SMART Subsea Cables: GOOS Project

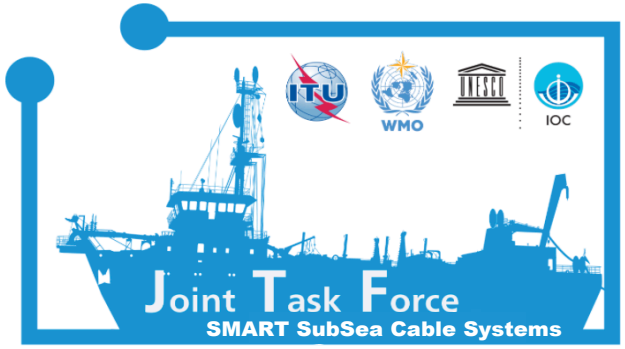
Science Monitoring And Reliable Telecommunications

Bruce M. Howe

ITU/WMO/IOC Joint Task Force
University of Hawaii at Manoa

José S. Barros

National Regulatory Authority for Communications
Portugal



2021 2030 United Nations Decade of Ocean Science for Sustainable Development

DEEP OCEAN OBSERVING STRATEGY

pogo Partnership for Observation of the Global Ocean

GORDON AND BETTY MOORE FOUNDATION

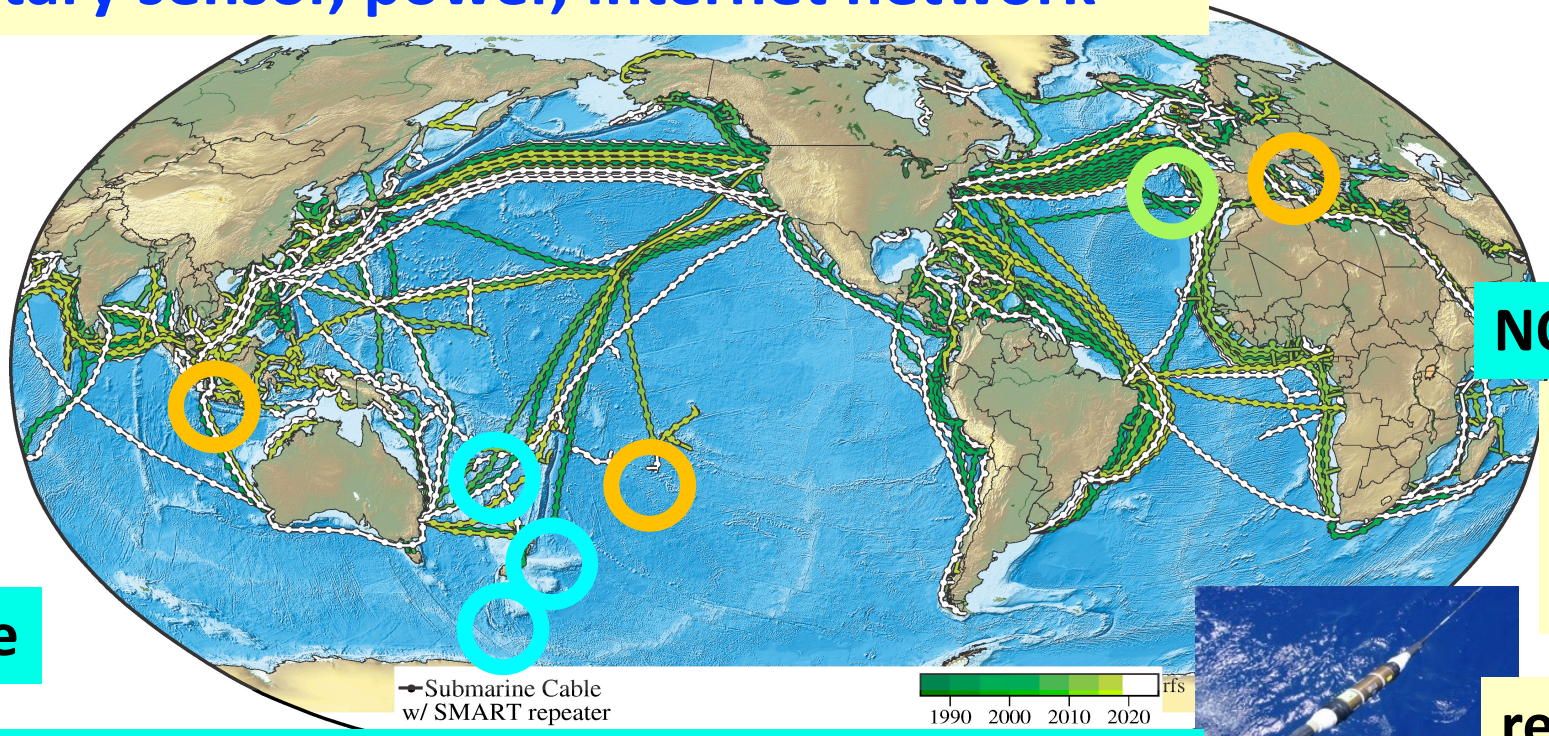
Global Ocean Observing System Steering Committee Meeting
30 November 2021

SMART Subsea Cables

Global Array: 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

1.2+ Gm
~20,000 repeaters
20 year refresh

UN Decade

repeaters ~70 km

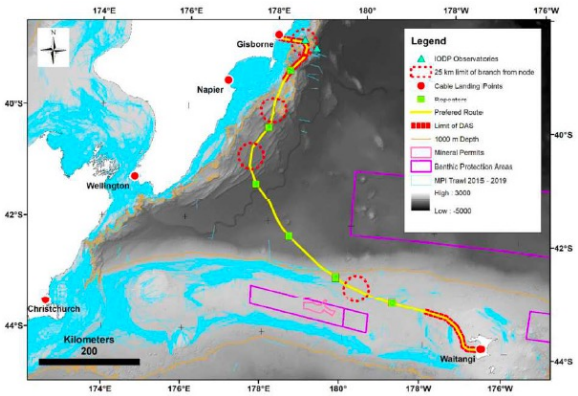
Know the environment – protect the network

CAM: 3700 km, Gov't, install 2025 → SMART Continent/Lisbon-Azores-Madeira ring

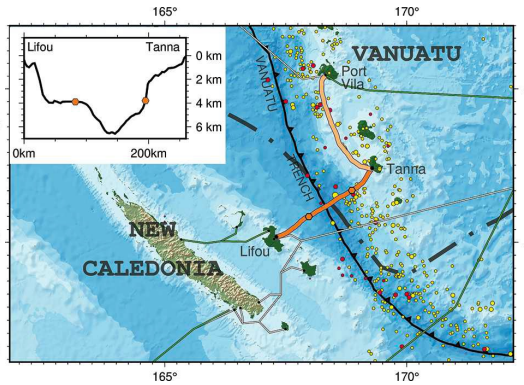
Bottom temperature, pressure, seismic acceleration

SMART Cables

- **Wet Demo**, Install 2022
- Three test SMART repeaters (sans telecom)



- **New Zealand – Chatham Islands**
- SMART + DAS + BUs/nodes
- Under gov't review (MBIE)

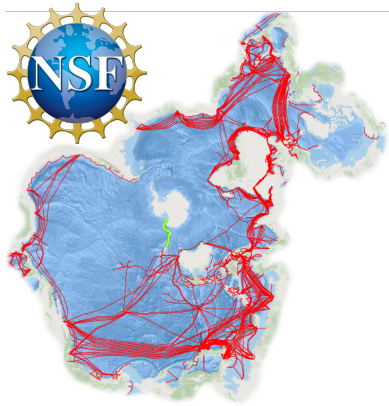


Vanuatu – New Caledonia

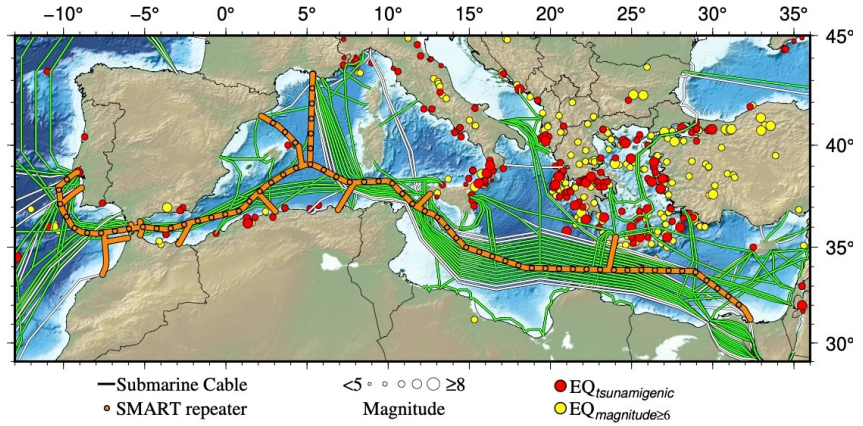
SMART, DAS

Partial funding; under gov't review

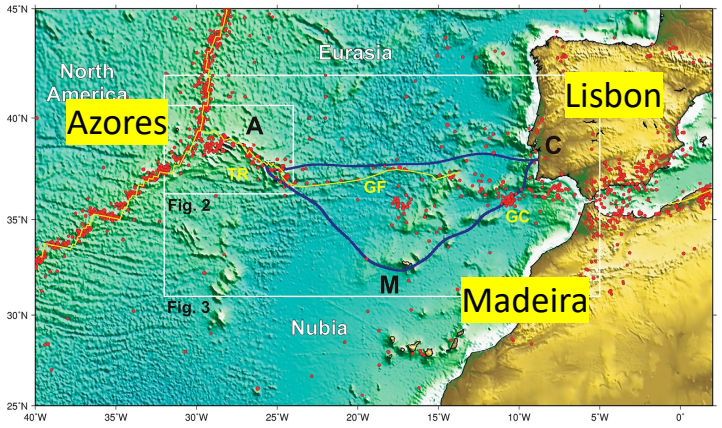
GORDON AND BETTY MOORE FOUNDATION



- **Antarctica – NZ**
- Improve connectivity
- SMART Cable
- Workshops, NSF, NAS



- **CAM2**
- Domestic, international connections, Digital hub
- 1755 earthquake tsunami
- Seismic, tsunami, ocean, environment
- 3700 km, 50 SMART repeaters, €120M
- RFP 2022, Ready For Service 2025
- ANACOM connection to telecom



LEA – Listening to the Earth under the Atlantic

- **MEDUSA**
- Install 2024/25
- Possibly up to ~60 SMART repeaters on main cables

- Improve coverage for large regional area
- Raising funds for SMART capability now

Principles for association as a GOOS Project - 1

From GOOS Projects: principles for affiliation, Document version 4 (25 May 2015)

1. Support principles of GOOS
2. Use FOO and EOVs
3. Aimed at increasing the readiness of requirements, observing networks, data systems, and/or information-generation activities;
4. Identifies and manages interfaces with existing GOOS structures and projects, as well as other existing national and international networks, systems and organizations where appropriate; -
5. Maintains communication and develops a strategy to leave a legacy with a GOOS- related structure;
6. Is independently managed.

Principles for association as a GOOS Project - 2

1. Supports GOOS Principles
   - User needs and defined objectives – from past decade of planning and development (workshops, papers, …), and project specific (e.g., CAM)
   - Sustained observations over the long term - foundation of SMART
   - From data capture (our focus) to end products and services included in planning (e.g., CAM, Moore)
   - Timely, free and unrestricted access to data – essential for early warning to long term climate – JTF works with countries involved (and IOC UN, iDOOS, Moore)
   - Experienced practitioners are involved to assure standards and best practices for observations and data management(e.g., JTF experts, LEA/Portugal, Moore, iDOOS, telecom)

Principles for association as a GOOS Project - 3

2. Use FOO and EOVs. TR evolution – first TR8, Mission qualified. Measure Subsurface Temp (EOV), pressure (emerging EOV), and seismic accel (”essential earth variable” – for tsunami)
3. Aim for readiness of requirements (via past planning, ITU), observing networks (telecom experience), data systems, and/or information-generation activities – through iDOOS and Moore
4. Interfaces with existing GOOS, national and international networks, systems and organizations – telecom ITU, WMO, IOC-Tsunami, ADB, WB, IADB, GEANT, RedCLARA, …
5. Maintains communication, strategy for transition to GOOS Observing elements/networks, GRAs, and global (with help of IOC, GOOS, iDOOS)
6. Independently managed – yes, JTF, now project office funding from Moore, ITU Secretariat in Geneva

Ideal characteristics of Projects

1. Long-term sustained infrastructure – fundamental to SMART, exceptional record from telecom (25 y) – will set examples for GOOS to strive for!
2. Clear objectives and expected results within a sufficient, but limited period of time – laid out in OceanObs19 paper.
3. Milestones, dates, costing: CAM – CIF 2022, RFS 2025, incremental SMART cost €15M (~10%+). Cf Recent New Zealand DARTS - €500k/y/buoy; CAM2 ~ €25k/y/repeater
4. Fundable: CAM, NZ, Antarctica, V-NC – all or significant government funded (regulator carrots); MEDUSA – EC/country consortium? Blue Economy and financing; ultimately gov't ocean agencies.
5. Potential to be repeatable / scalable / reusable – yes, industry requires
6. Engages developing countries – yes, likely early adopters (e.g., Vanuatu) because of access to Development funding.

Interface with GOOS

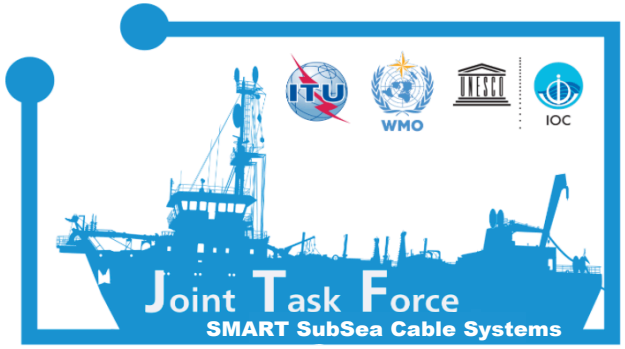
1. JTF SMART will communicate with the GOOS SC and OOPC.
   JTF SMART UN Decade Project ⟷ GOOS Co-Design Programme.
2. Communications shall be kept to efficient minimum, and full use of web page updates and other electronic media will serve to update the community on progress - Agreed!

Benefits

- GOOS can help entrain SMART into the Global Ocean Observing System
- SMART can deliver a *new* component to GOOS: new tech, potential for expansion (deep sea power+ comms), leverage industry ($5B/y, 180 years, nearly sole user of deep seabed), new stakeholders, new funding, sharing critical infrastructure, Blue economy

SMART Subsea Cables: GOOS Project

Science Monitoring And Reliable Telecommunications



Thank you!
Mahalo Obrigada

Questions?

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Partnership for Observation of the Global Ocean

GORDON AND BETTY MOORE FOUNDATION

Global Ocean Observing System Steering Committee Meeting
30 November 2021