Observing the Ocean and Earth

SMART CABLES

PTC'25

Submarine Cable Topical Session

20 January 2025, Honolulu

José S. Barros
Joint Task Force SMART Cables
Executive Committee

Overcoming the Challenges of Sensing in Subsea Telecom Cables

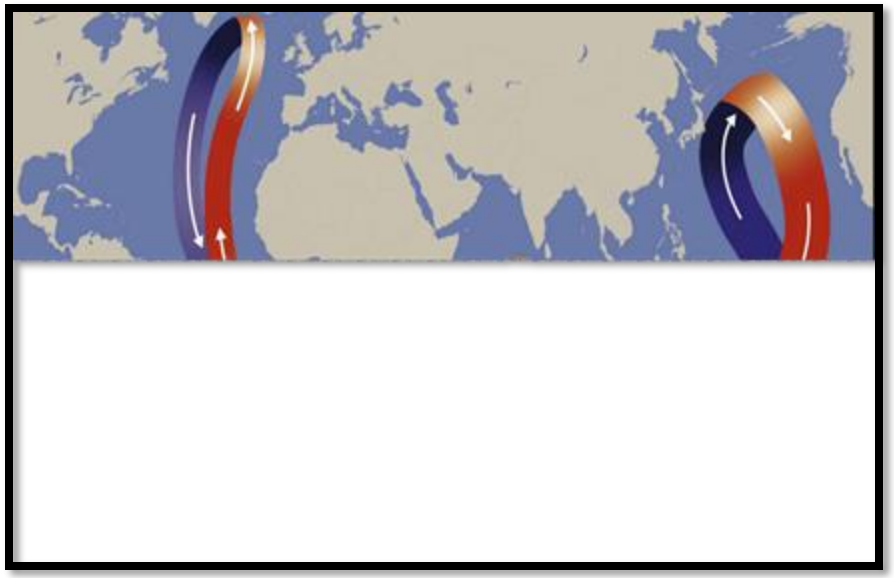
Science **M**onitoring **A**nd **R**eliable **T**elecommunications

https://www.smartcables.org/

Who we are - our mandate

….a global initiative, uniting 300 volunteers and stakeholders from science and society, engineering, marketing, business development, regulatory, and data management disciplines…

earthquake & tsunami early warning



climate change, ocean heat, circulation and sea level rise

A United Nations initiative to unite science and society with the telecom industry to observe the oceans and the earth

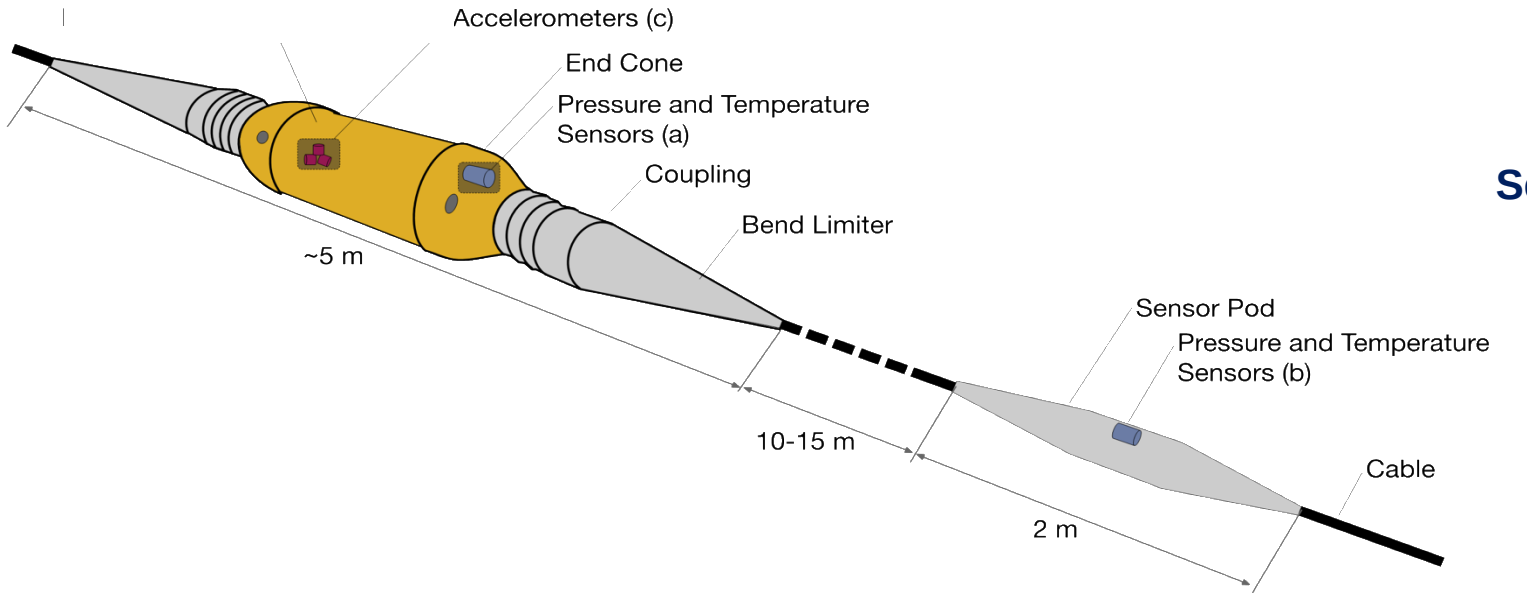
SMART Cables, multipurpose infrastructure

Going beyond telecom, sharing cable infrastructure with telecom + science + society

Absolutely <u>NO INTERFERENCE</u> between Telecom part and Observation part

Based on existing technology

Dedicated fiber pair for sensing, with sensors inserted in repeaters or inserted in separate sensors housing



Sensor package (KISS approach)

- temperature
- pressure
- seismic
- ***essential ocean variables***

SMART vs Optical Fibre Sensing

Complementary , not competition

1. Measurements characteristics can differ in complementary ways

2. SMART sensors can calibrate fibre sensing observations

3. Validate unexpected observations

Seismic and environmental detection

Discussion: Pros and Cons: Earthquakes

Comparison of communication submarine cables sensing techniques for seismic monitoring

	DAS	USLI	SOP	SOP-OTDR	SMART Cables
Equipment Requirements	DAS interrogator required	Ultra-stable laser source	Regular coherent line cards	HLL in optical amplifiers	Safe separation between communications and sensing systems
Fibre Requirements	Dark Fibre. Illuminated fibres TBD	Fibre spectrum required	No impact on existing channel plan	No impact on existing channel plan	Extra fibre pair if that is the solution provided by manufacturer
Cable requirements	Can be used on existing cables	Can be used on existing cables	Can be used on existing cables	Can be used on existing cables	Requires new cables
Costs	Small, limited to landing sites	Small, limited to landing sites	Small, limited to landing sites	Small, limited to landing sites	10 to 15% incremental costs for new cables
Sensitivity	Medium/High TBD	Medium. TBD	Medium. TBD	Medium. TBD	High
Detection: number of false positives	Large	Large	Large	Large	Small

TBD – To Be Demonstrated, requires Research & Development

Source: Luís Matias, IDL

Seismic and environmental detection

Discussion: Pros and Cons: tsunamis

Comparison of communication submarine cables sensing techniques for tsunami monitoring

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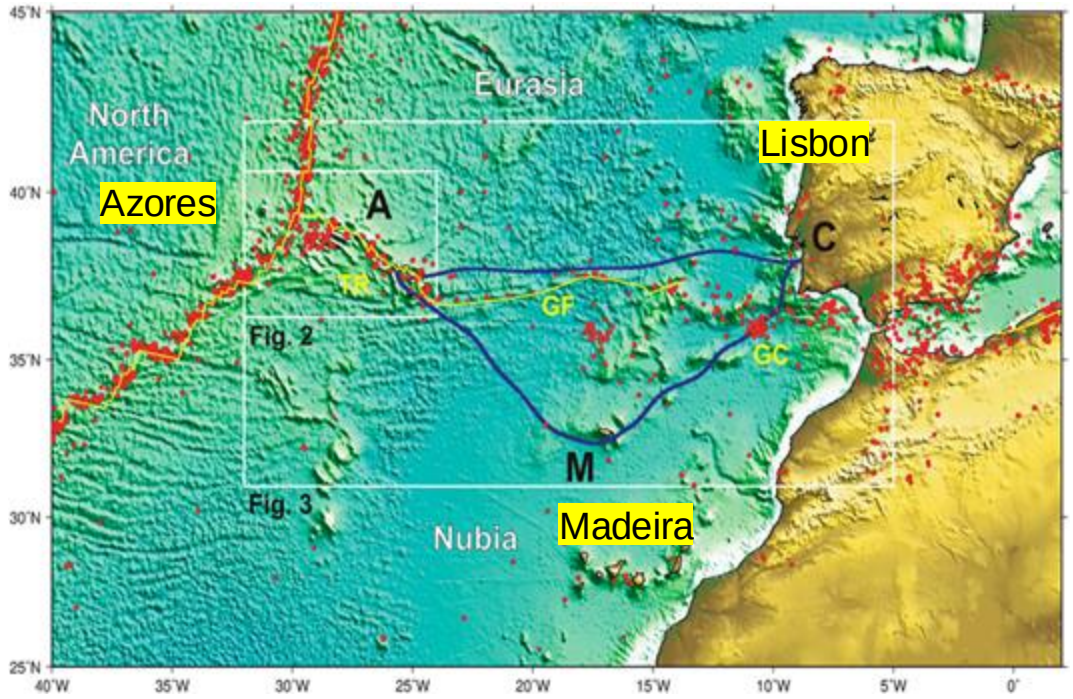
Sensitivity	TBD	TBD	TBD	TBD	High
Detection: number of false positives	Unknown. TBD	Unknown. TBD	Unknown. TBD	Unknown. TBD	Nil
TBD – To Be Demonstrated, requires Research & Development					

Source: Luís Matias, IDL

SMART Cables projects already funded

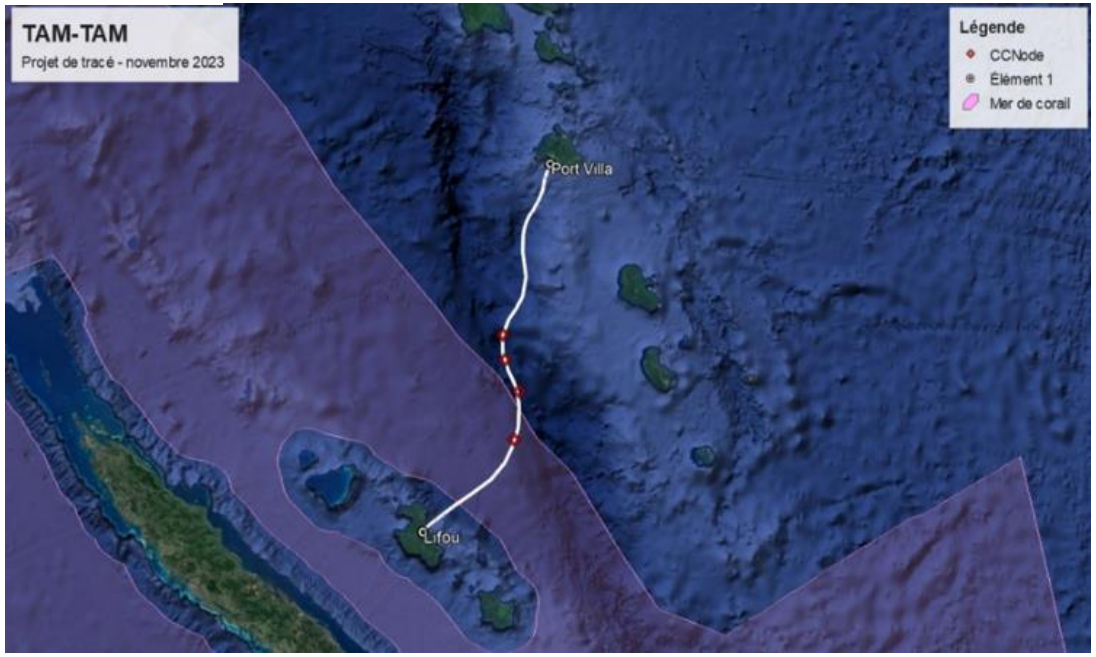
Atlantic CAM



3700 km, ~ 20 SMART modules

Gov't €154M. EU support €56M

TAMTAM



450 km ~ 4 SMART modules

French Govt, telecom, multi-lateral banks

both incorporate optical fibre sensing

Potential (?) future systems as SMART Cables

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Northern Hemisphere

- Polar Connect
- Far North Fiber
- TUSASS
- PISCES
- MEDUSA
- MISTS
- IOMEA
- Azores Inter-Islands

Southern Hemisphere

- NZ - Chatham Islands
- AUS/NZ - Antarctica (Mc Murdo)
- Antarctica - Chile

Contribution to cable protection

SMART Cables (and OFS) can contribute for cable protection, of the SMART cable itself, as well as other cables in its vicinity !!!

Contribution to cable protection

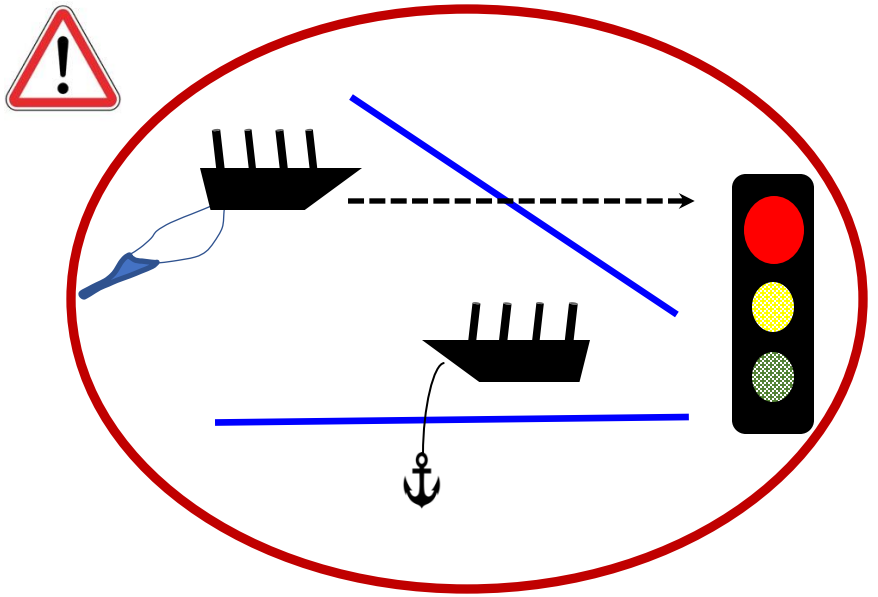
Submarine Cable Monitoring and Surveillance Service

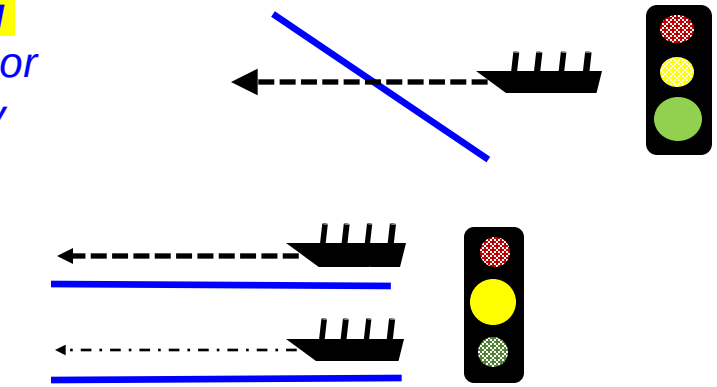
to be implemented in Nat'l EEZs and Territorial Waters

Production of warnings and alerts to ships in the vicinity of SCs routes within the EEZ and Territorial Waters. Upon request, reports will be issued to:

- SCs operators and owners;
- Int'l Organizations;
- Governments;
- Authorities;
- Courts;
- Ships:
- …

SCs routes + ***AIS*** + ***Coastal Radars***+ ***SCs sensing***
(detection of impacts due to fishing trawling, anchor impacts, landslides, currents, noise from nearby engines, deliberate aggression,…)





: vessel route (cruising speed)
: vessel route (low speed)
: vessel stopped
: fishing activities (trawling, …)
: SC route

Wrapping up

SMART Cables enable environmental and seismic detection and contribute to the protection of the cable itself as well as other cables in the vicinity.

SMART Cables are a good example of multipurpose infrastructure at the service of telecom sector, Science and Society.

SMART Cables are a marriage between science with telecom one global environmental monitoring system to a greater understanding of our planet - undeniable humanitarian benefits

SMART Cables contribute to the UN initiative, Early Warnings for All.

Challenges remain - despite recent momentum

- One size fits all – doesn't exist
- Regulatory
- Financing & business model
- Data & security concerns

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Listen to the Earth's pulse at the bottom of the sea

ITU unesco WMO

GORDON AND BETTY MOORE FOUNDATION

Schmidt Marine TECHNOLOGY PARTNERS

https://www.smartcables.org/

ITU/WMO/UNESCO IOC Joint Task Force

THANK YOU

Scan to Join!