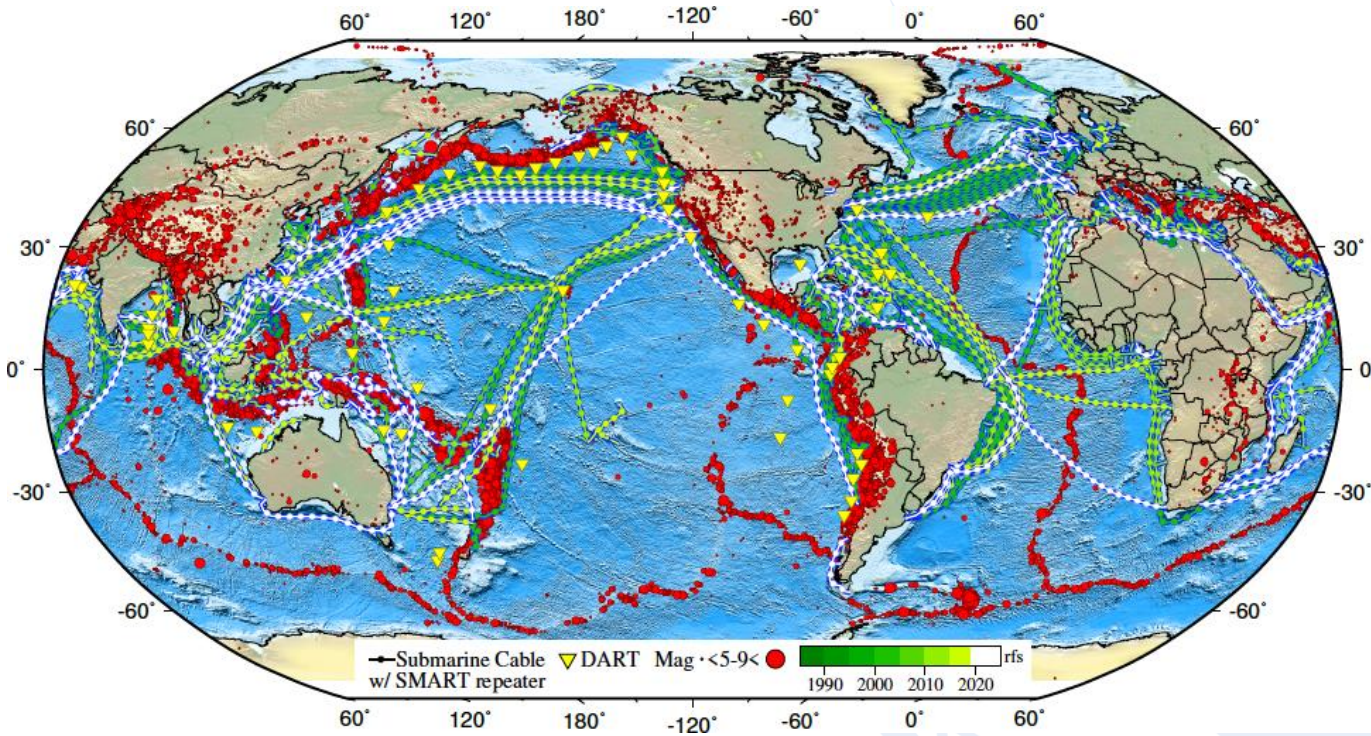


plainpicture



# Tsunamis

Red earthquakes  
Green/white cables



| Place            | Year | Mag | H (m) | Deaths  |
|------------------|------|-----|-------|---------|
| Chile            | 1960 | 9.5 | 25    | 6000    |
| Alaska           | 1964 | 9.2 | 30    | 132     |
| Mindinao         | 1976 | 7.9 | 9     | 7,800   |
| Tumaco           | 1979 | 8.1 | 6     | 350     |
| Hokkaido         | 1993 | 7.8 | 30    | 250     |
| Papua New Guinea | 1998 | 7.1 | 15    | 2200    |
| Sumatra          | 2004 | 9.2 | 33    | 230,000 |
| Solomon Island   | 2007 | 8.1 | 12    | 52      |
| Samoa            | 2009 | 8.1 | 14    | 189     |
| Maule, Chile     | 2010 | 8.8 | 3     | 525     |
| Tohoku           | 2011 | 9.0 | 10    | 19,000  |
| Palu             | 2018 | 7.5 | 7     | ~2000?  |





# The SMART Cable Opportunity

## Better observe the ocean

Flywheel of Climate, Source of Hazards

### More Sensors

A global network of  
ocean floor observation stations

### Less Money

Harness 3<sup>rd</sup> party investment  
to save millions in deployment costs

## Societal and environmental issues:

- **Climate change** – ocean temperature, circulation  
– direct impact, short and long term
- **Sea level rise** – hazard for coasts, island, cities
- **Disaster warning** – tsunami and earthquake  
monitoring throughout ocean basins and coastal  
margins

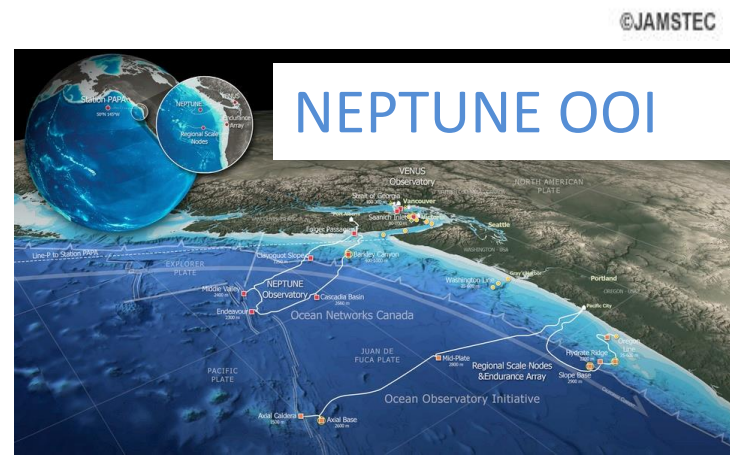
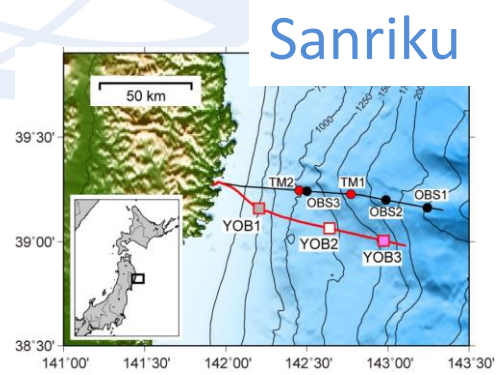
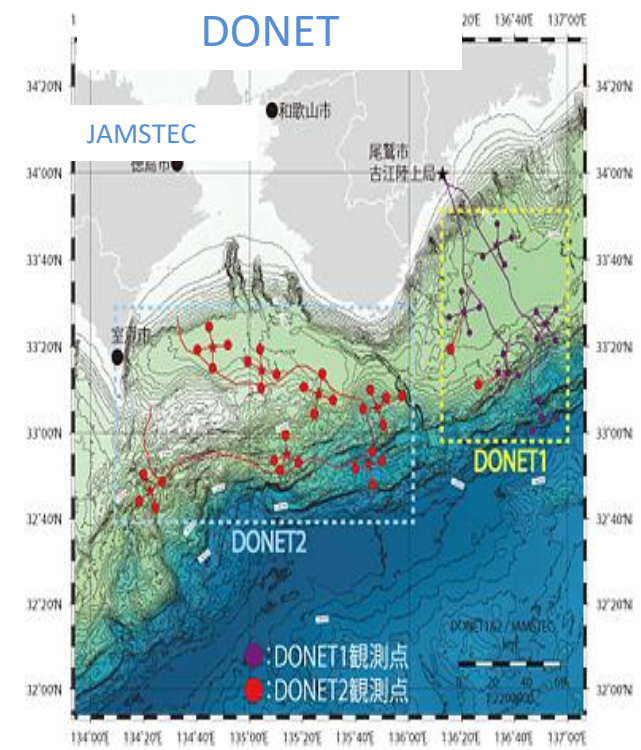
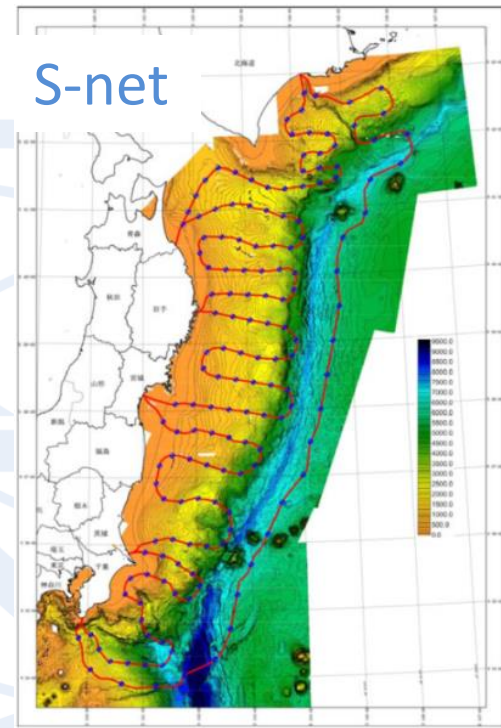






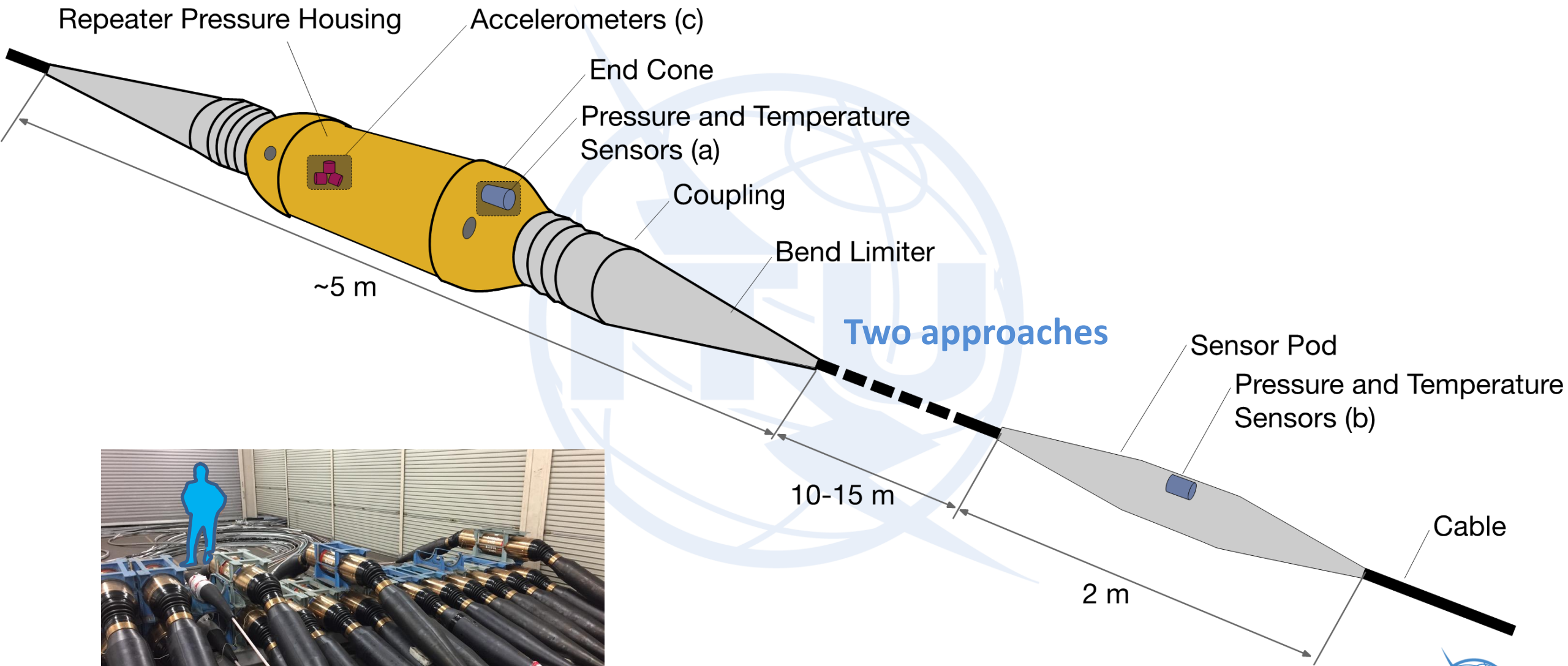
# Existing technology components

- Dedicated cable systems
  - Existing and proven:
    - S-Net, Sanriku
    - DONET, perhaps NEPTUNE, OOI-RCA (high power, ROV)
    - *N-Net – new*
  - Sanriku lower cost, close to SMART
- Or use Branch unit on commercial cable – wet demo





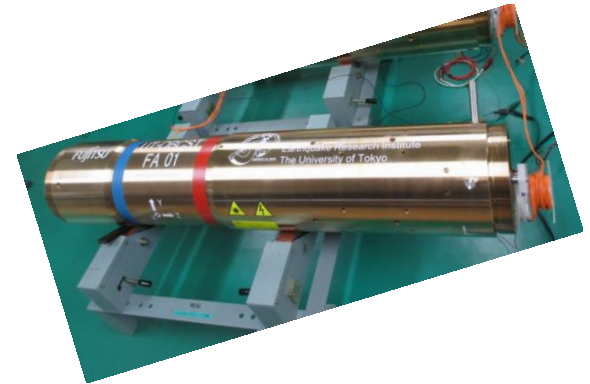
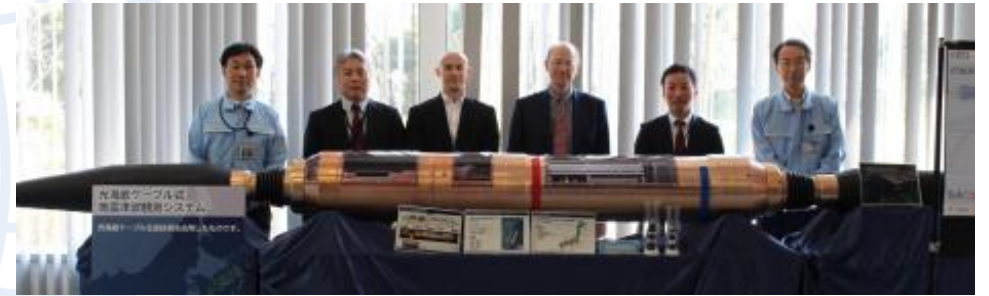
# SMART Repeaters





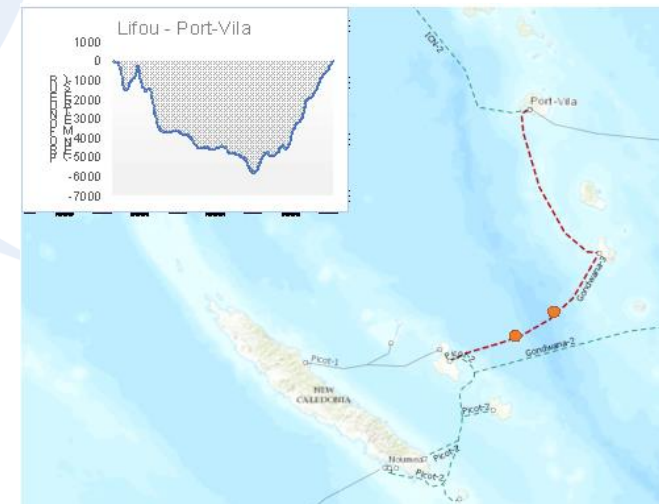
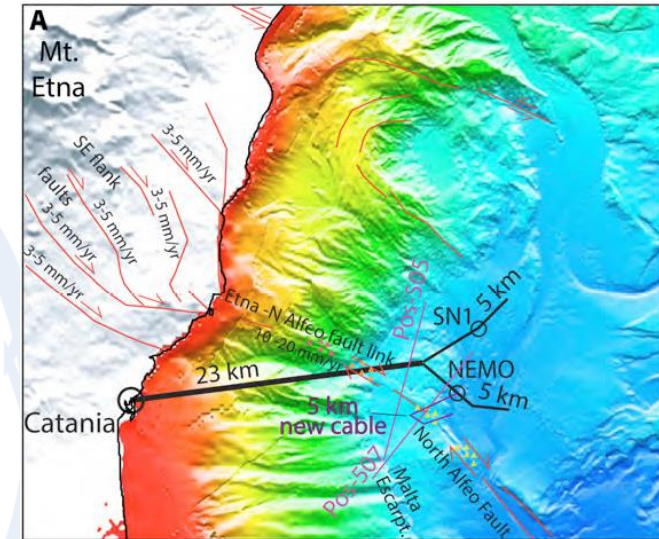
# Costs

- Dedicated single purpose early warning systems (S-net, N-net) and plug and play science systems (NEPTUNE-Canada, US OOI-RCA, DONET)
- SMART
  - *Expect lower cost*
  - Share/incremental costs only, with telecom
  - Assume no wet maintenance for SMART part
  - Pick and choose which systems
  - Build up coverage over time



# Ongoing projects

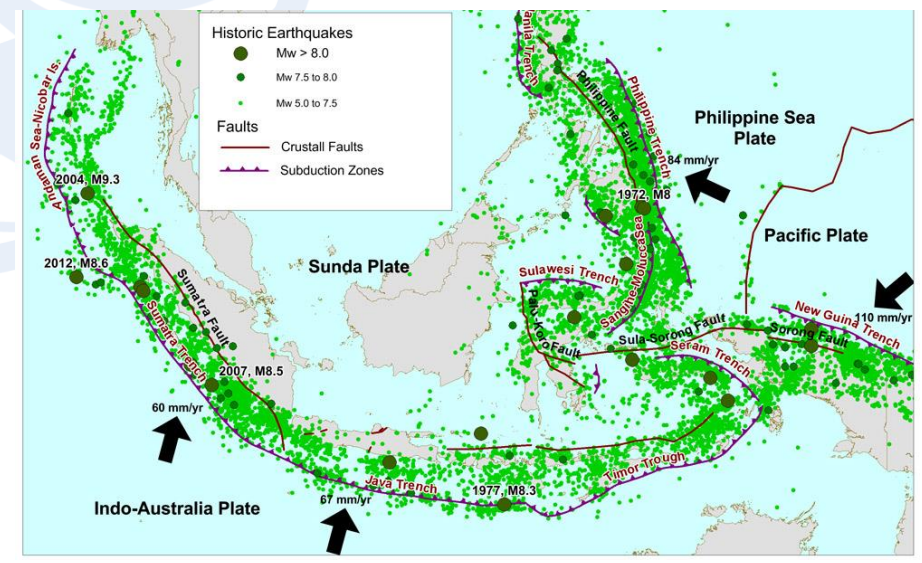
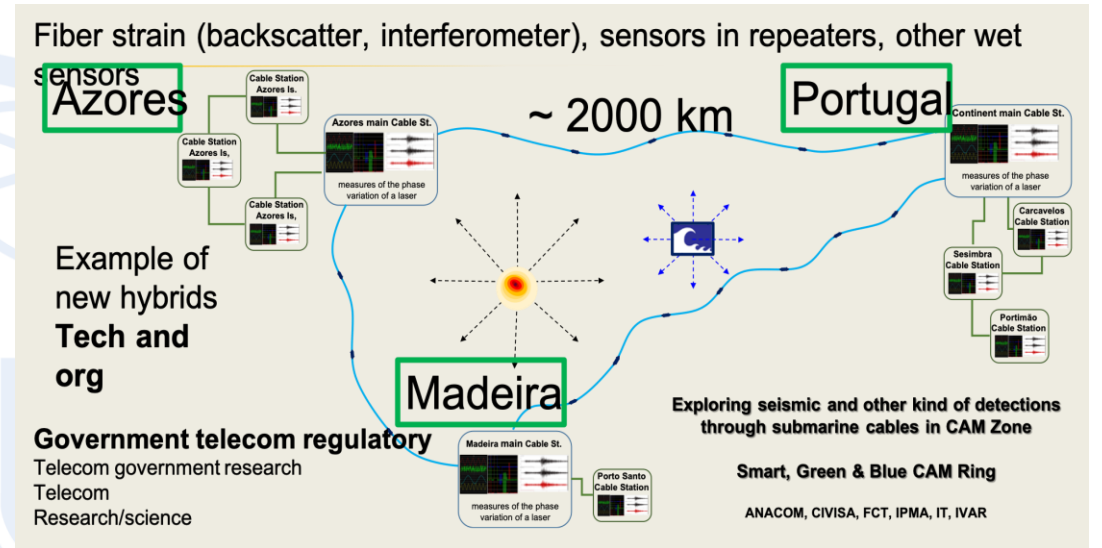
- National Institute of Geophysics and Volcanology (INGV, Italy): “Wet demonstration” project (**Funded**)
- New Caledonia –Vanuatu SMART Cable: Very modest (appropriate) scale pilot SMART system connecting New Caledonia to Vanuatu (300 km, 2 SMART repeaters) (**Partially (majority) funded and is under work for obtaining the balance needed**)





# Proposed projects

- ANACOM (Portugal): Science/early warning + telecom system for Lisbon-Azores-Madeira-Lisbon
- Indonesia: “Cable-based tsunami warning system” based on SMART concepts





# Conclusion

- SMART cables provide alternative/complementary methods for climate change monitoring and tsunami early warning
- Technically feasible and there are already ongoing (funded) and proposed projects on SMART cables
- ITU, WMO and UNESCO IOC are supporting **Joint Task Force on SMART cables**.
  - Monthly e-meetings and yearly face-to-face events
  - Participation is welcome!
  - Details are at <https://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx>





