SMART Subsea Cables:
Significant Progress in Global Ocean Observation.

Juanjo Dañobeitia,
UTM-CSIC, Barcelona, Spain
on behalf
IOC-UNESCO- JTF SMART Cables

SMART CABLES

27th-ERVO Annual Meeting
2nd-4th June2025
Tórshavn, Faroe Islands

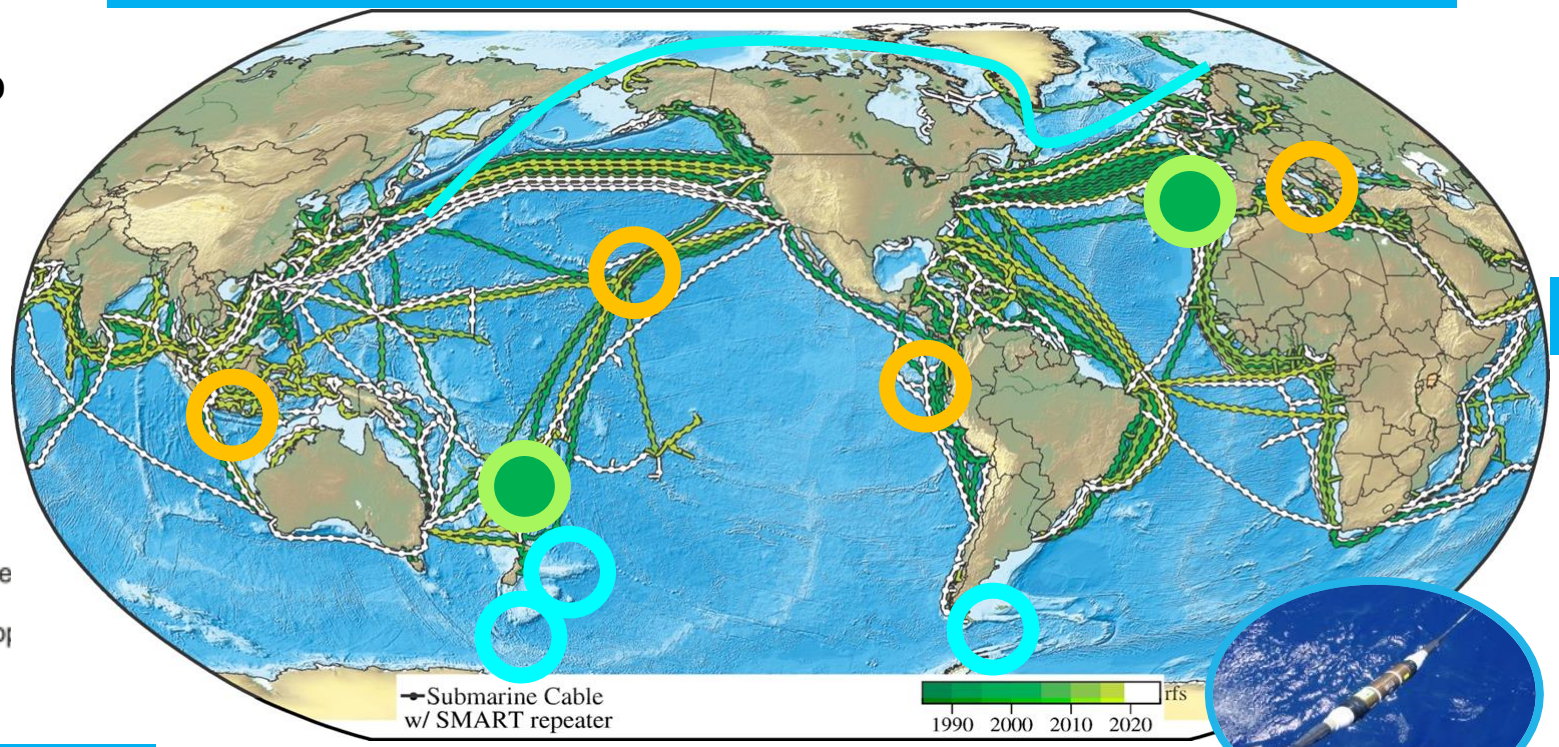
UTM
UNIDAD DE TECNOLOGÍA MARINA

Climate Change and Disaster Risk Reduction

Global Array for Climate, Oceans, Sea Level, Earthquakes, Tsunamis

Create a Planetary sensor, power, Internet network

1st order addition to Ocean-Earth observing system



Share submarine cable infrastructure
Telecom + science
↓€$

NO Interference

1.4+ GM
~20,000 repeaters
20 year refresh

repeaters ~100 km

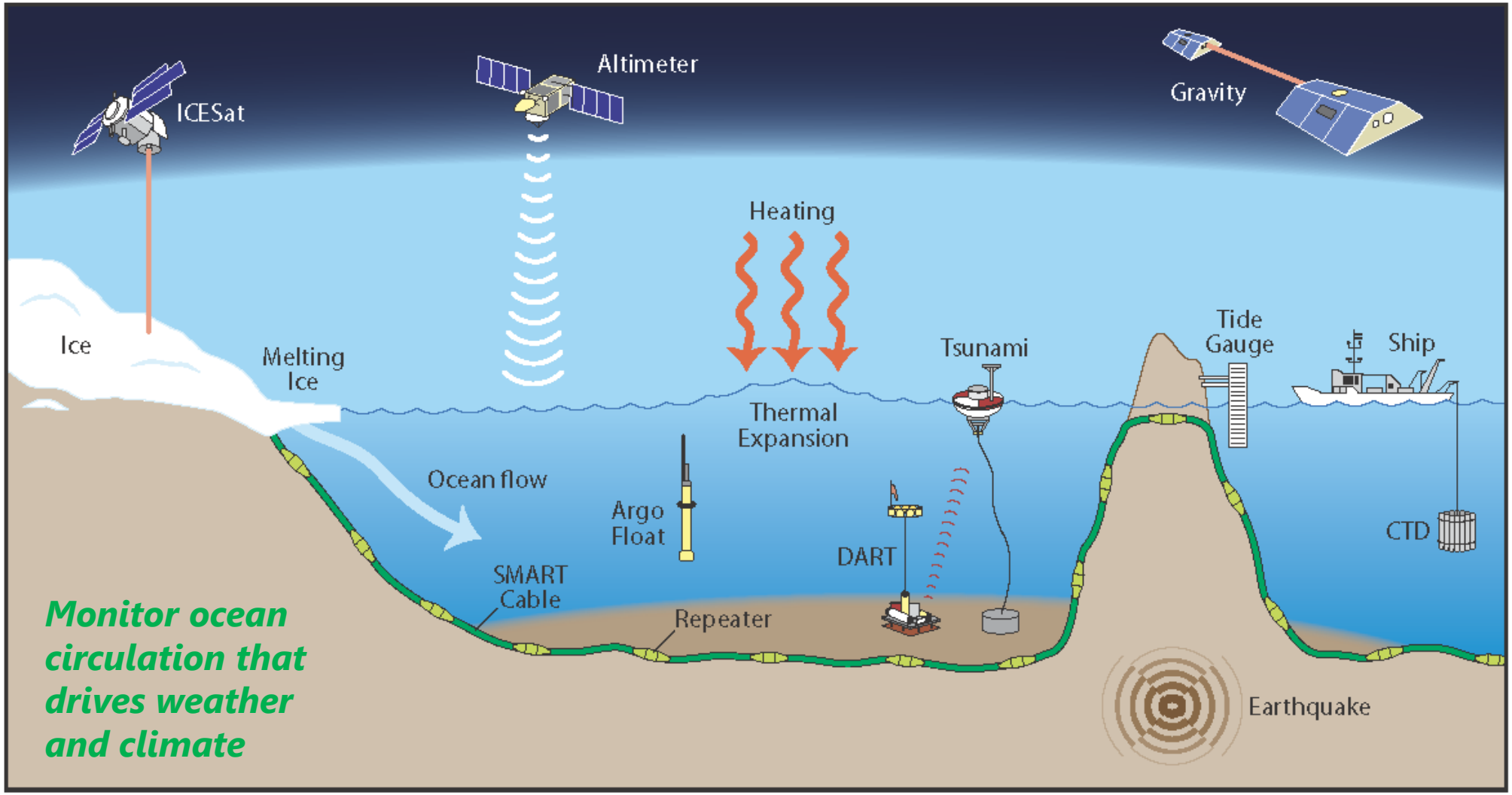
2021 2030 United Nations Decade of Ocean Science for Sustainable Develop

SMART Atlantic CAM and Tamtam V-NC Funded, install 2026

Know the environment protect the network

Bottom temperature, pressure, seismic motion

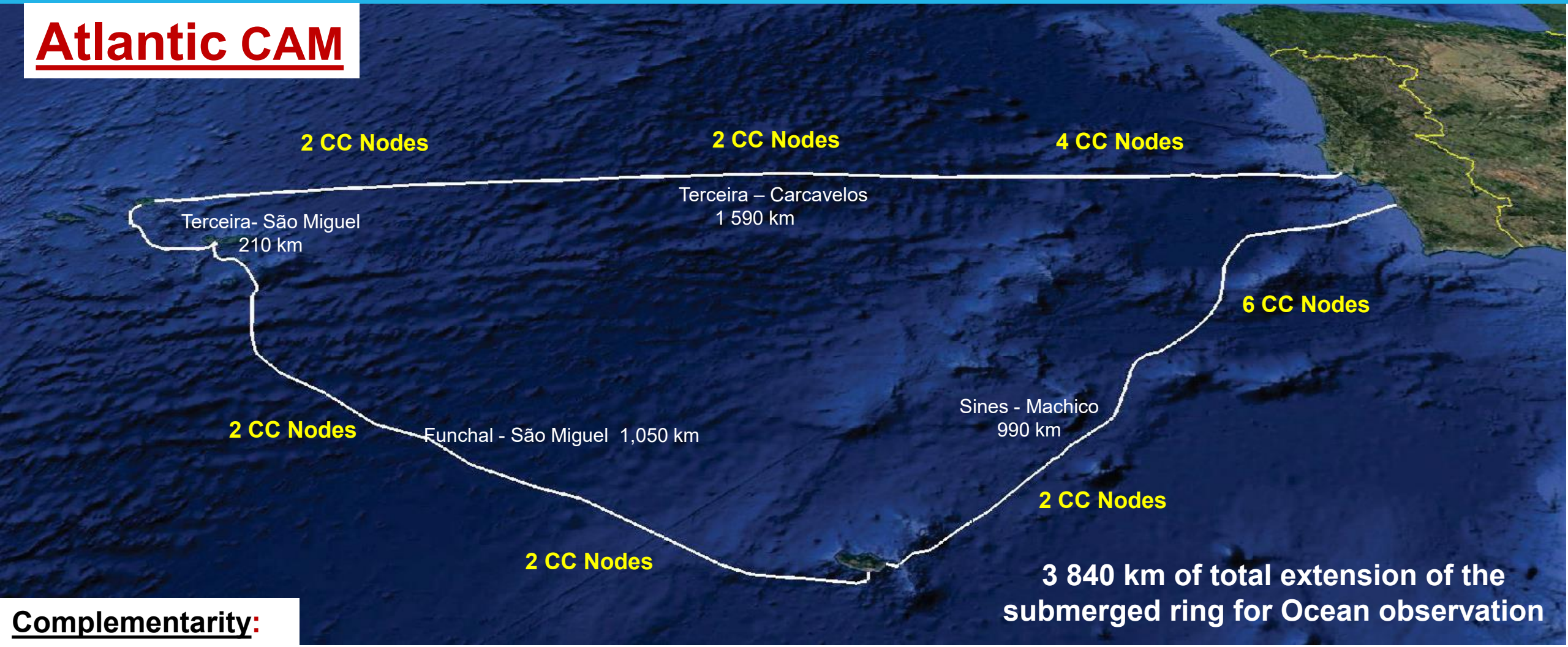
Ocean + Climate change – Long term Observation



SMART Cables measure Essential Ocean Variables:
Temperature, Pressure; Seismic motion + …

SMART Cables

Atlantic CAM



Complementarity:

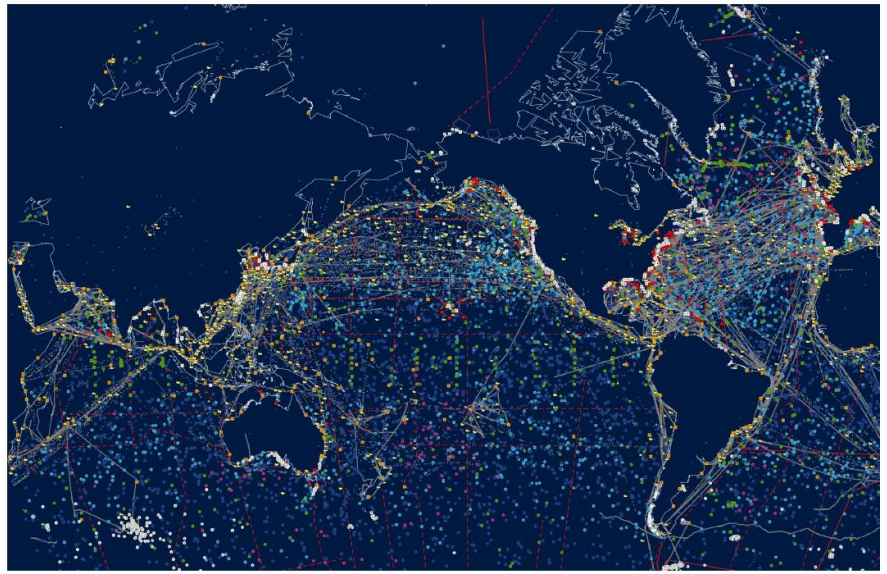
In addition to the wet sensors in each CC Node, each segment will have an additional fibre (~150 km) in the connection to each CLS for future DAS use near the coast; Atlantic CAM will be receptive to the use of other OFS monitoring methods that may complement the observation made by wet sensors.

Integrating SMART Cables

Evolution
- GOOS Project (innovation, limited duration)
- 2023 Bottom Pressure adopted as an EOV
- 2024 adopted as a GOOS OCG as an 'emerging' network

Benefit:
- Respond to global societal needs
- Visibility as part of GOOS
- Leverage collective knowledge, frameworks
- Data (provenance) visible in GOOS – IOC systems
- Influence development OCG, GOOS

Work ahead SMART Cables:
- Network specification sheet, network icon, Ocean Observing Report Card
- Work network maturity – best practices etc.
- Ensure ready to integrate data streams as go live



News

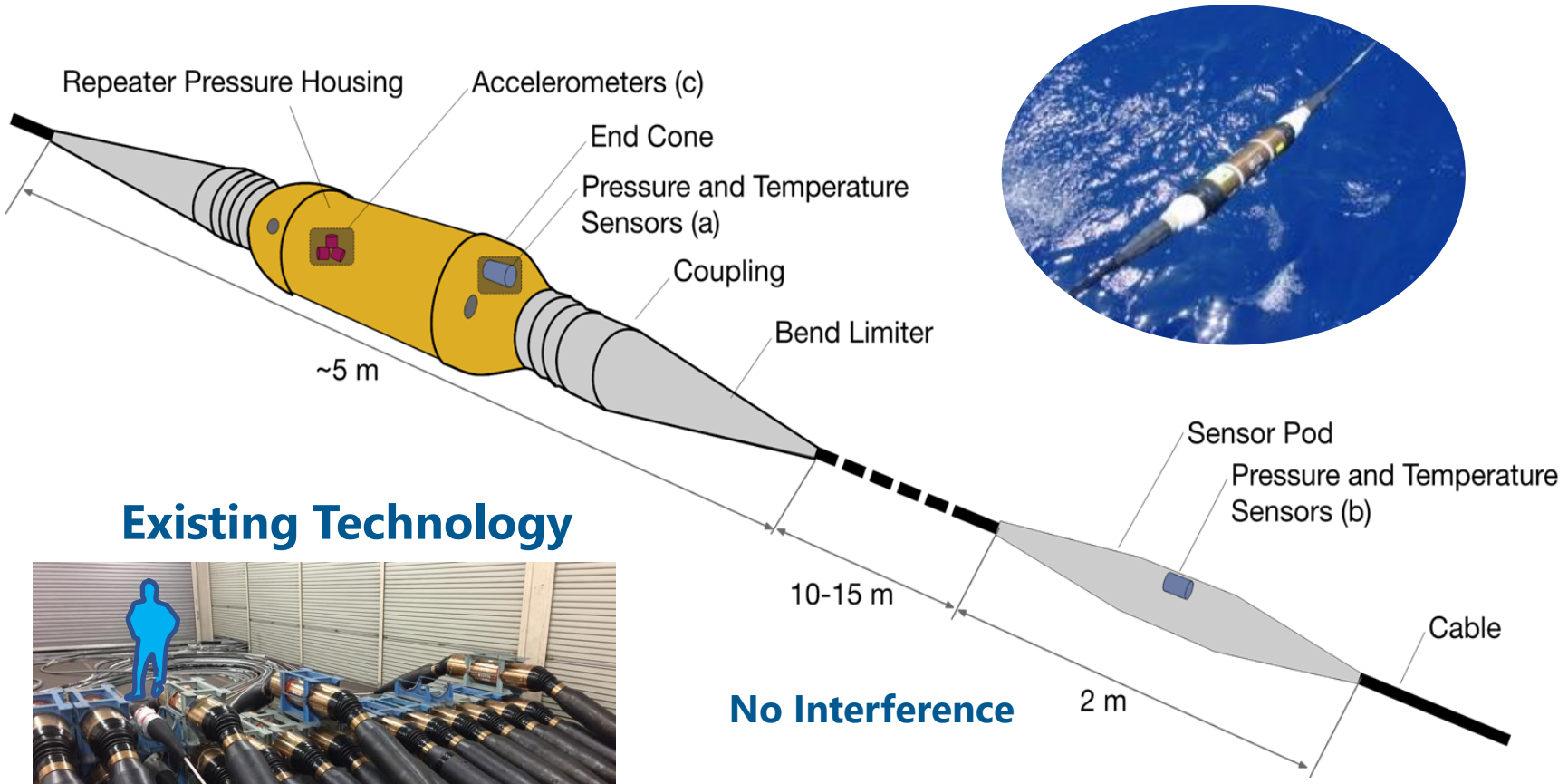
Three emerging observing networks join the Global Ocean Observing System

Article on GOOS Website

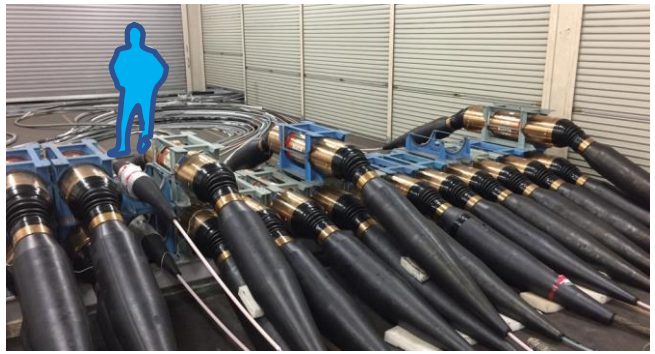
SMART Cables

Shared Cable Infrastructure: Telecom + Science

Climate change, ocean, DRR (Earthquakes + Tsunamis)



Existing Technology



No Interference

Sensors:

- Temperature
- Pressure
- Seismic

Key points:

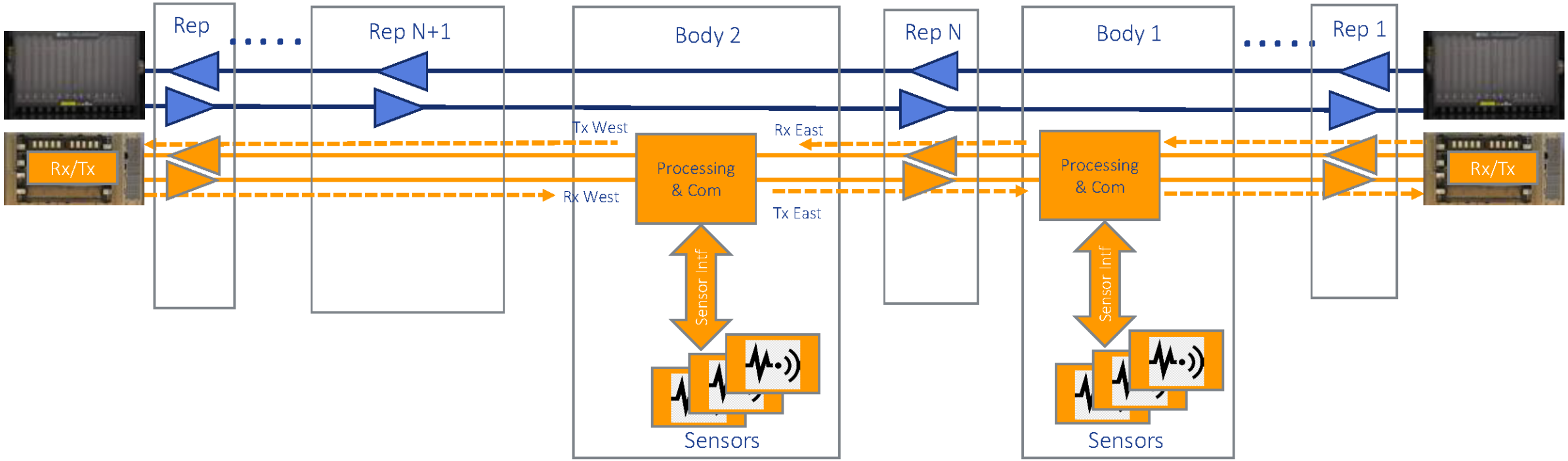
- Spacing ~100 km
- Essential Ocean Variables, Global Ocean Observing System

Principle of communication

- Blue = Telecom
- Orange = Climate Change (CC)

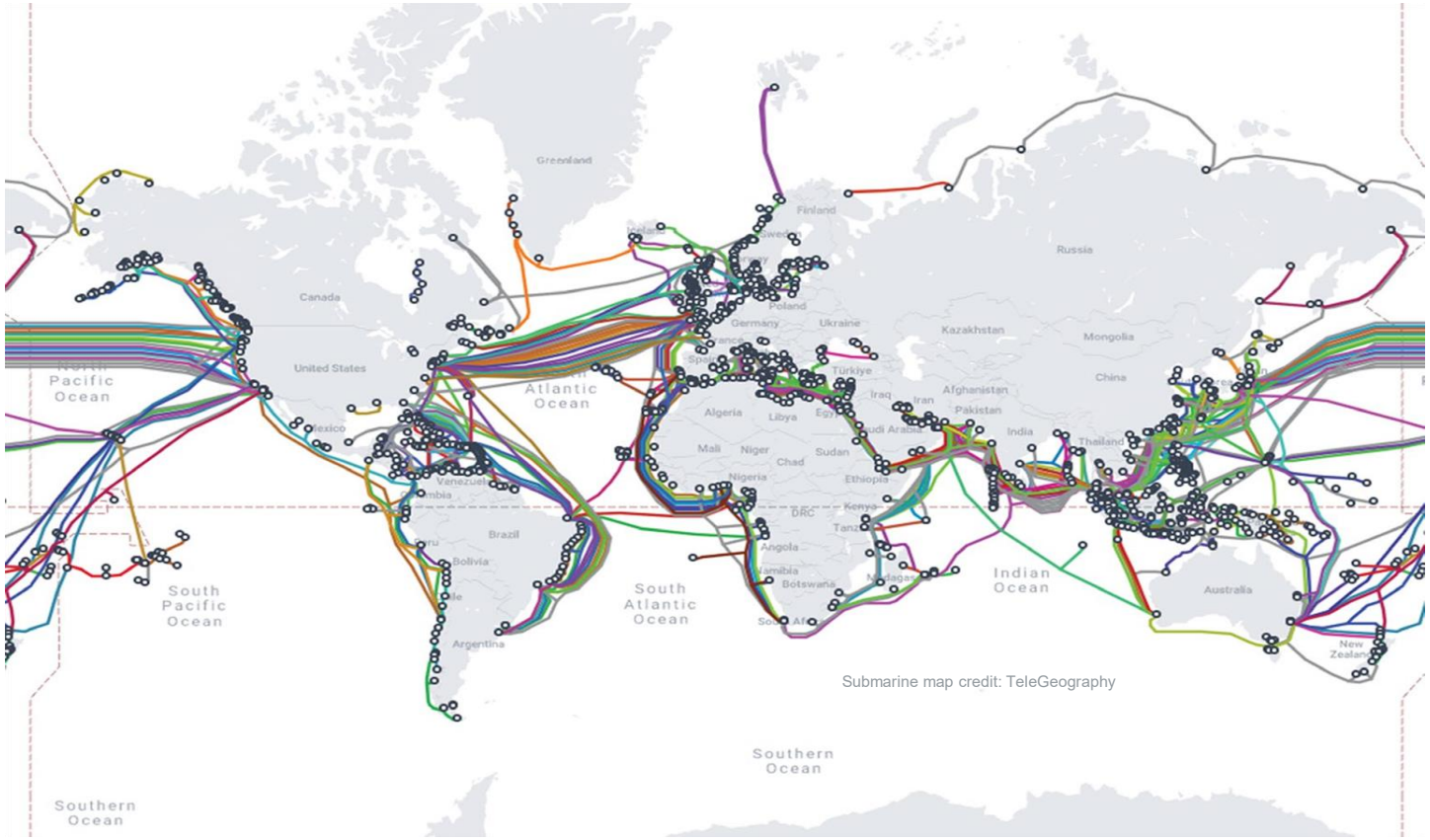
Telecom and SMART
Maximum possible separation

- Telecom Amplifier
- CC Communication module
- Sensor Modules
- CC Portal
- SLTE
- PFE



FUTURE WORK

- HUGE GLOBAL POTENTIAL FOR SMART CABLE OBSERVATORIES
- DATA COMPARISON WITH LAND/OBS STATIONS
- VALUABLE INTEGRATION EXPERIENCE LEARNED FROM THIS PROJECT



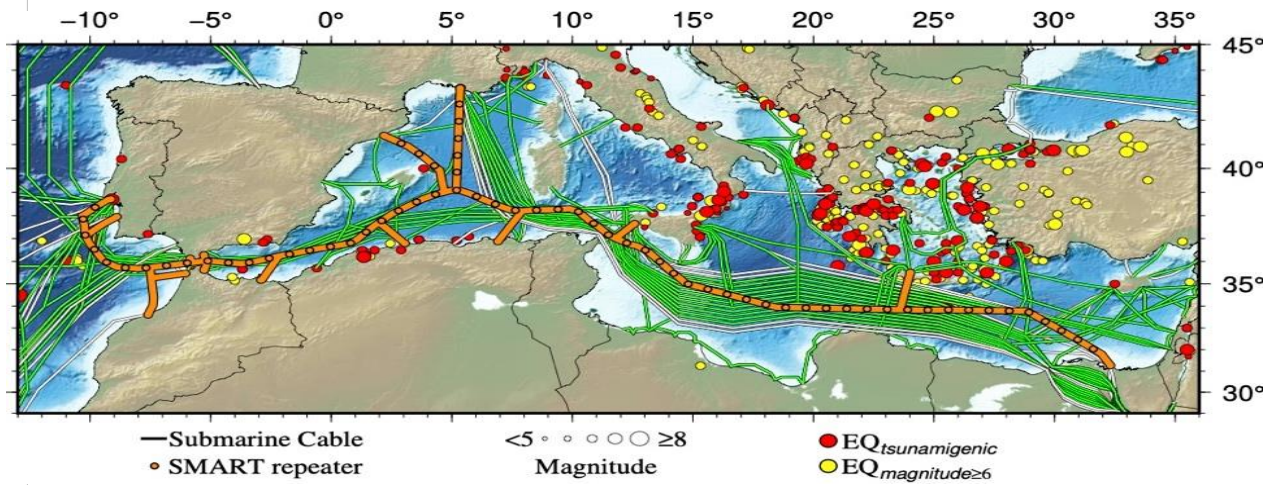
Submarine map credit: TeleGeography

Future Systems

Polar Connect Far North Fiber and neighboring Atlantic Projects (Tussas, PISCES, IRIS, IOMEA, etc.

Mediterranean Redundant Subsea- Cables

Medusa



MISTS

European Regional Seas of RVs Activity

RV CELTIC EXPLORER

RV TOM CREAN

RV TARAJOQ

RV JáKUP SVERRI

RV GO SARS

RV Þórunn Þórðardóttir

RV SVEA

RRS JAMES COOK

RV MARIA S. MERIAN

RV L´ATALANTE

RRS DISCOVERY

RV METEOR

RV ODON DE BUEN

Odon de Buen

RV MARE NIGRUM

RV AEGEAO

RV GAIA BLUE

RV SARMIENTO DE GAMBOA

Smartbay
Porcupine Abyssal Plain
Mölene Island
Ligurian Sea
Obsea
Black Sea
Azores Islands
Iberian Margin
Western Ionian Sea
Hellenic Arc
Canary Islands

ADDED VALUE

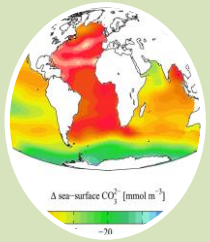
Enhance value of Scientific recordings, maintenance of Large-Scale Infrastructure increasing efficiency at National & EU marine science activities

27th ERVO

ervo

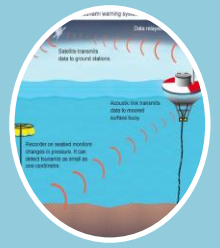
Scientific benefits

- To enhance **Ocean Global monitoring** by integrating sensors into submarine telecommunications cables
- To establish a robust **SMART Cable network** by strengthening cooperation between research infrastructures, providing its DOOS deep-sea component, and fully **integrating into GOOS**
- To improve **Tsunami and Earthquake** detection and **early warning systems**.
- **Encourage technology innovation and development,** enhancing cooperation with **telecom, industry, and science**
- To assess the crucial role and evolution that these processes play in the **Earth dynamic systems**, as **global changes, ocean acidification, geological hazards**
- **Strengthen collaboration between RVs and SMART cables for calibration purposes, and other underwater issues**

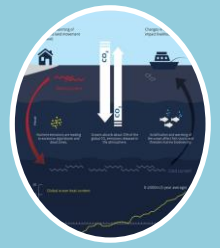


Global ocean warming and acidification

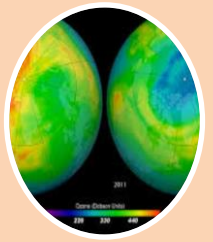
Impact and sustainability of Marine Resources exploitation



Real-time observations and early warning systems for earthquakes & tsunamis



Marine Ecosystems and Climate Change mitigation



Earth interactions hydrosphere, biosphere, lithosphere, atmosphere

Global Array: Climate, Oceans, Sea Level, Earthquakes, Tsunamis


Level of standardization achieved at ERVO 2012,
Faial Island, Azores, Portugal
!!! Many Thanks !!!

Takk fyrið
Thank you

jjdanobeitia@utm.csic.es
jj.danobeitia@unesco.org