Cosmic accelerator

Photons

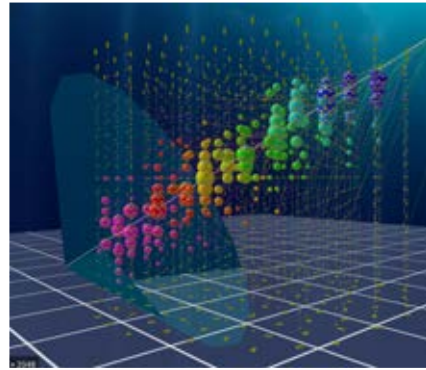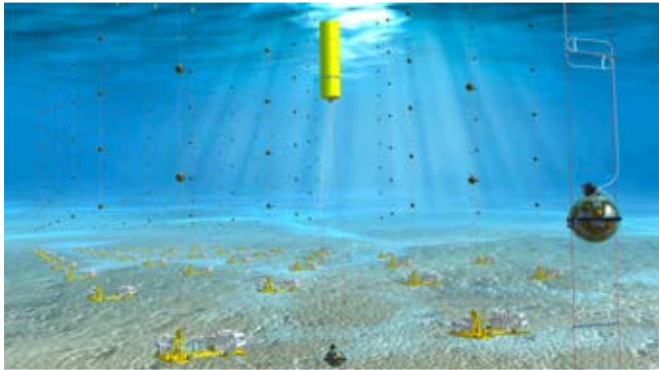Comic rays (nuclei)

Neutrinos

Gravitational Waves

http://www.km3net.org/
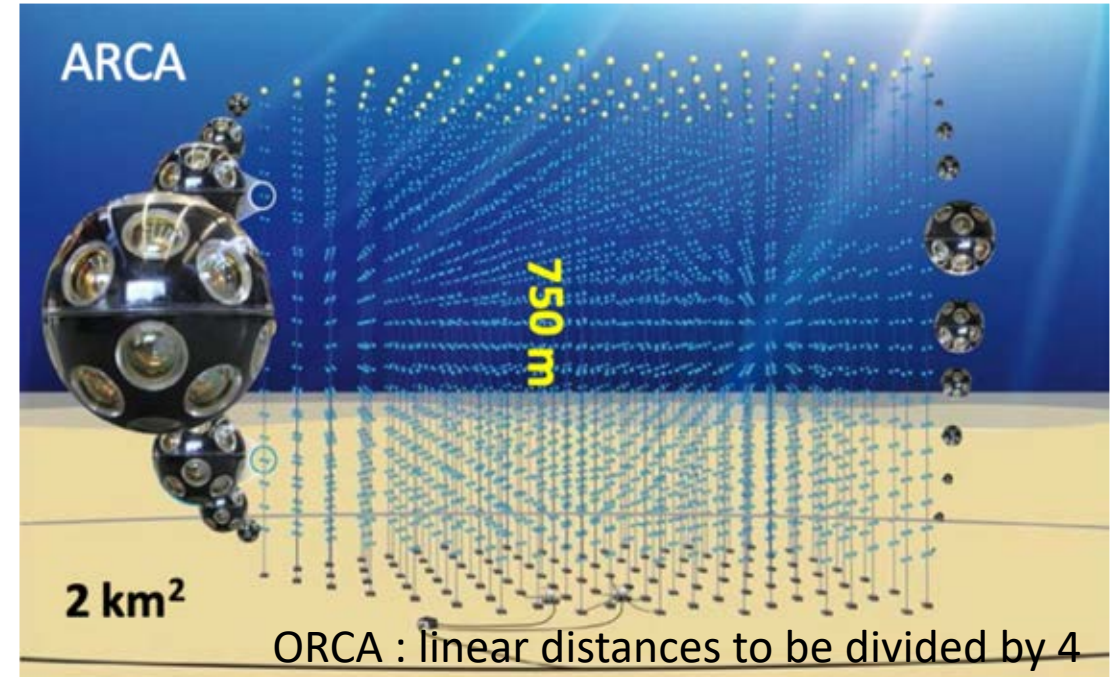

ARCA @ Capo Passero (Sicily)
Astronomy Research with Cosmic Rays in the Abysses
3500 m water depth, 100 km from shore

ORCA @ Toulon
Oscillation Research with Cosmic Rays in the Abysses
2500 m water depth, 40 km from shore

ARCA

750 m

2 km²

ORCA : linear distances to be divided by 4

ORCA : linear distances to be divided by 4

Network of cabled observatories located in deep waters of the Mediterranean Sea.

Centrally managed: common hardware, software, data handling and control

Marine infrastructure East Sicily
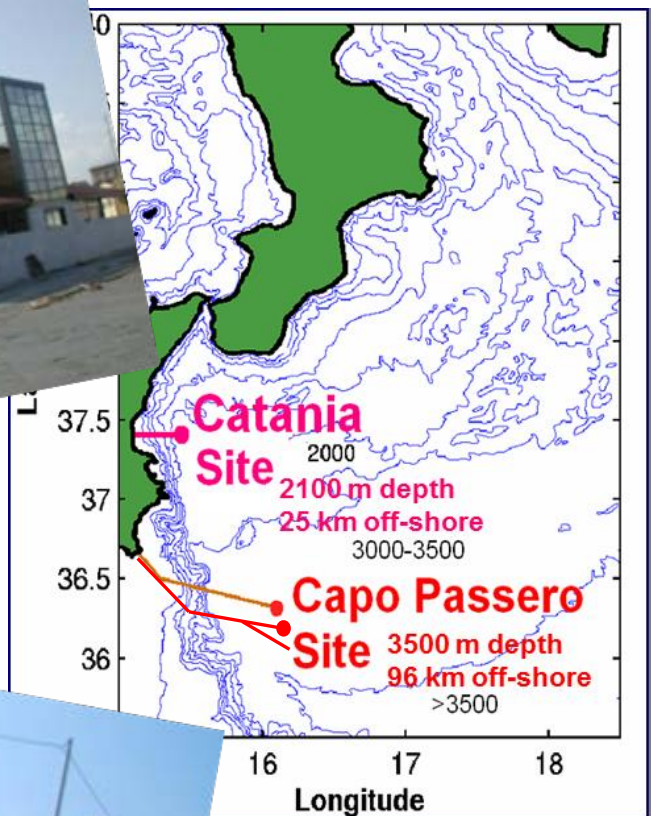
Catania (2100 m water depth)
Multipurpose (including EMSO-ERIC)
25 km-long electro-optical cable 10 fibers, 6 conductors divided among 2 CTFs (4 independent e.o. outputs)

Capo Passero (3500 m water depth)
Multipurpose (including KM3NeT and EMSO-ERIC)
100 km-long electro-optical cable 20 fibers, 1 conductor (DC) Cable Termination (5 independent e.o. outputs)

100 km-long electro-optical cable 48 fibers, 2 conductors (DC) Cable Termination (16 independent optical and electrical outputs)

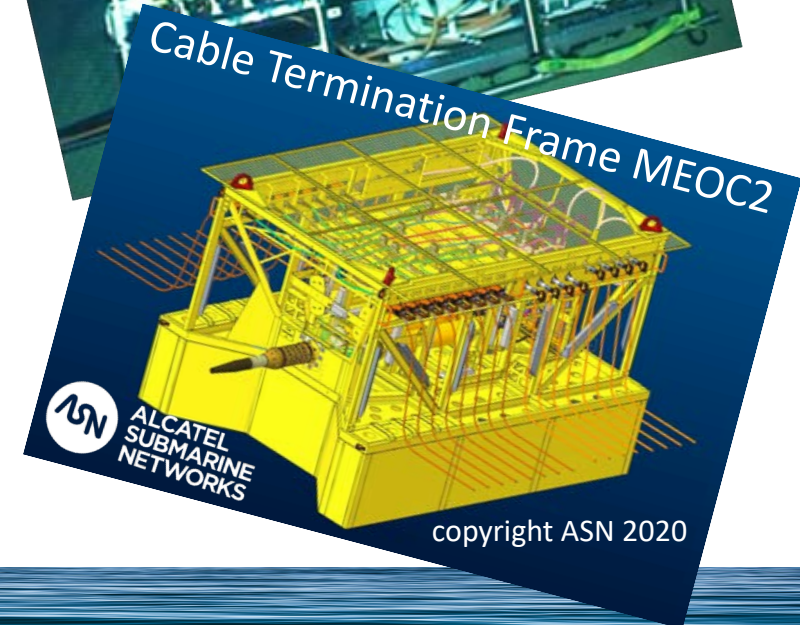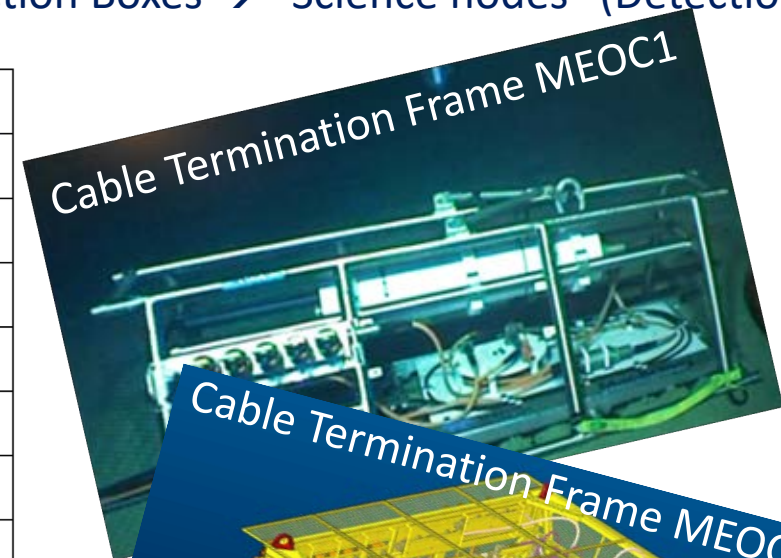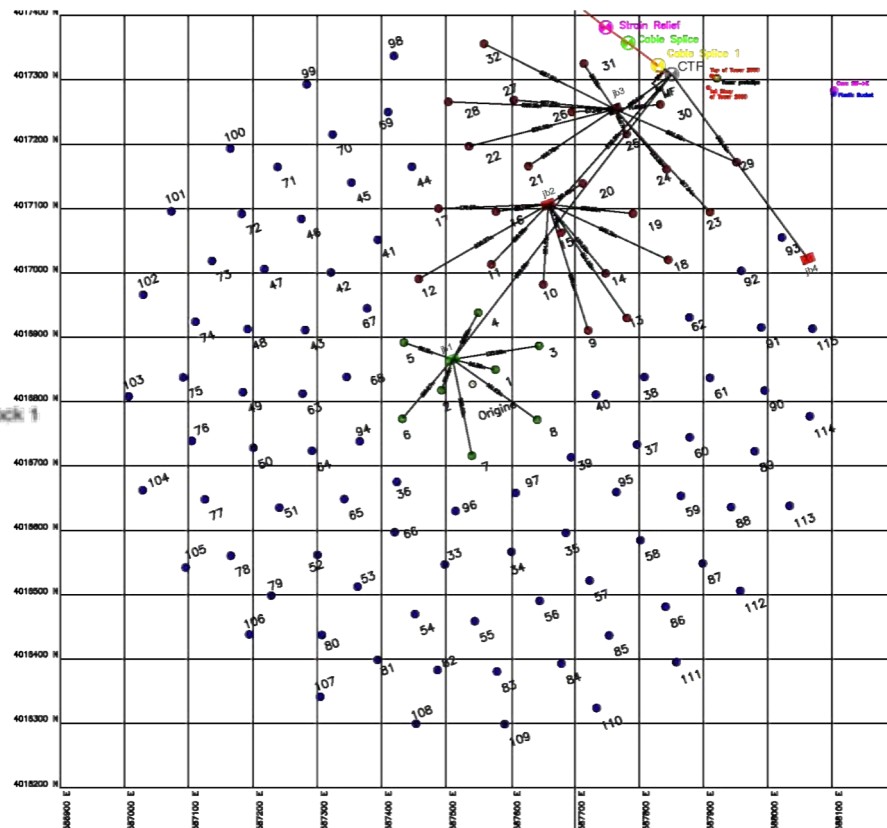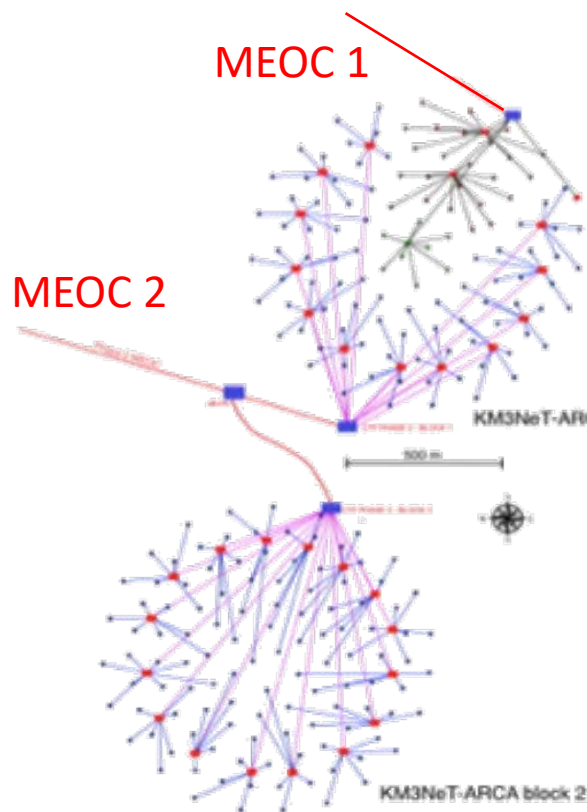Both shore labs have direct 10Gbit connection to the EU optical network infrastructure for research

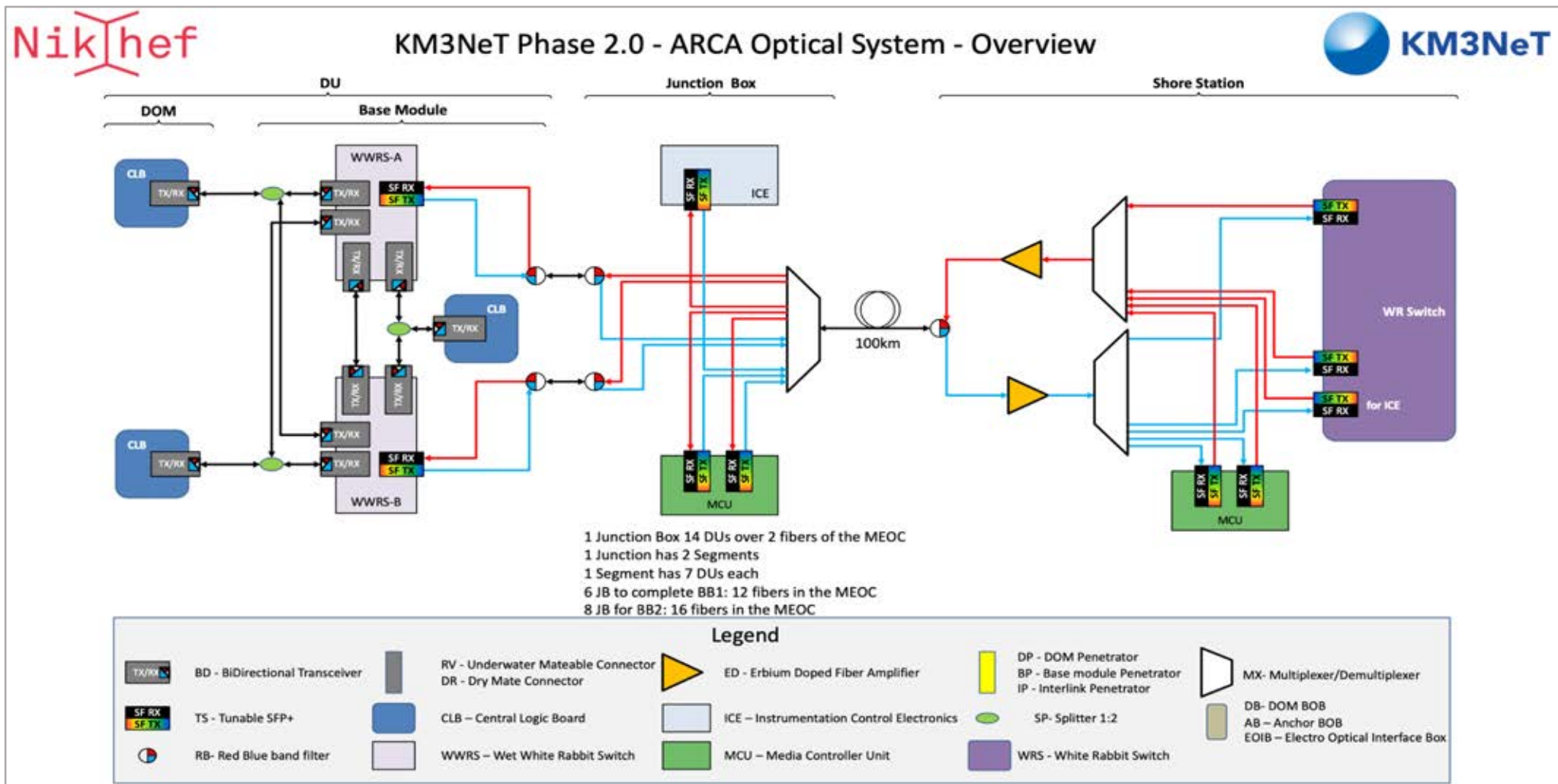Idmar PO-FESR 2014-2020, PON KM3NeT Sicilian regional funding

Main Electro-Optical Cable 1: DC power sea-return: "Standard" DC Solution

Main Electro-Optical Cable 2: DC power 2 conductors: new design from Alcatel Submarine Network

Star-like power and optical distribution system: Cable Termination → Junction Boxes → "Science nodes" (Detection Units)

MEOC 1

MEOC 2

KM3NeT-ARCA block 1

KM3NeT-ARCA block 2

Cable Termination Frame MEOC1

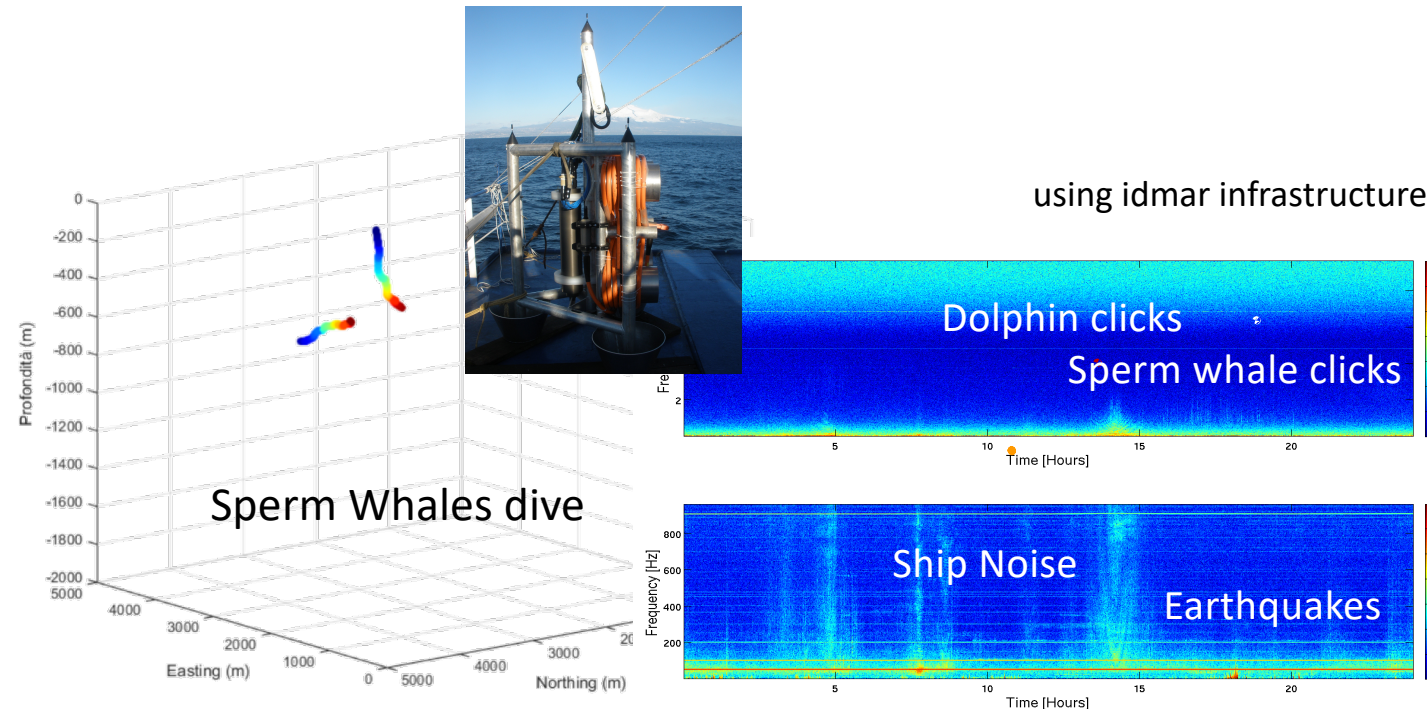Cable Termination Frame MEOC2
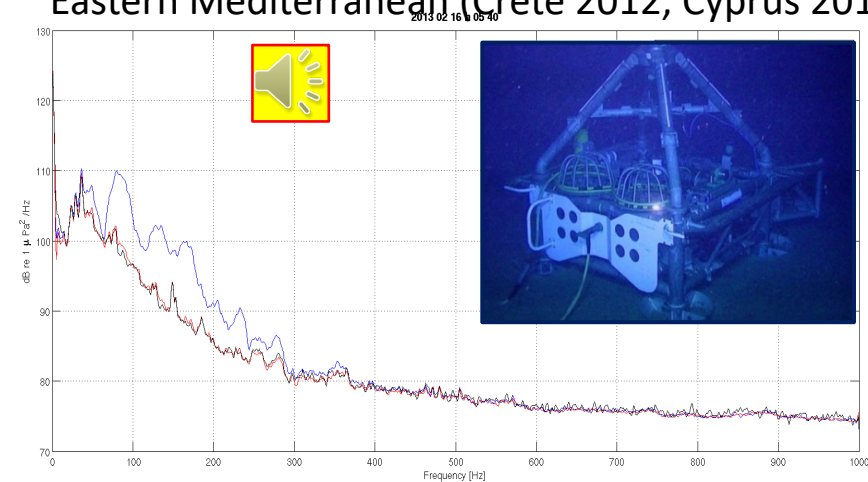
copyright ASN 2020

KM3NeT custom solution with European hardware manufacturers/providers

KM3NeT deep-sea <u>infrastructures</u> and <u>observatories</u> offer unprecedented tools to

- develop and test novel marine technologies and detectors

- monitor geophysics and biological phenomena and anthropic footprint

SMO-OnDE and EMSO- SN1 observatories (Catania)

Airgun detection
Eastern Mediterranean (Crete 2012, Cyprus 2019)

using idmar infrastructure

Sperm Whales dive

Dolphin clicks
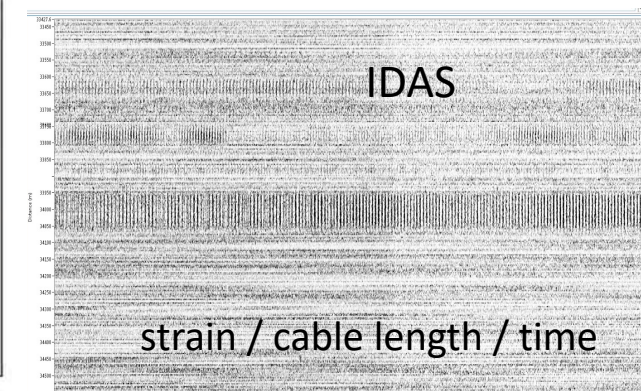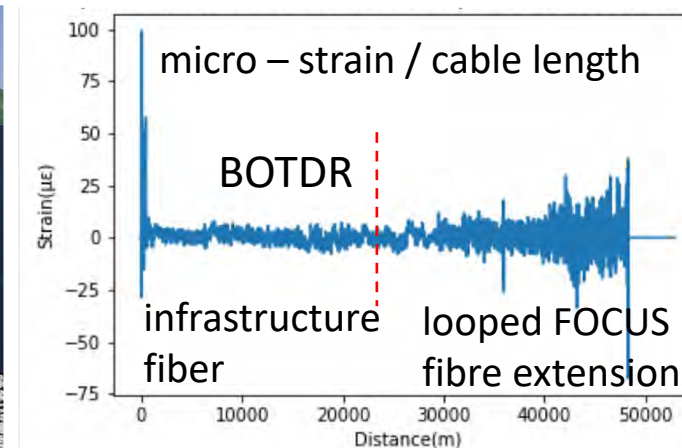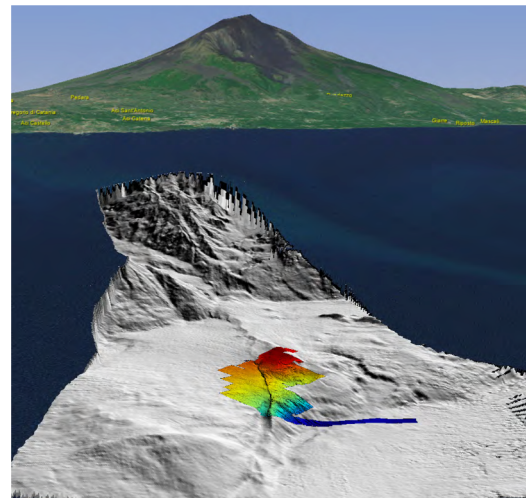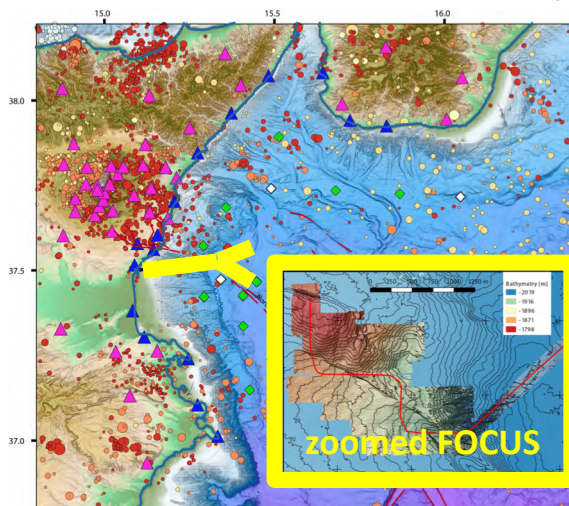Sperm whale clicks

Ship Noise
Earthquakes

KM3NeT deep-sea <u>infrastructures</u> and <u>observatories</u> offer unprecedented tools to

- develop and test novel marine technologies and detectors

- monitor geophysics and biological phenomena and anthropic footprint

Deep-sea Net plow: at seafloor (2000m depth)
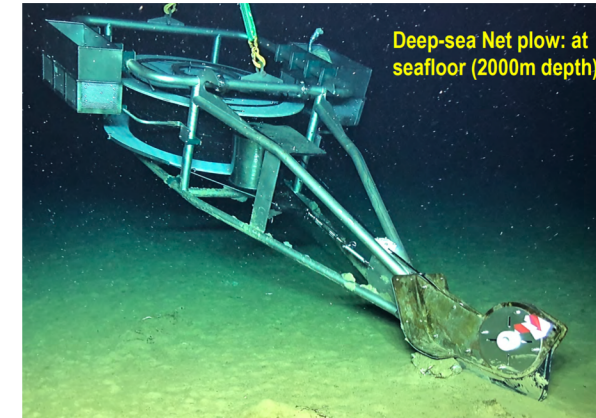
BOTDR (FOCUS) and iDAS acquisition using optical fibres of the Catania Infrastructure plus 6 km extension (looped)
Correlation with acoustics (SMO-OnDE/ EMSO-SN1) and seismic data (EMSO-SN1) and geodetic stations, OBS

zoomed FOCUS

micro – strain / cable length

BOTDR

infrastructure fiber   looped FOCUS fibre extension

IDAS

strain / cable length / time

https://www-iuem.univ-brest.fr/lgo/les-chantiers/erc-focus/