NEMO - SN1 Observatory:

The 1st European real-time seafloor multidisciplinary observatory

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NEMO - SN1 Team

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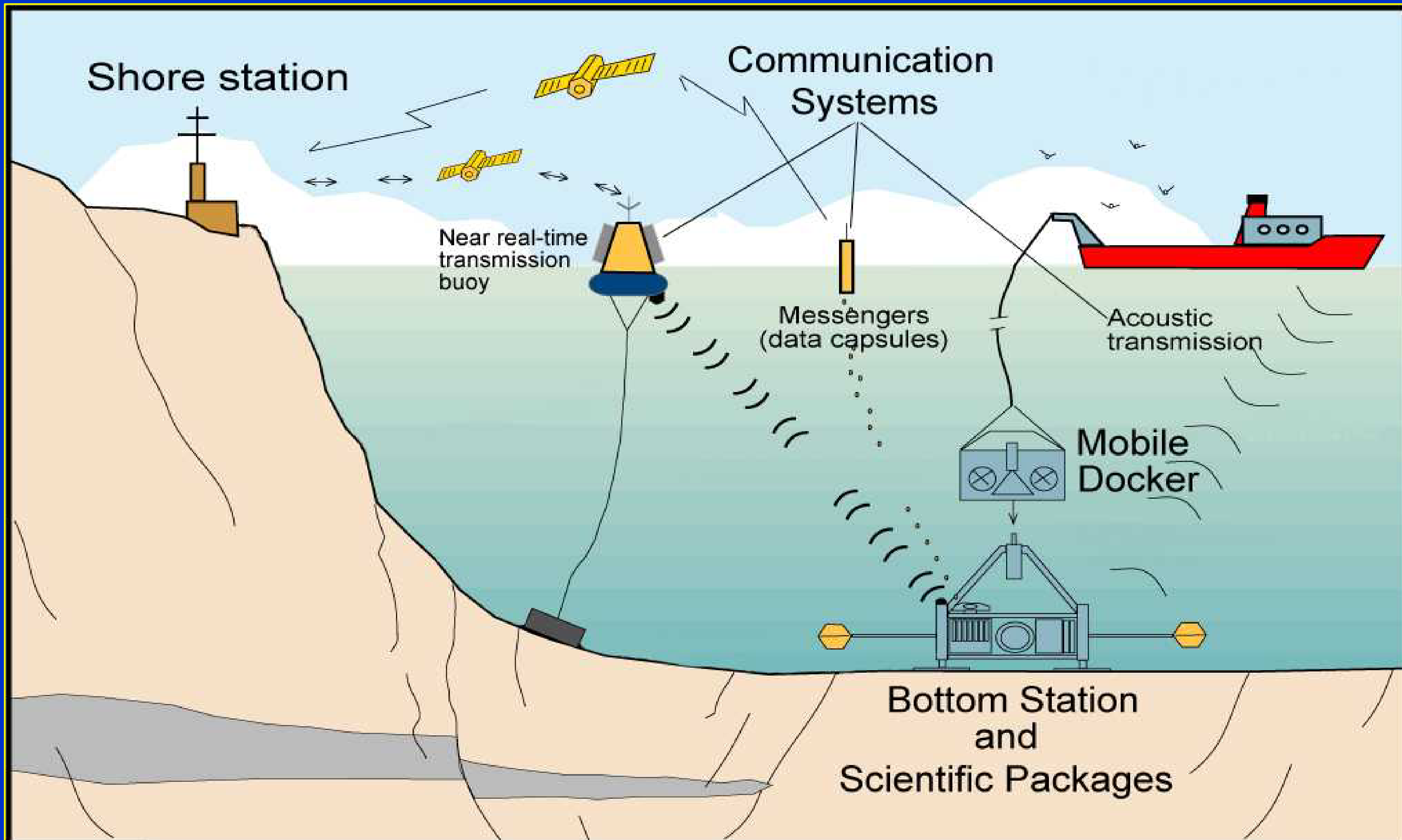
Technische Fachhochschule Berlin Hans W. Gerber

Elettra Tlc S.p.A. Giuseppe Maugeri

Università di: Roma-3 Claudio Faccenna , **Catania** Stefano Gresta , **Messina** Giancarlo Neri , **Palermo** Dario Luzio

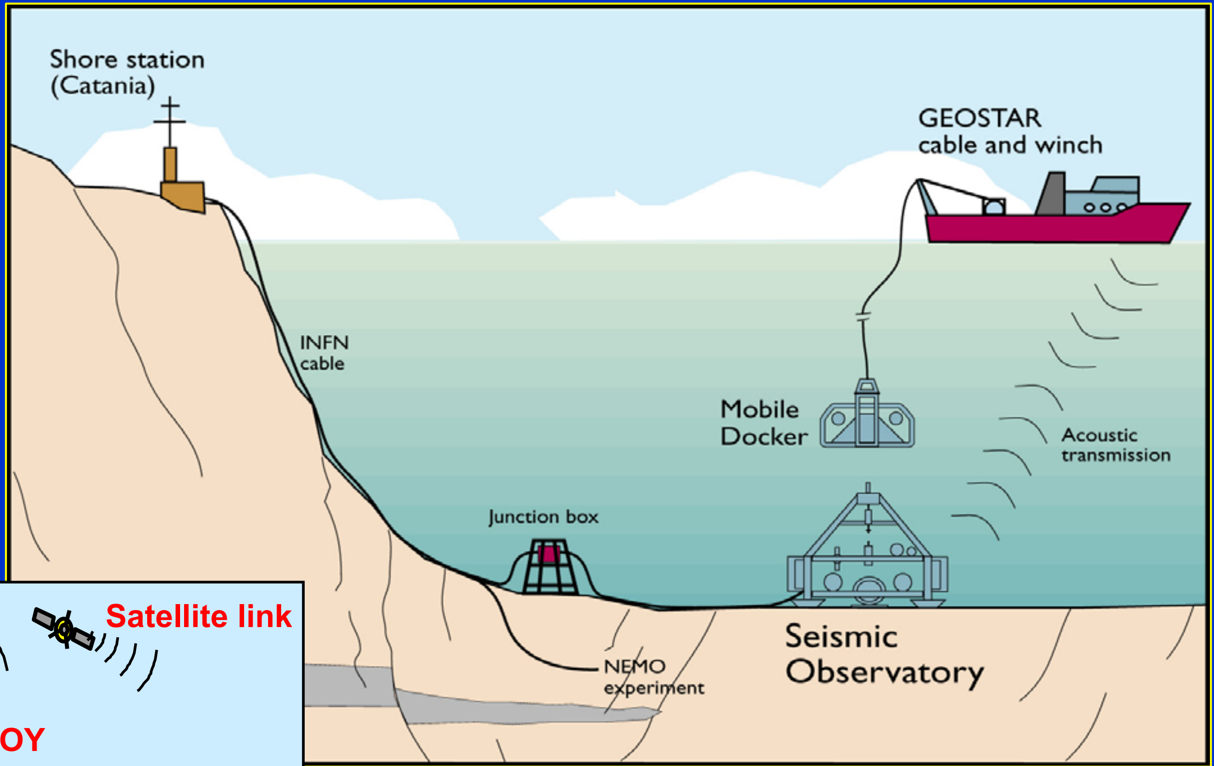
GEOSTAR

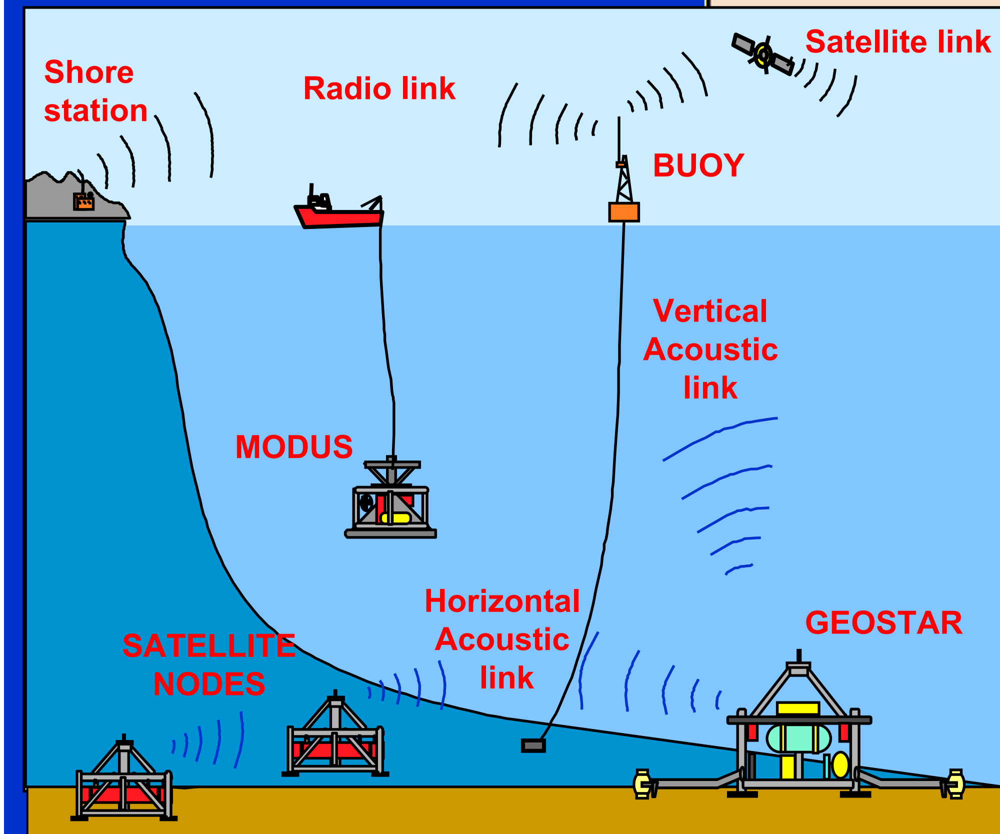
GEophysical and Oceanographic STation for Abyssal Research



NEMO - SN1

Cabled (real time)

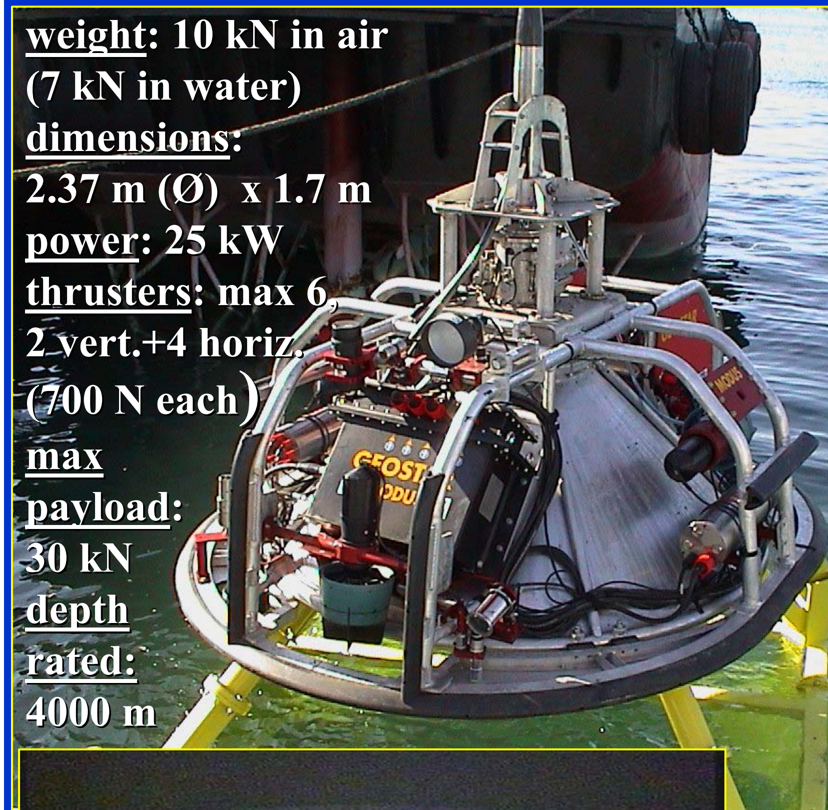




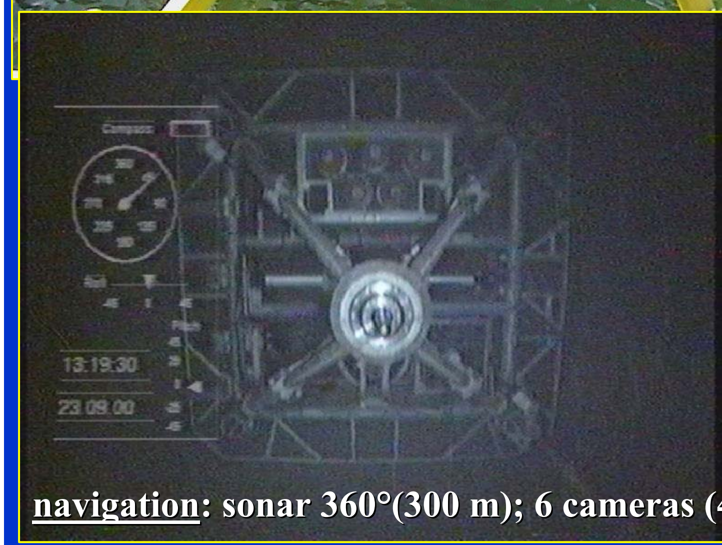
EC-ORION

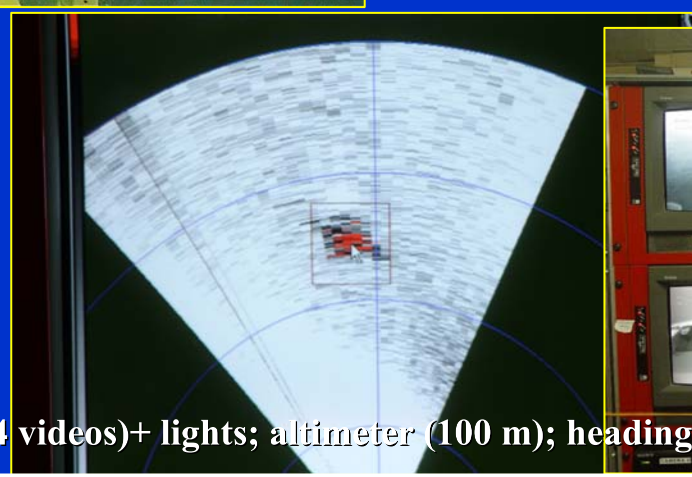
Networking

MODUS (MObile Docker for Underwater Sciences)



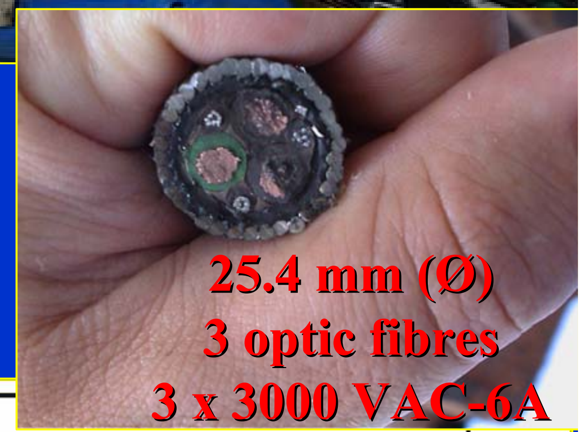
<u>weight</u>: 10 kN in air
(7 kN in water)
<u>dimensions</u>:
2.37 m (Ø) x 1.7 m
<u>power</u>: 25 kW
<u>thrusters</u>: max 6,
2 vert.+4 horiz.
(700 N each)
<u>max payload</u>:
30 kN
<u>depth rated:</u>
4000 m



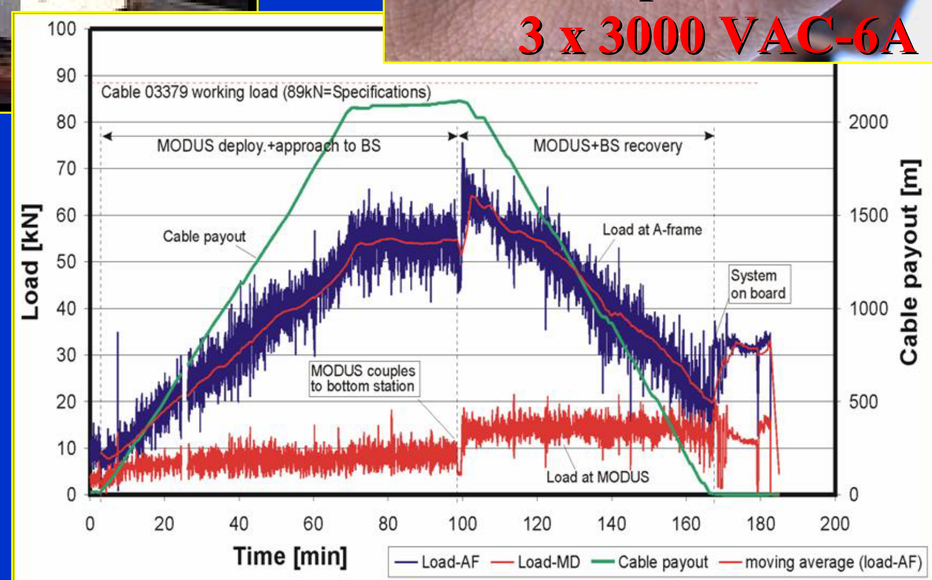


<u>navigation</u>: sonar 360°(300 m); 6 cameras (4 videos)+ lights; altimeter (100 m); heading (1°); tilt (1°); LF transponder

INGV Cable & winch



- winch: 3.8 x 2.35 x 2.4 m; 180 kN
- HPU: 1.77 x 1.15 x 1.71 m; 20 kN
- max payout speed 70 m/min (1st layer), 51 m/min (10th layer)
- static load 80 kN (top layer)
- cable: 4000 m, 10 layers, 22 kN/km (in air)-18 kN/km (in water), 89 kN working load, 205 kN breaking strength



Logistics – access to vessels

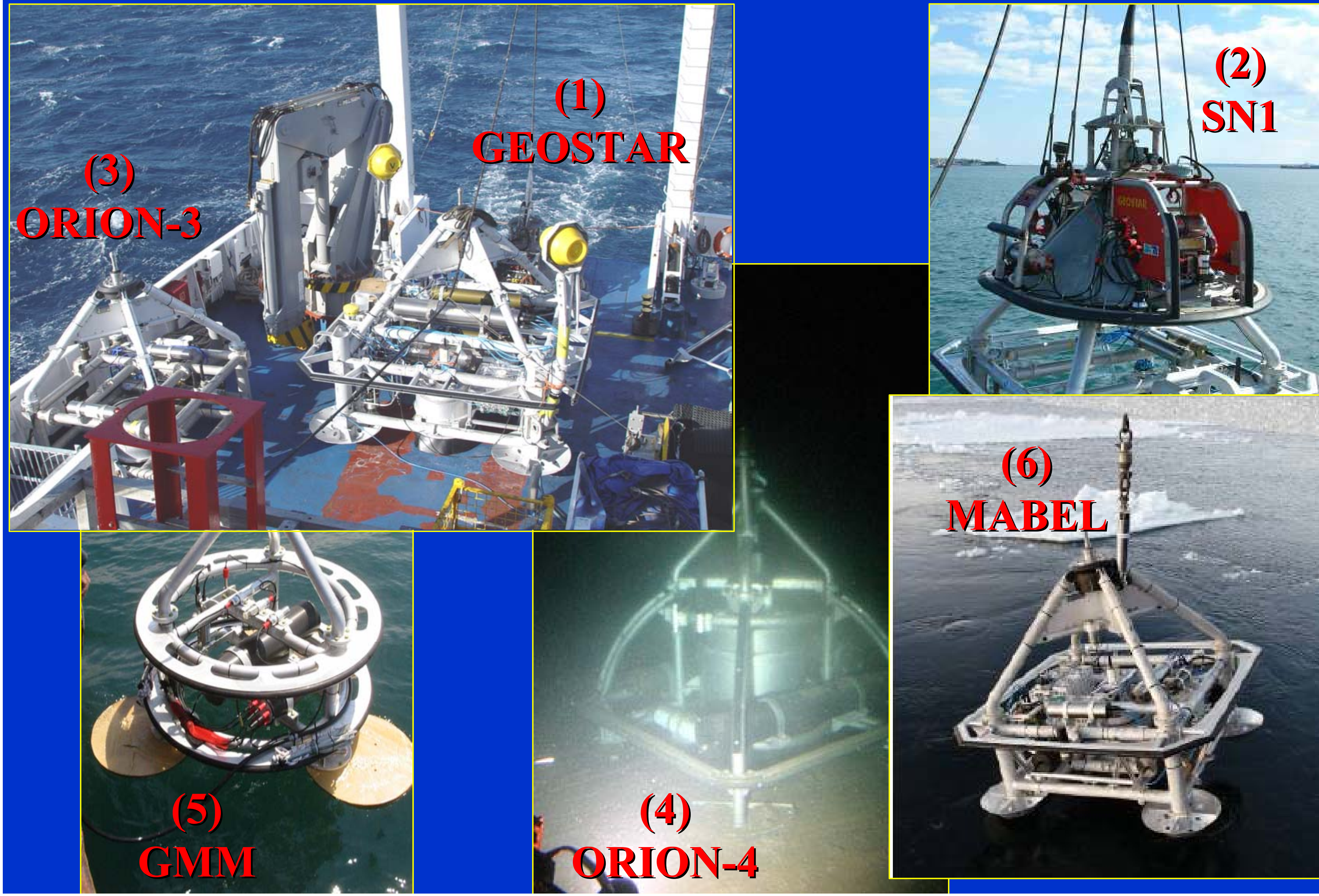
R/V Universitatis

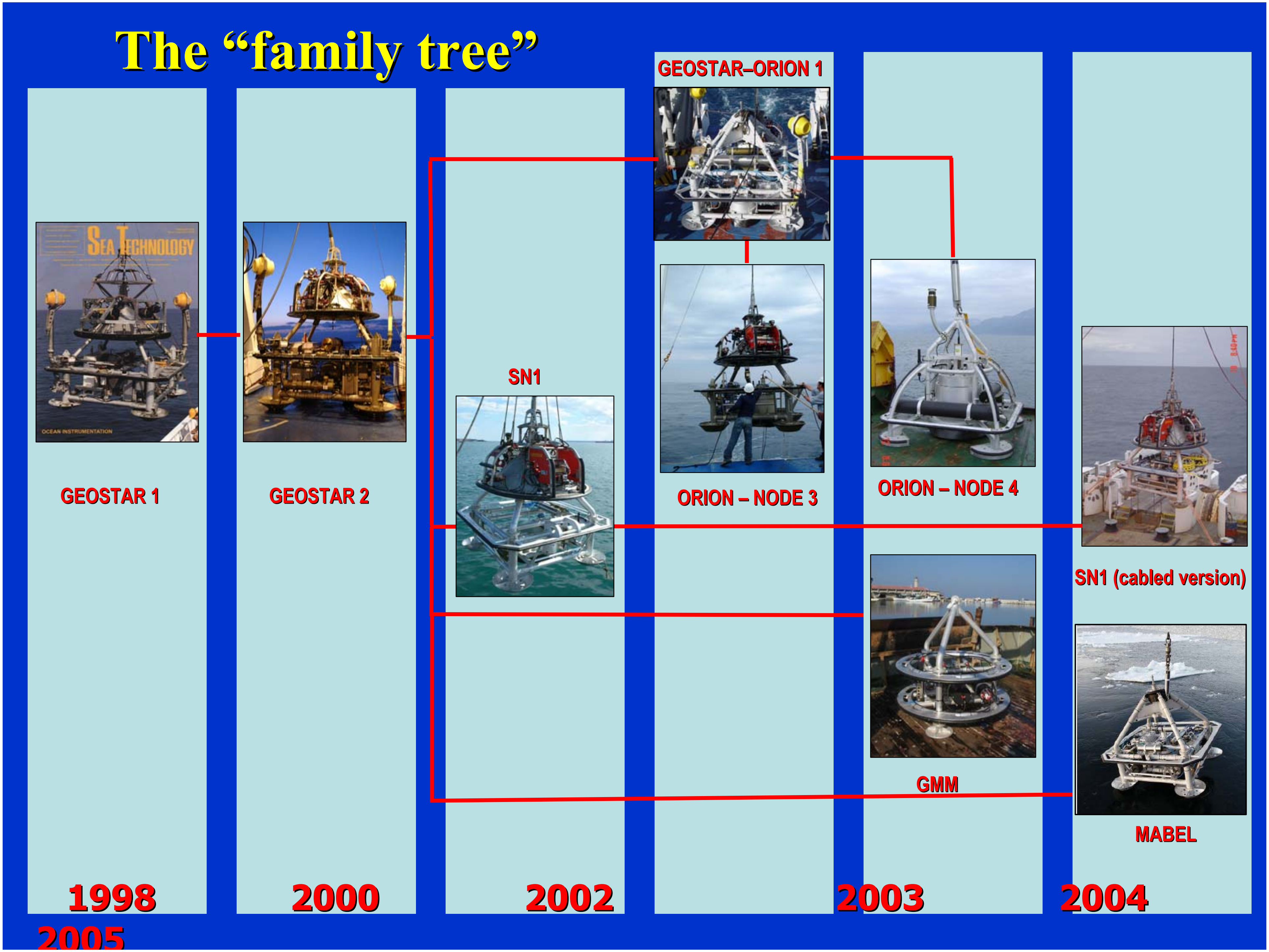

C/V Pertinacia


R/V Urania

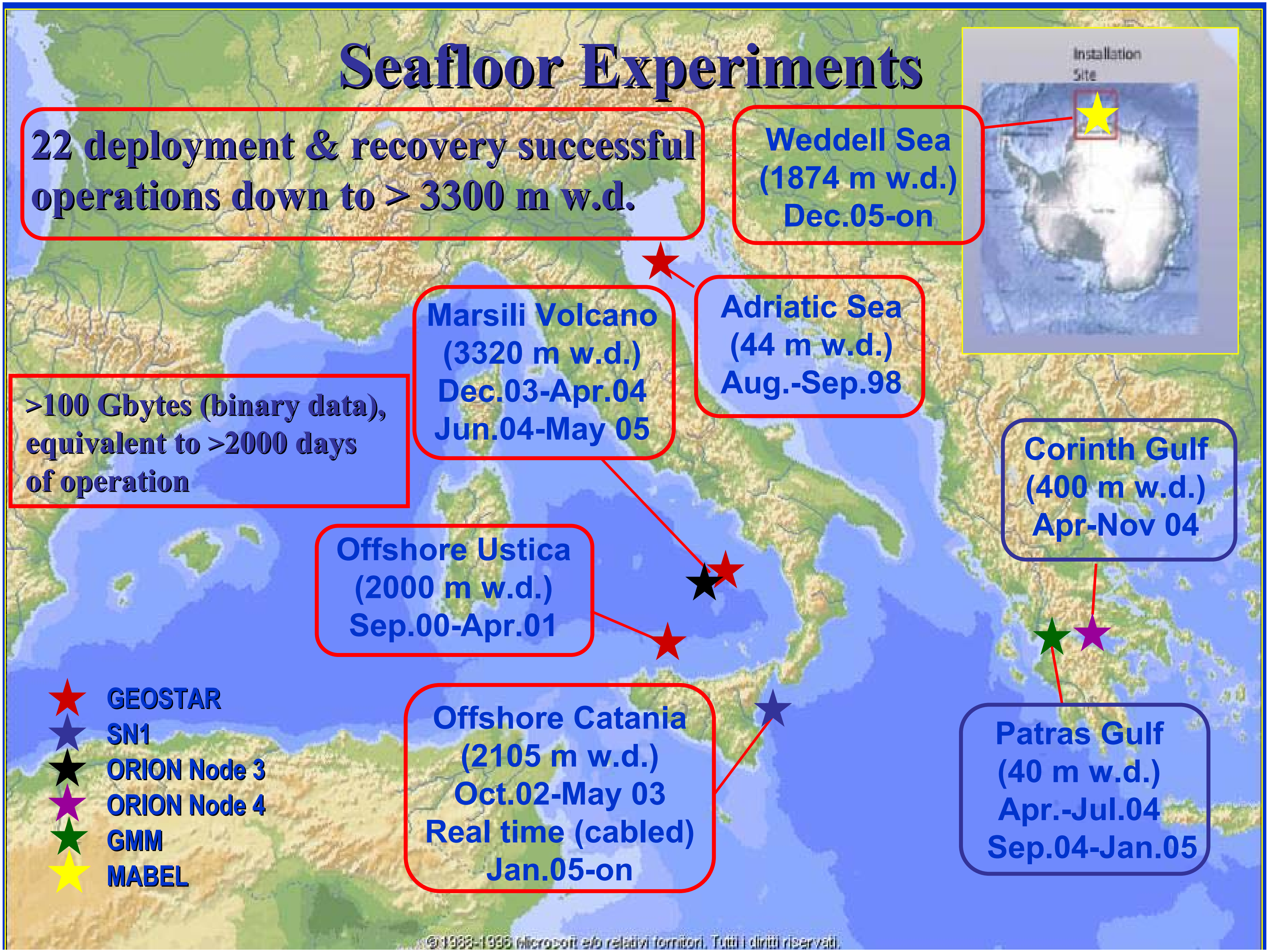
M/P Mazzarò

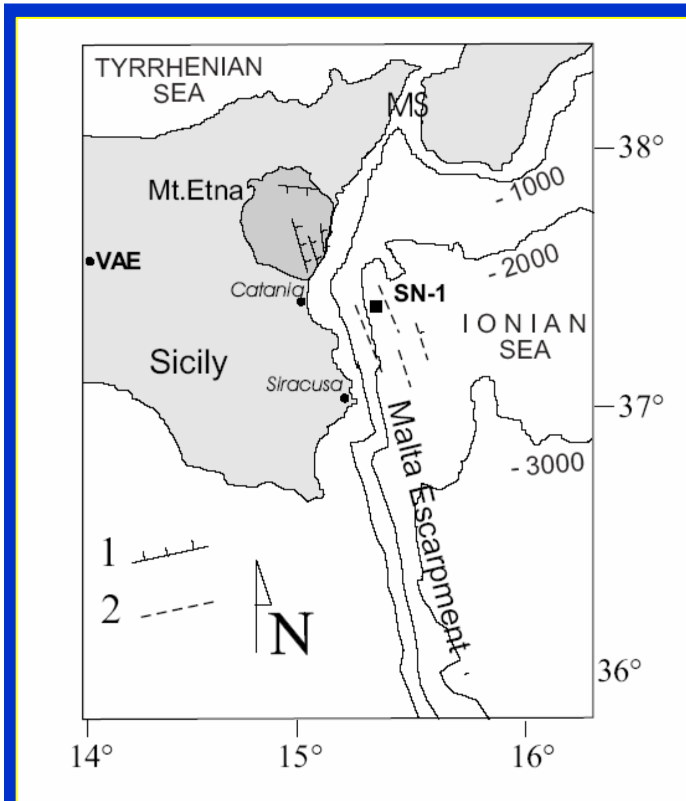
A fleet of 6 Seafloor Observatories

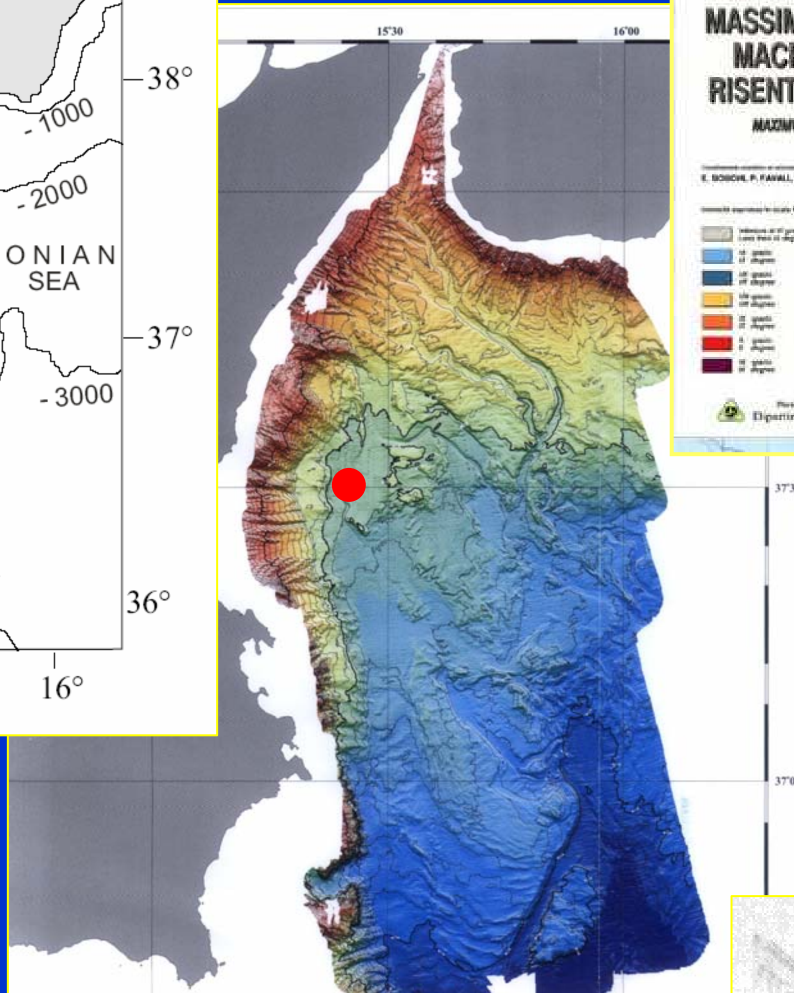



The "family tree"
GEOSTAR–ORION 1
SEA TECHNOLOGY
OCEAN INSTRUMENTATION
SN1
ORION – NODE 3
ORION – NODE 4
GEOSTAR 1
GEOSTAR 2
SN1 (cabled version)
GMM
MABEL
1998
2000
2002
2003
2004
2005

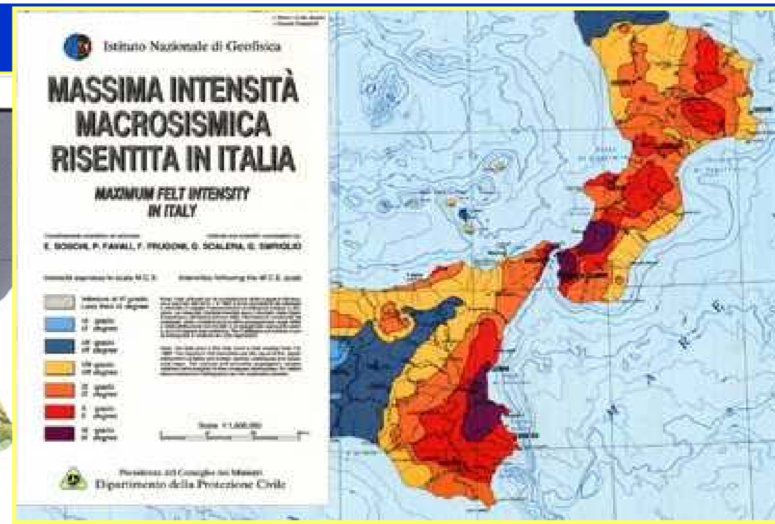
Seafloor Experiments







Marani et al., 2004



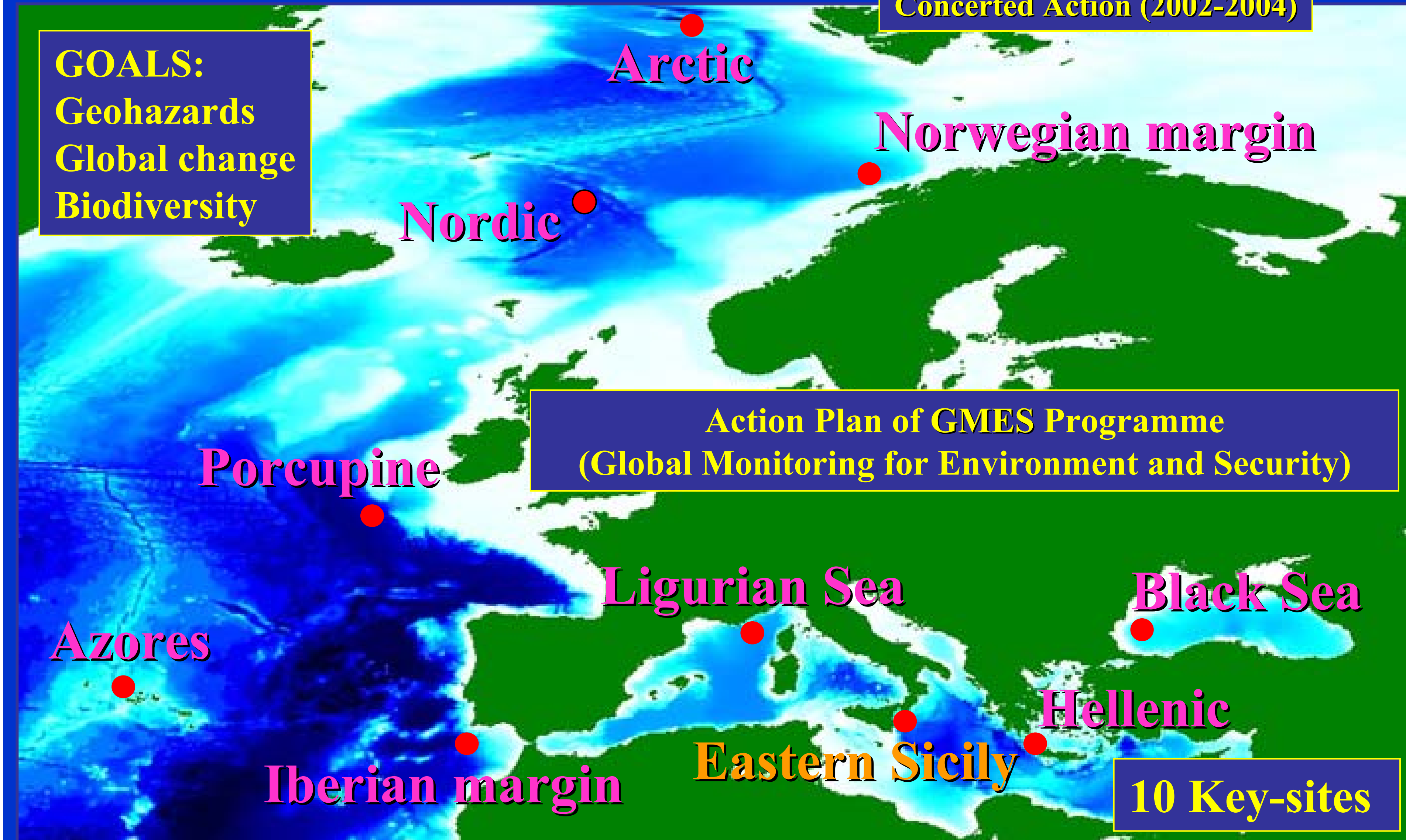
The most important earthquakes:
1169, M 6.6; 1693, M 7.4; 1908, M 7.2

Platania, "Il Terremoto di Messina, 1908"

European Seafloor Observatory NETwork

Concerted Action (2002-2004)

GOALS:
Geohazards
Global change
Biodiversity

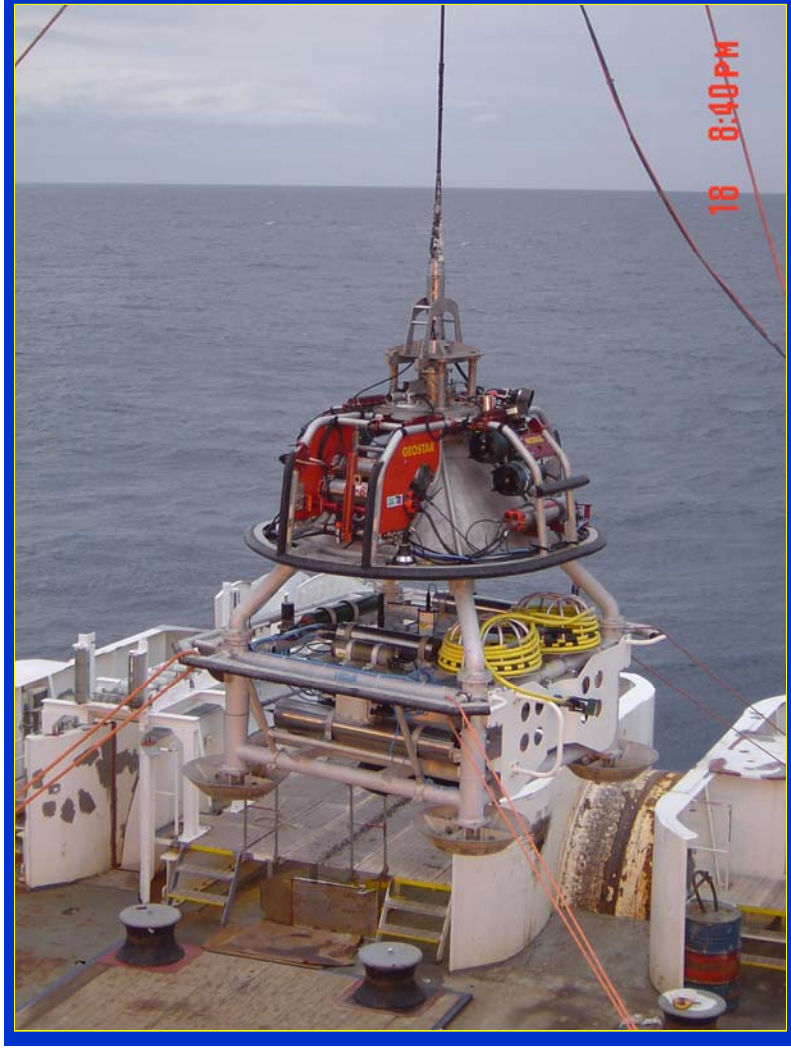


Action Plan of GMES Programme
(Global Monitoring for Environment and Security)

10 Key-sites

weight:
14 kN in air (8.5 kN in water)
dimensions:
2.9 x 2.9 x 2.9 m (overall)
depth rated:4000 m

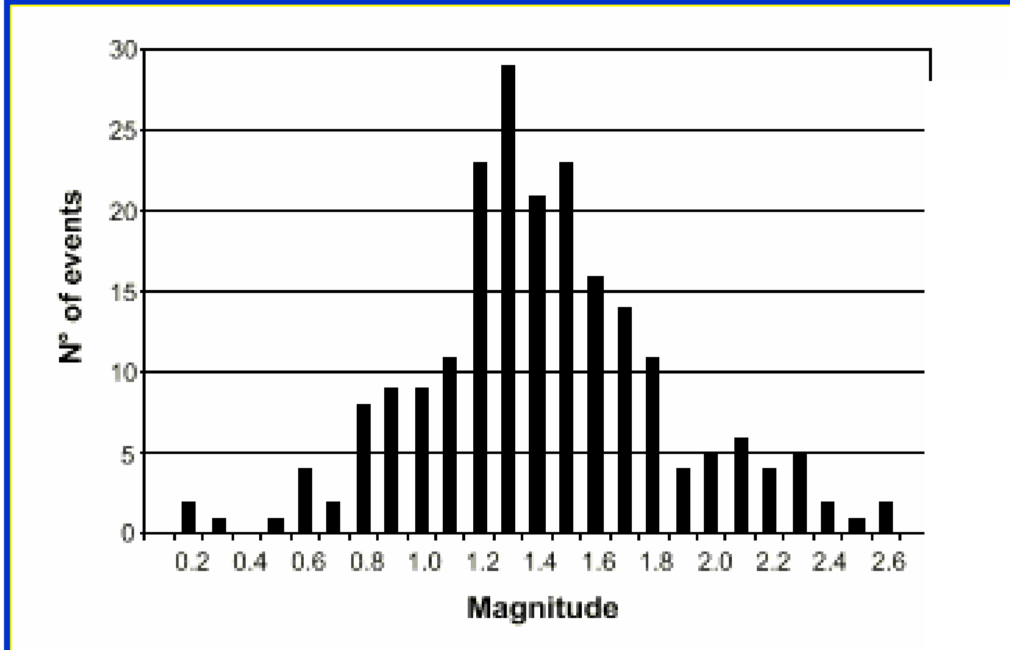
1st mission stand-alone mode
October '02 - May '03
(>130 days; >12 Gbyte data)



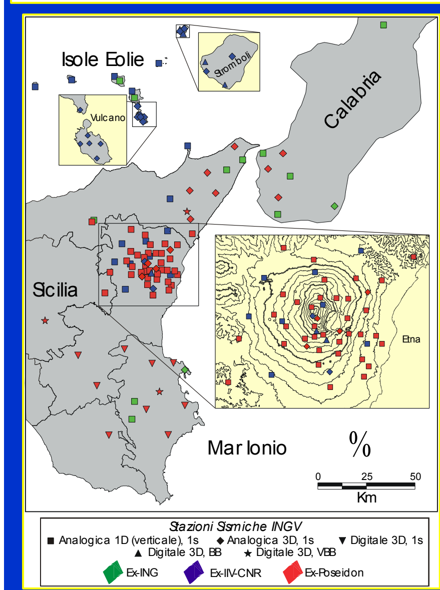
Guralp CMG-1T
in the Ti-sphere
.0027-50 Hz

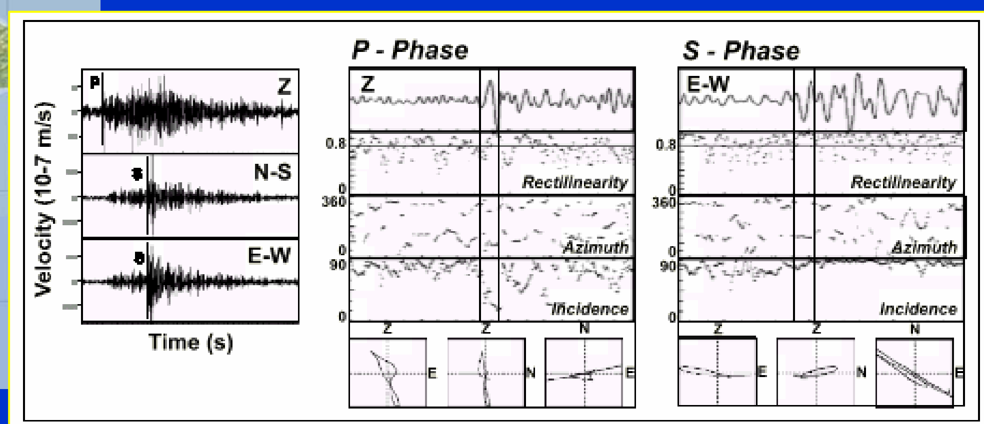
3-C broad-band seismometer	100 Hz	[Z, EW, NS]	24 bit
Hydrophone	100 Hz		24 bit
Gravity meter	1 Hz	[g, T]	24 bit
CTD	1 sample/10 min		
3-D current meter	2 Hz	[Vn,Ve,Vz,T,P,H,Tx,Ty]	16 bit
Precision tilt meter	10 Hz	[Tx, Ty]	24 bit

499 earthquakes recorded only by SN1 (over 130 days)

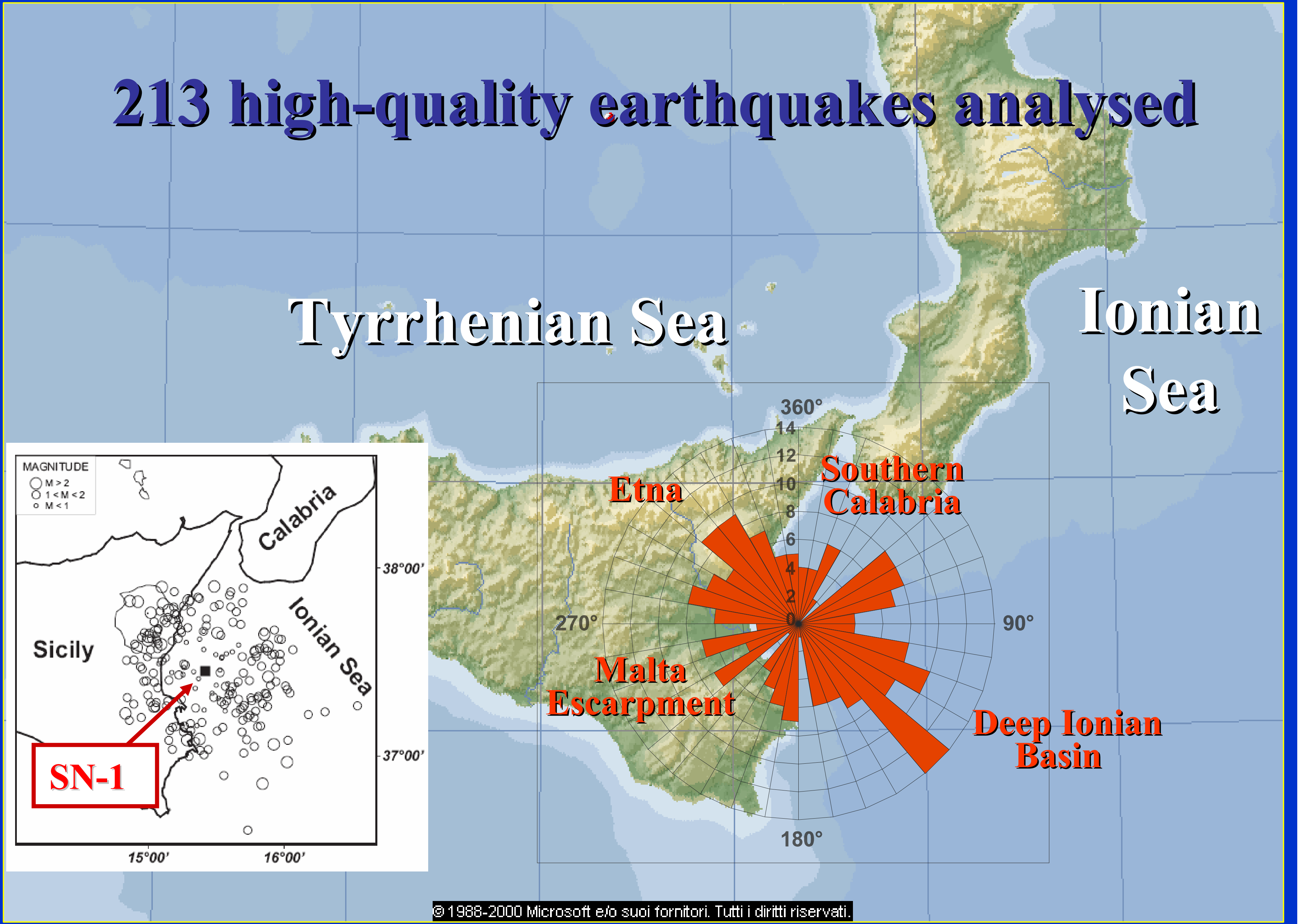


	Reported events	Triggers Reported (not located events)	SN-1 Triggers only	SN-1 total triggers
Teleseismic Events	32	-	-	32 (2.3%)
Regional Events	249	14	14	277 (20.4%)
Local Events	355	213	485	1053 (77.3%)
Total	636 (46.7%)	227 (16.7%)	499 (36.6%)	1362 (100%)





213 high-quality earthquakes analysed



INFN Lab
Catania harbour

10 Optic Fibres ITU- T G-652 (6 used)
6 Electrical Conductors Φ 4 mm^2 (4 used)

SN1
(INGV)

2.330 m double shield cable

5.220 m

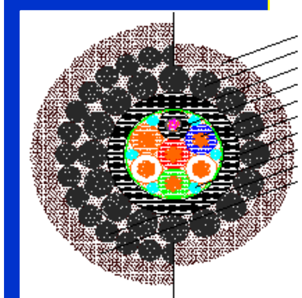
Joint

BU

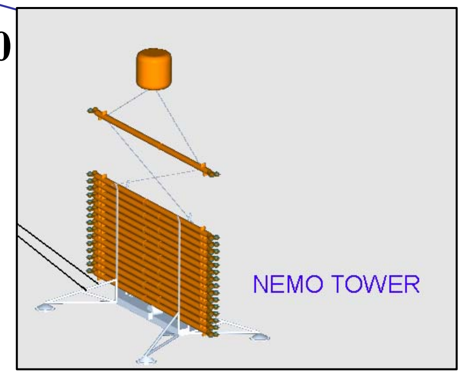
Joint

Joint

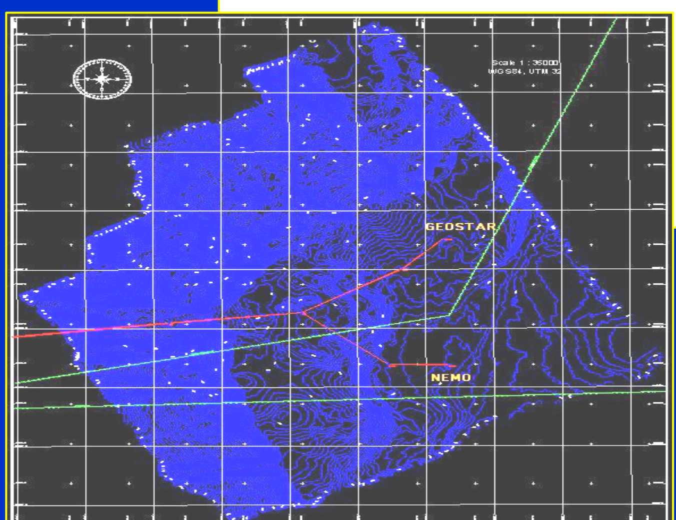
5.000

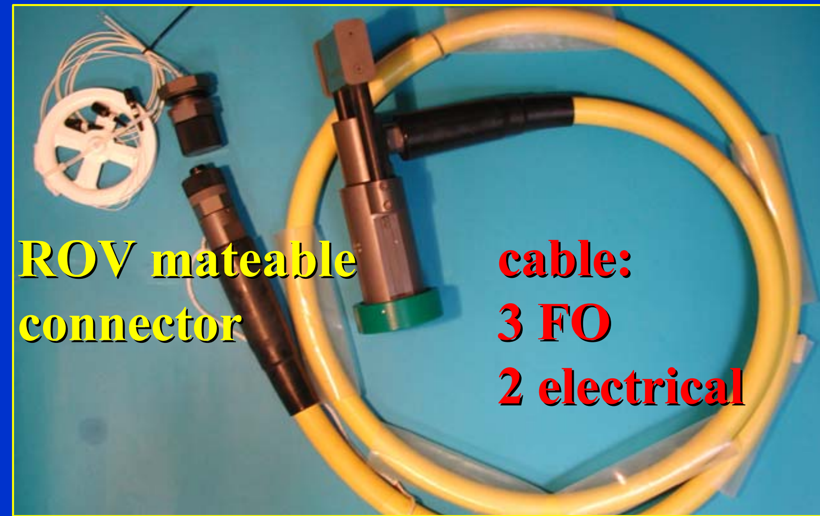


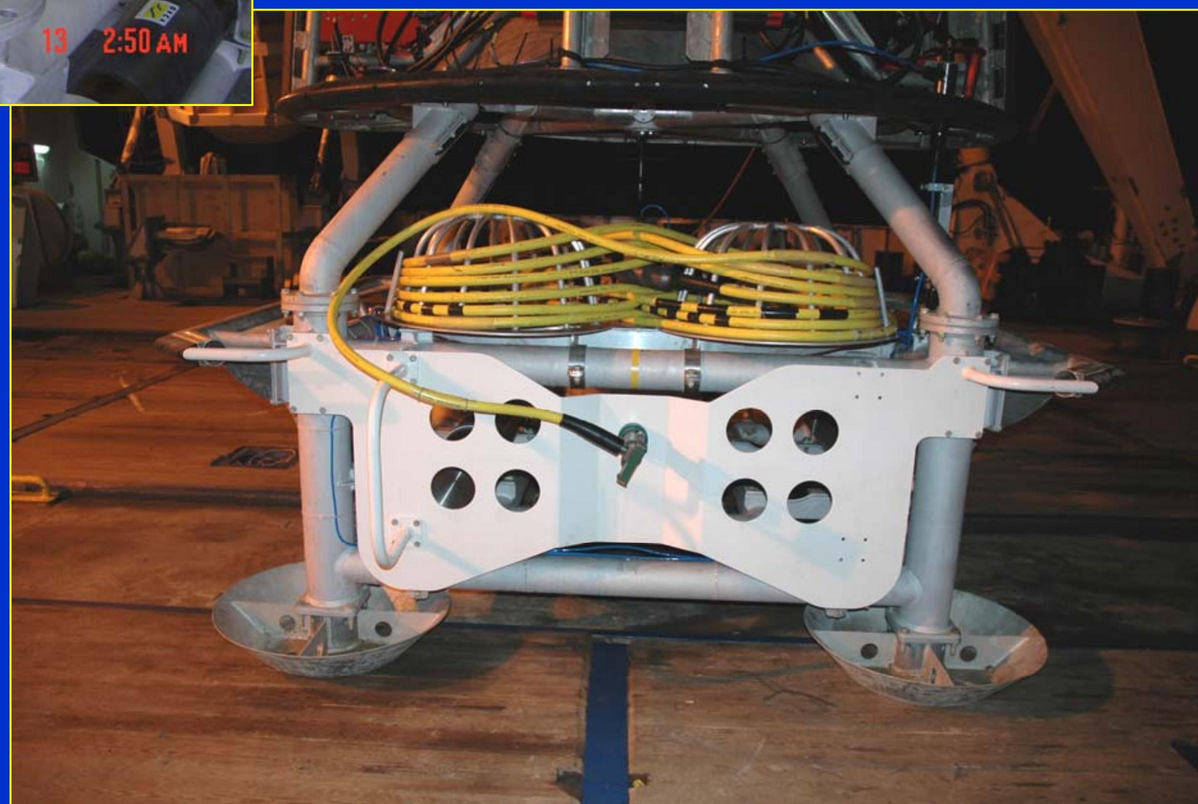
20.595 m single shield underwater cable



NEMO Pilot experiment (INFN)



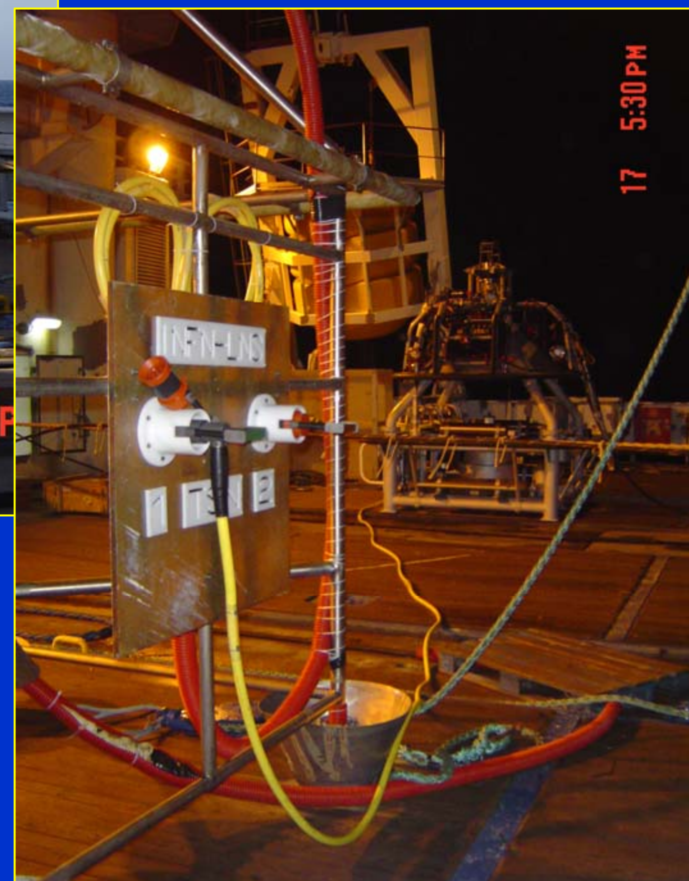




INFN

INGV

Junction boxes

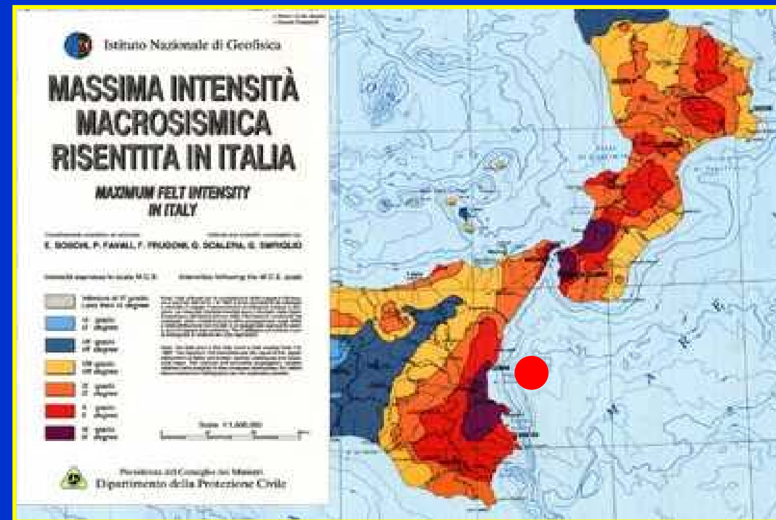


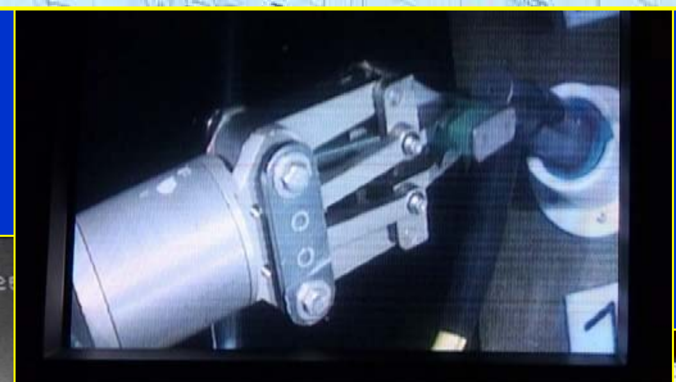
INFN

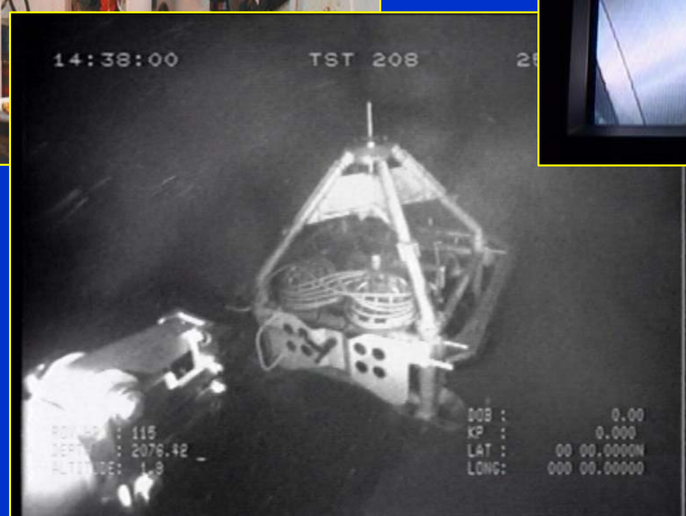
INGV

The 1st "Real-Time" seafloor observatory in Europe

First operative ESONET site
25 January 2005
2060 m w.d.



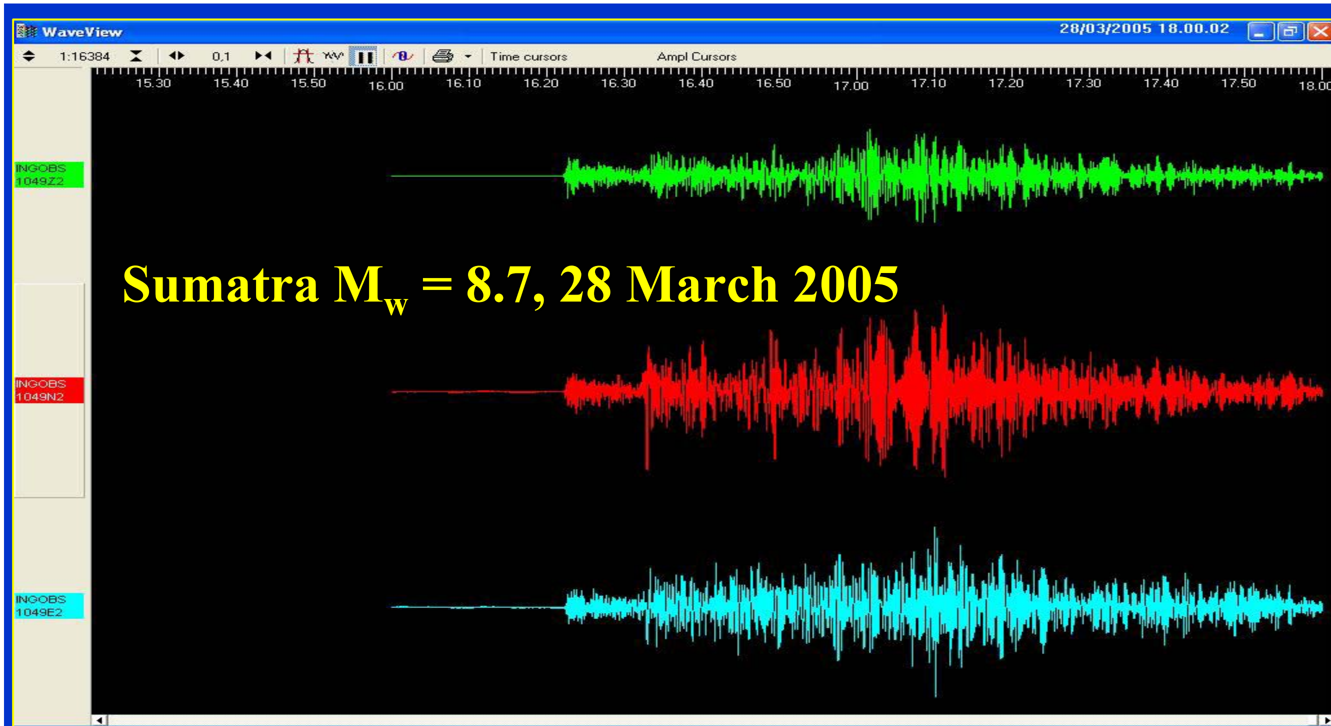


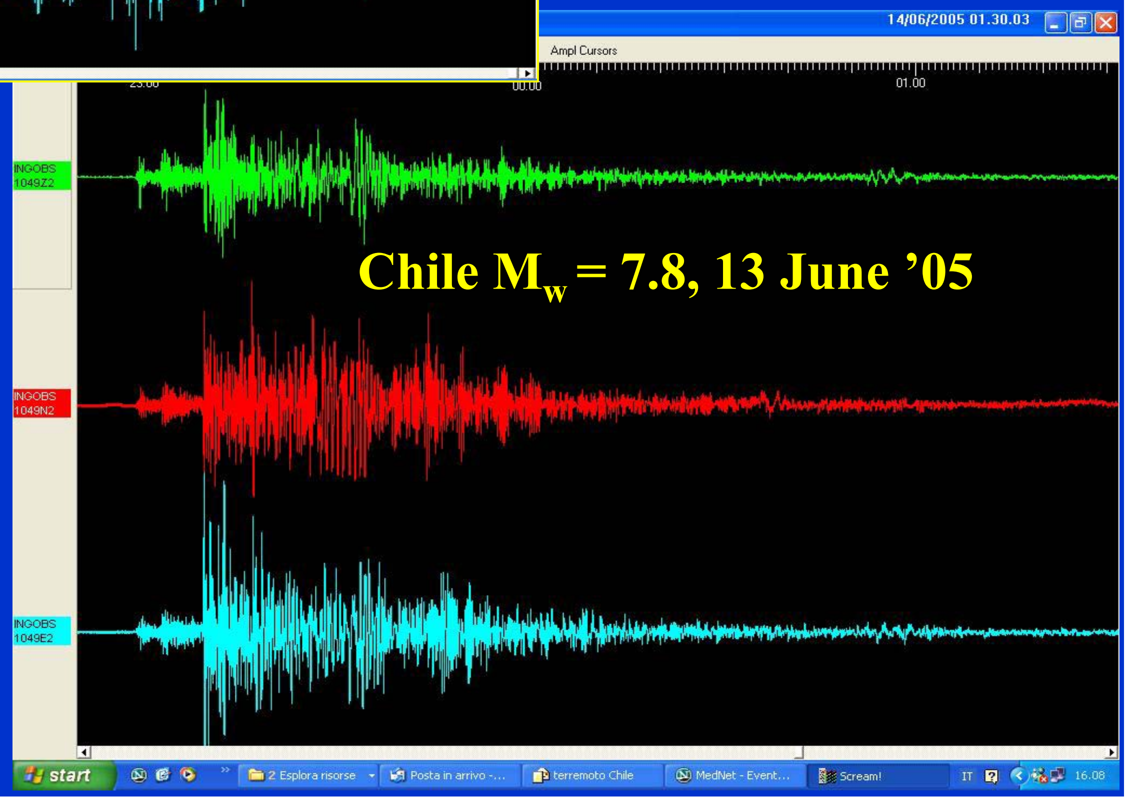


INFN

INGV

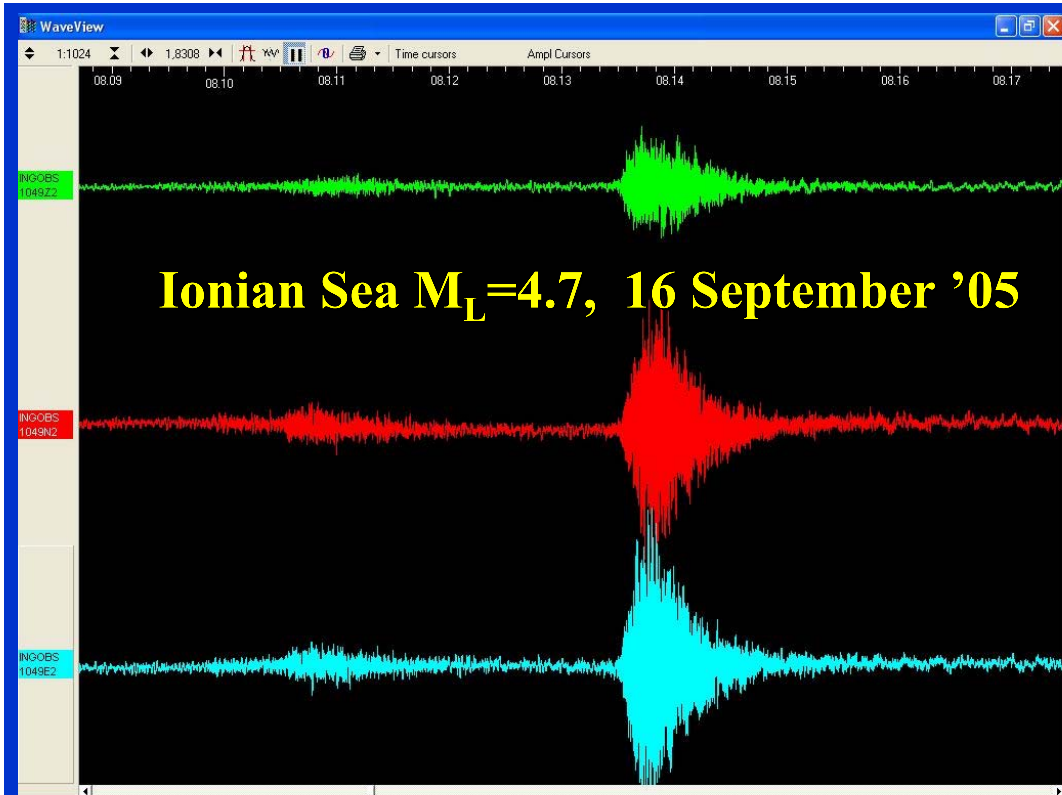
Important teleseismic events

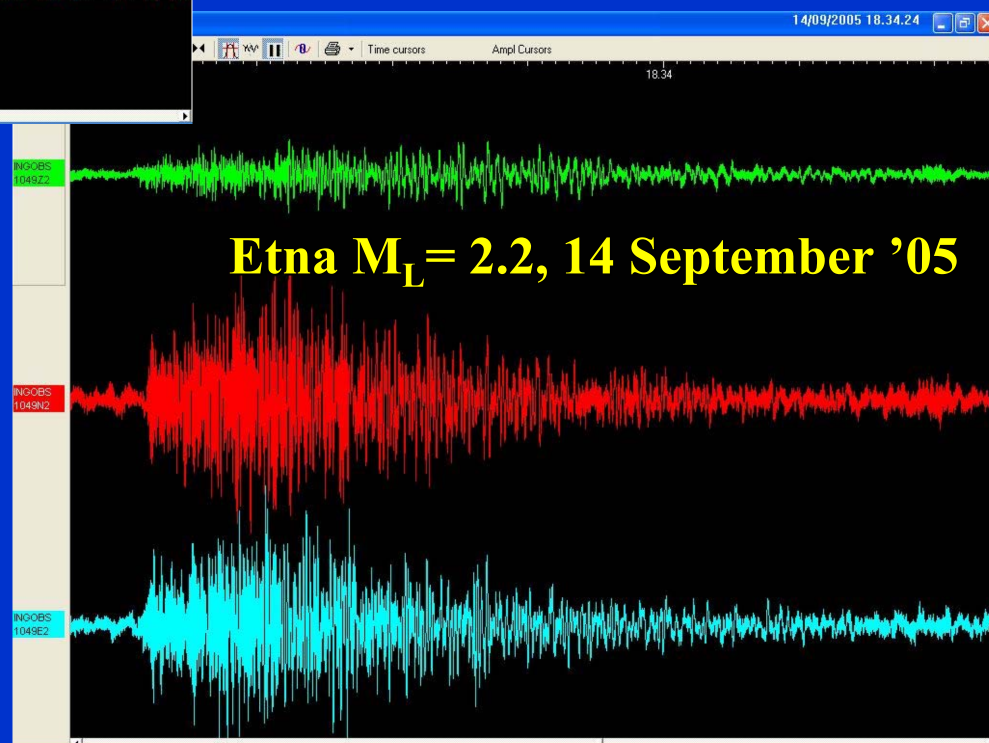




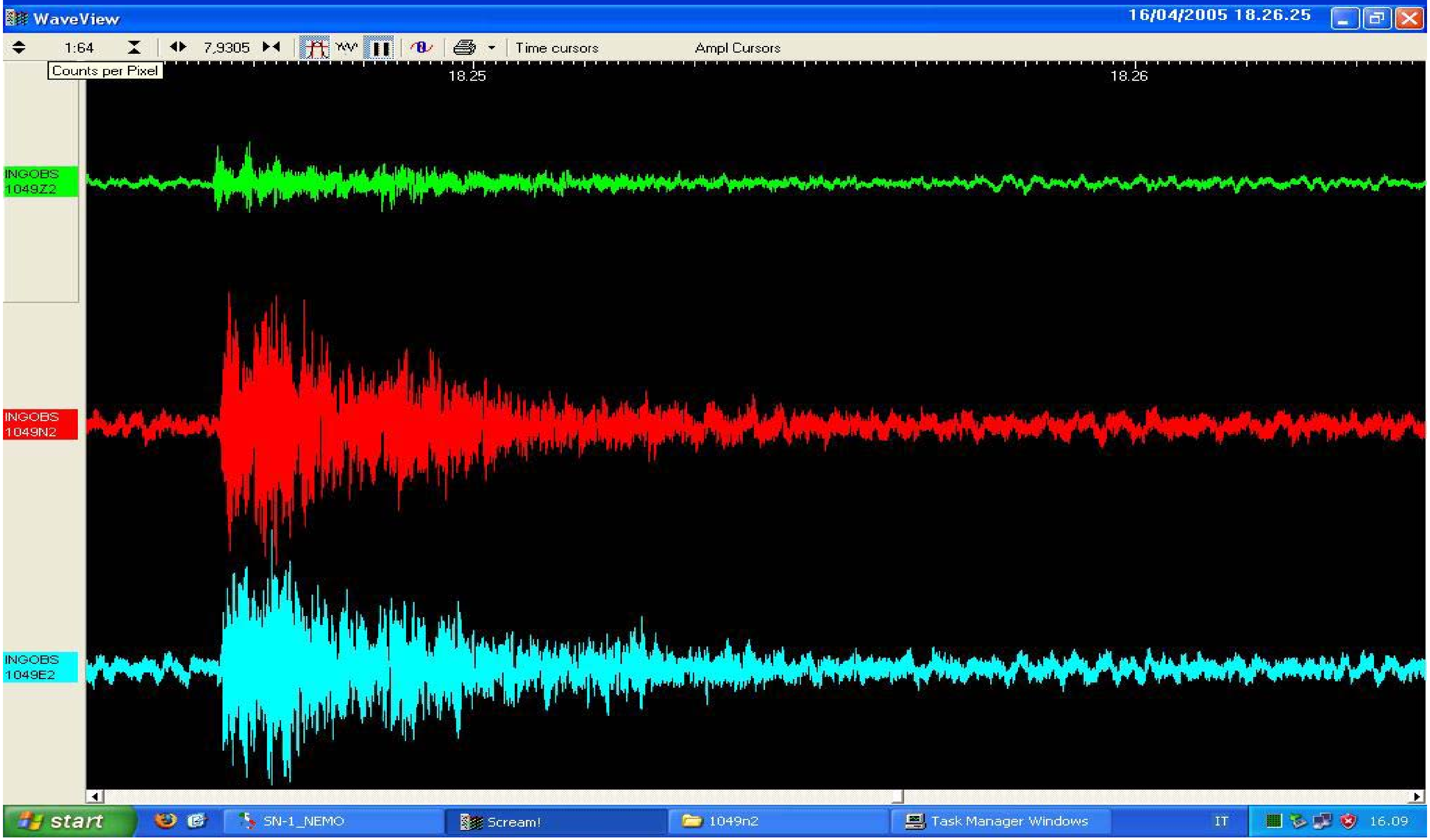
SN1 real-time seismological recordings

Regional/Local examples

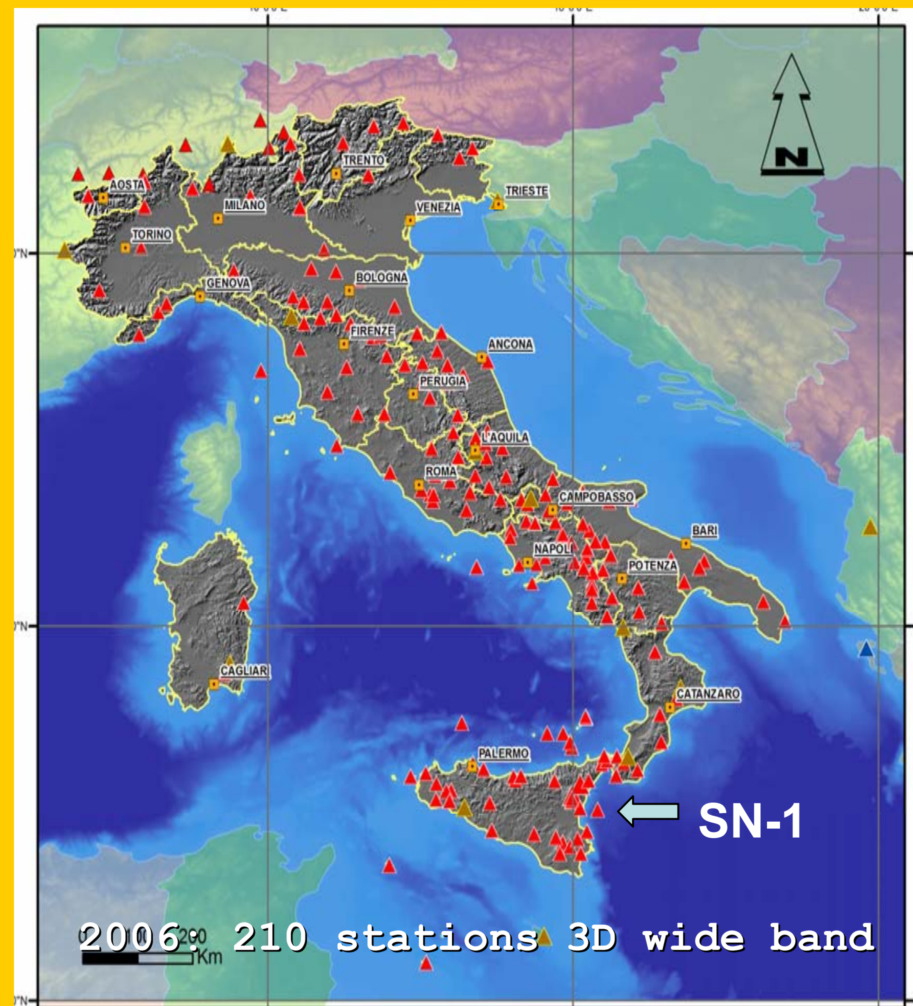




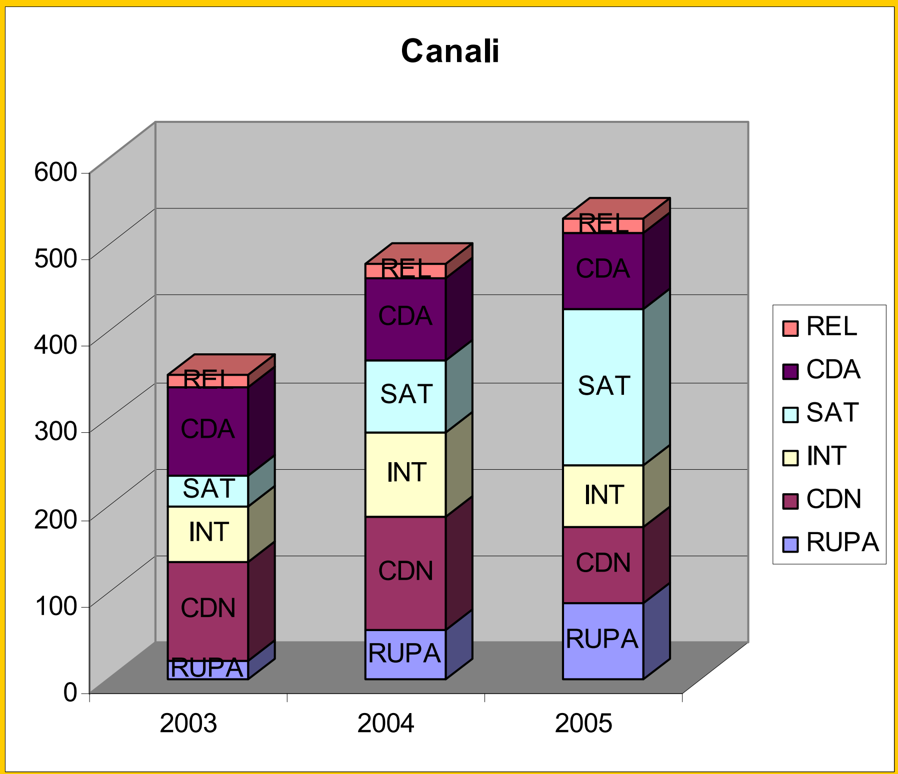
Example of local event only recorded by SN1

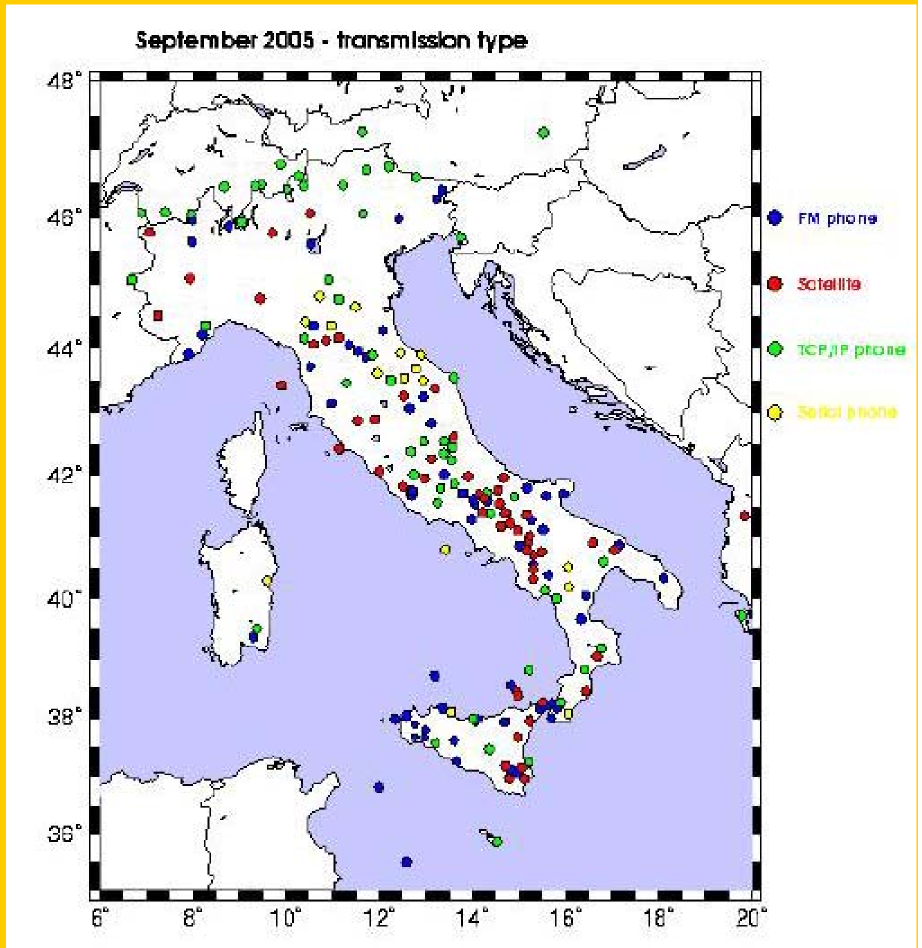


Aumento del 130% del numero di stazioni e del 500% di canali (terne di sensori a larga banda)



Ridondanza e affidabilità dei sistemi trasmissivi



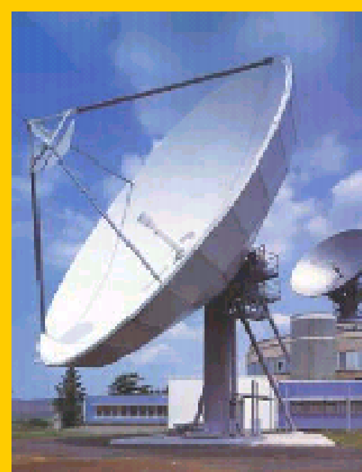


Costi collegamenti Satellitari vs. CDN o RUPA ~ 1:8

Broad band Seismometer

Accelerometer

GPS

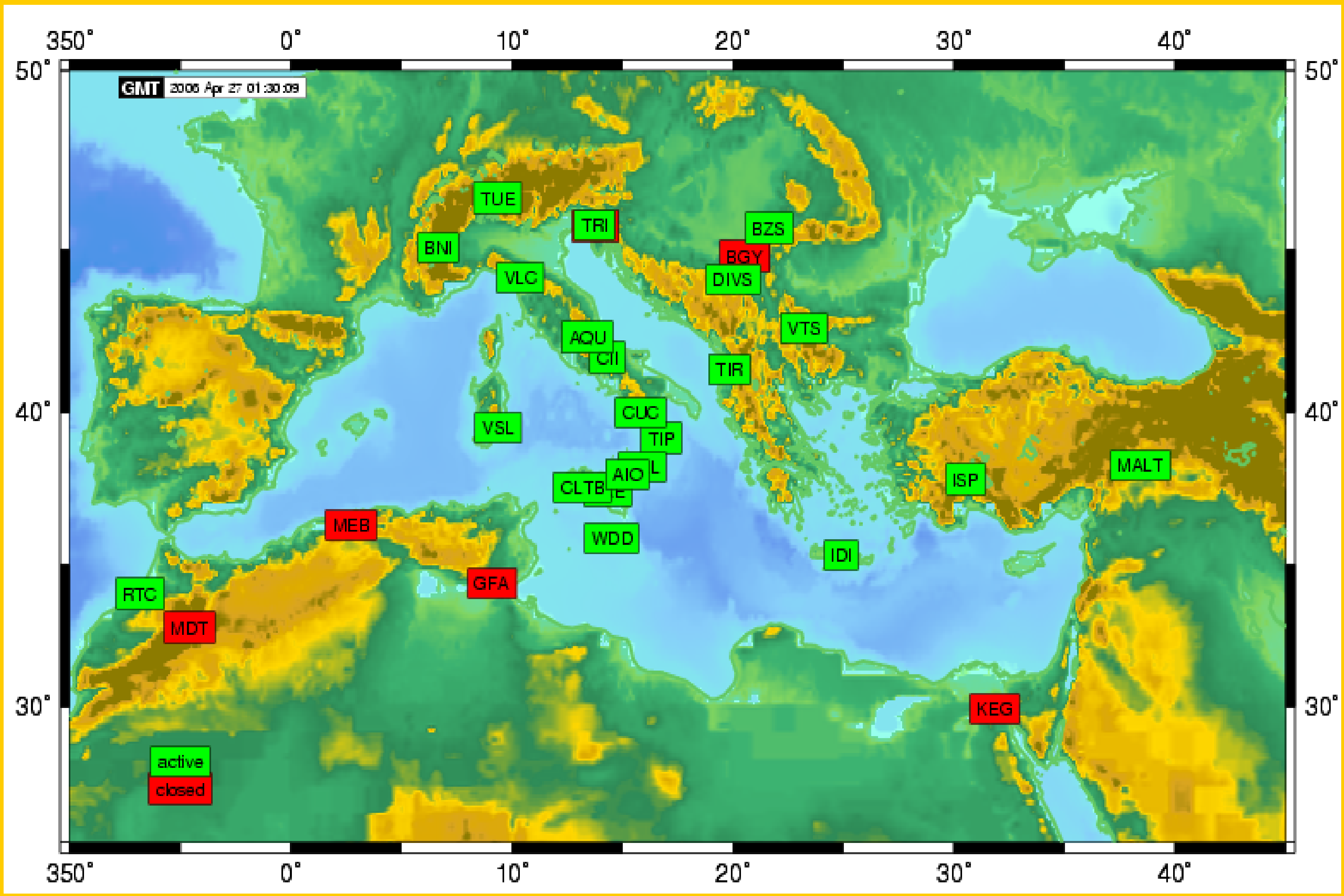


Satellite or RUPA Transmission


Stazione multisensore INGV
Sismometro BB - Accelerometro - CGPS
Istituto Nazionale di
Geofisica e Vulcanologia
Stazione Sismica - La Salle (AO)

MedNet

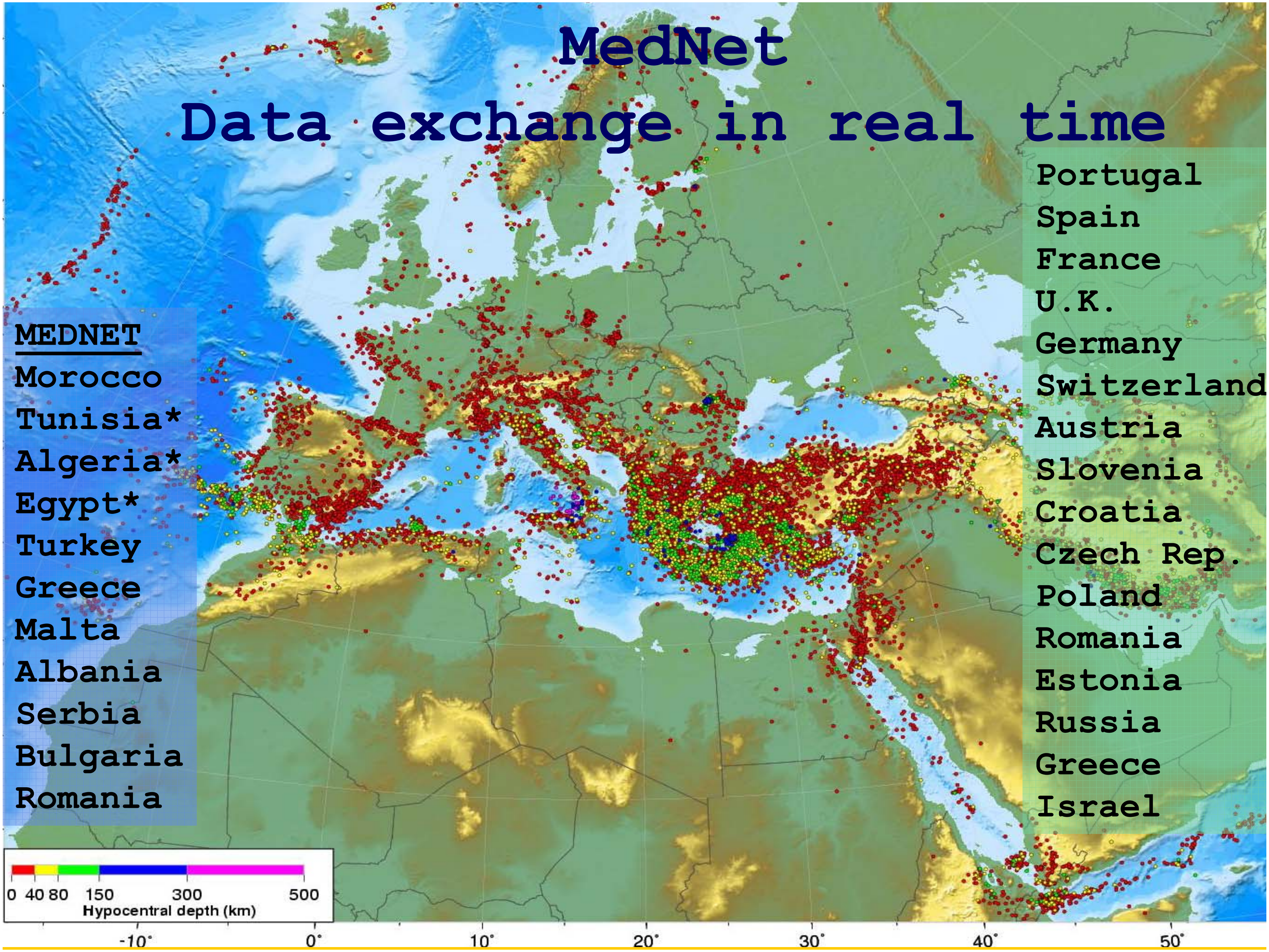
Very-broad-band seismic network



MedNet
Data exchange in real time

MEDNET
Morocco
Tunisia*
Algeria*
Egypt*
Turkey
Greece
Malta
Albania
Serbia
Bulgaria
Romania

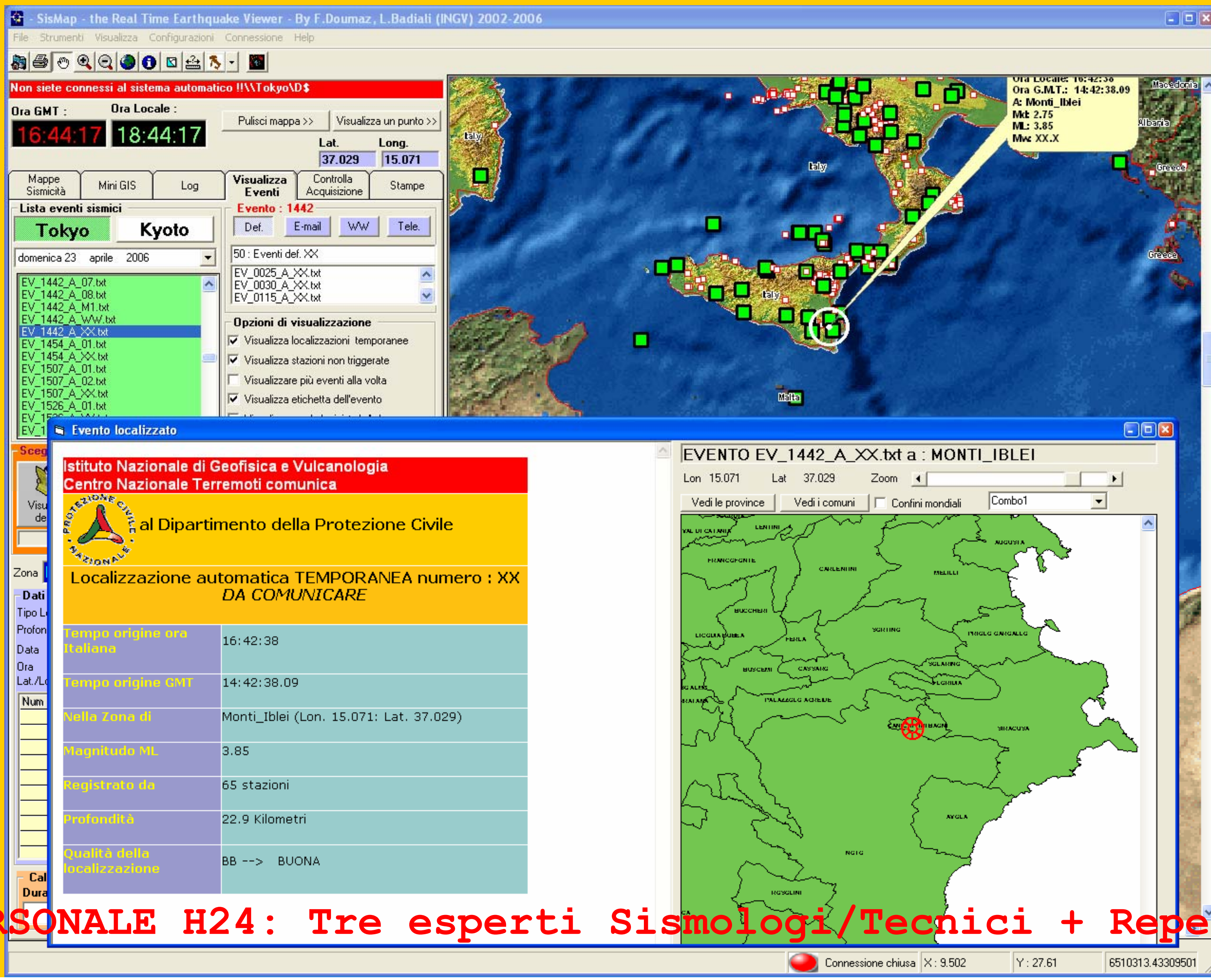
Portugal
Spain
France
U.K.
Germany
Switzerland
Austria
Slovenia
Croatia
Czech Rep.
Poland
Romania
Estonia
Russia
Greece
Israel



Rapidità

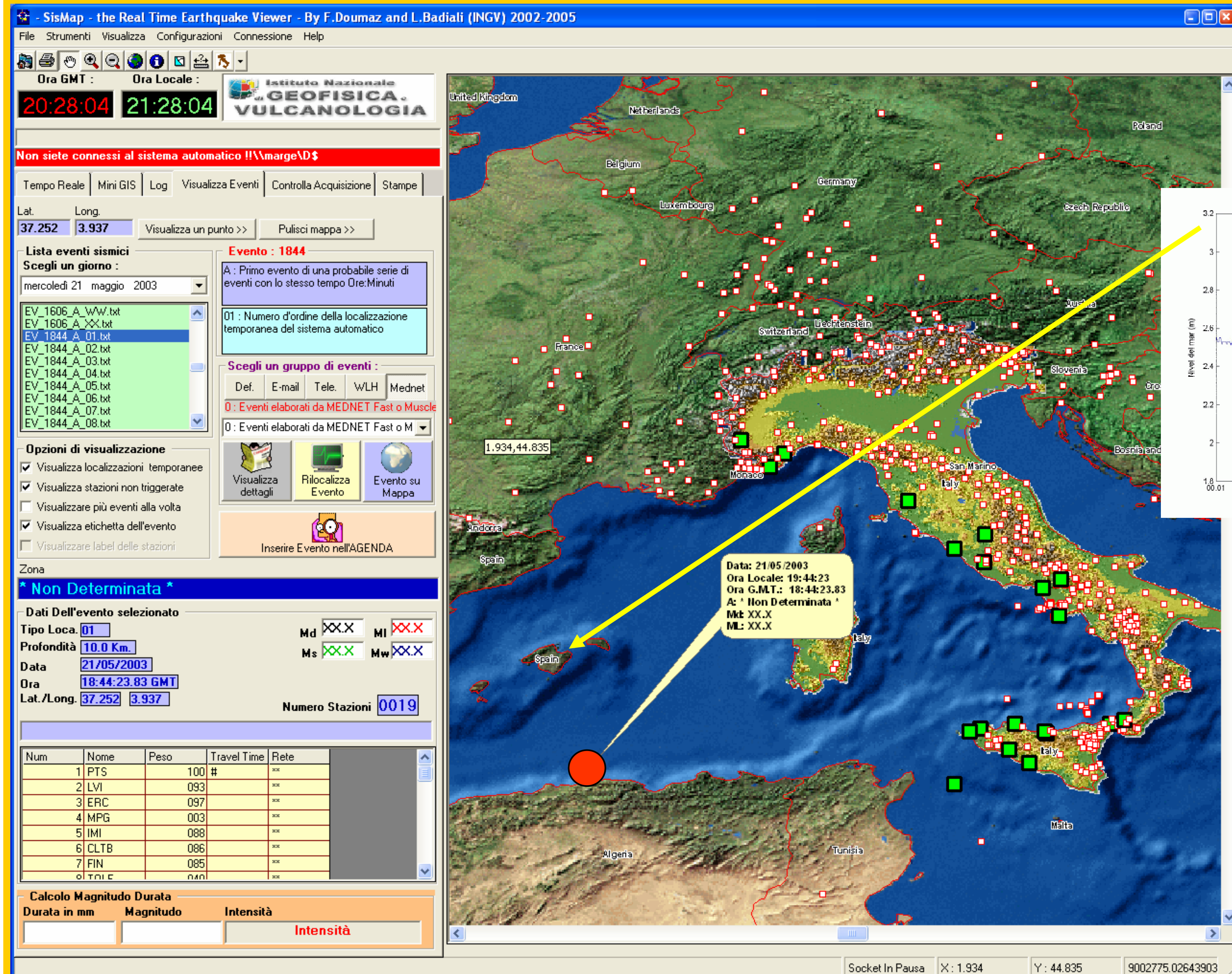
Ritardi entro 10 secondi

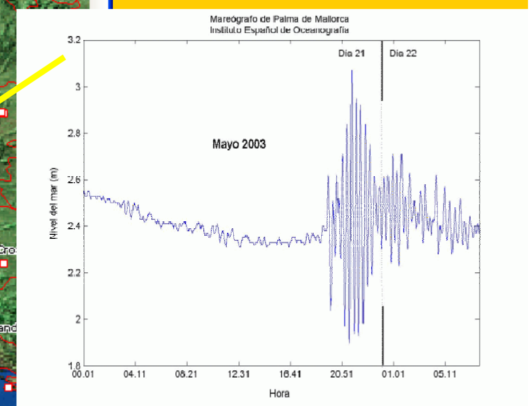
Comunicati entro 2'



PERSONALE H24: Tre esperti Sismologi/Tecnici + Reperibili

Algeria: 2.5 - 5 minutes



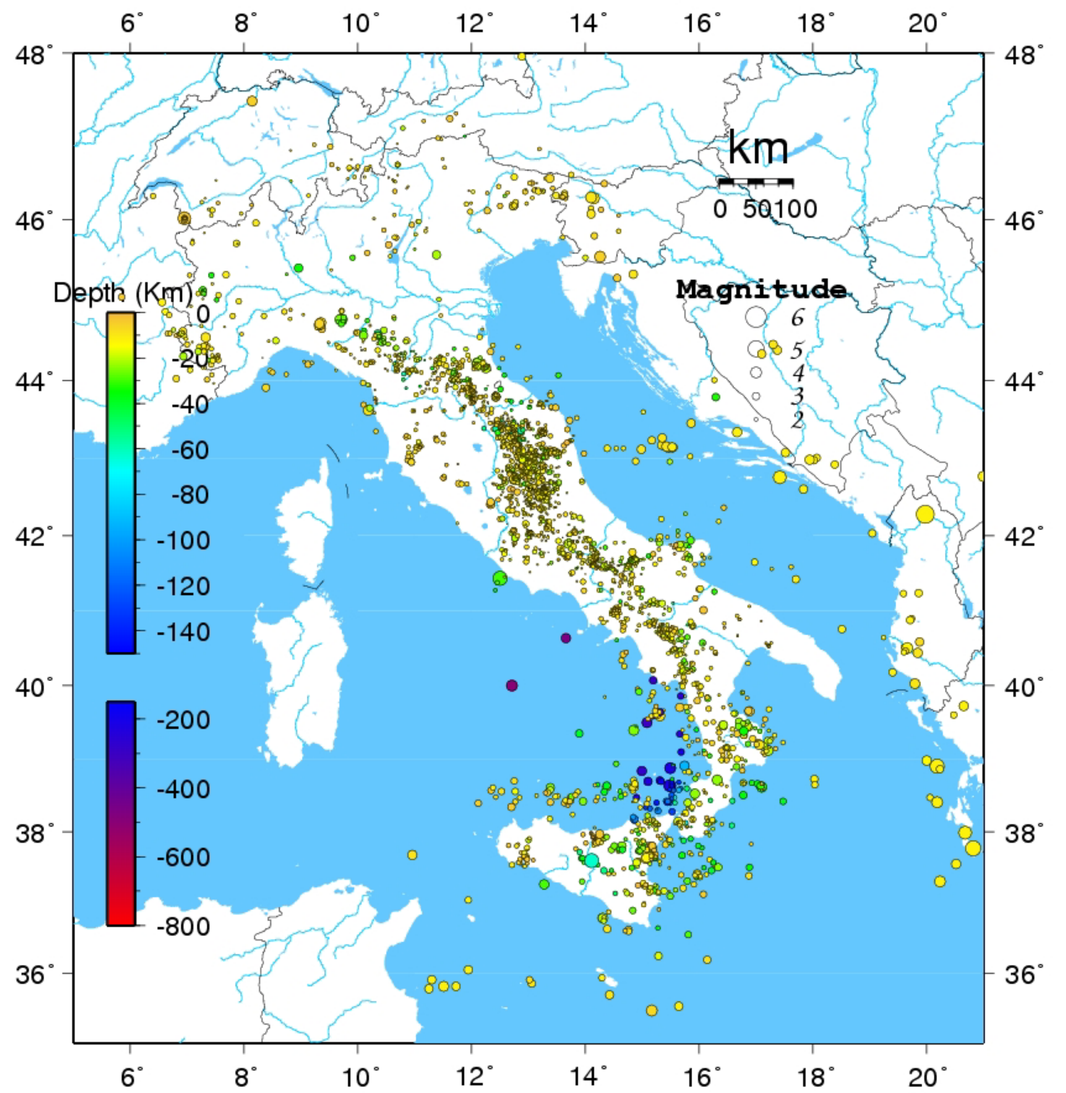


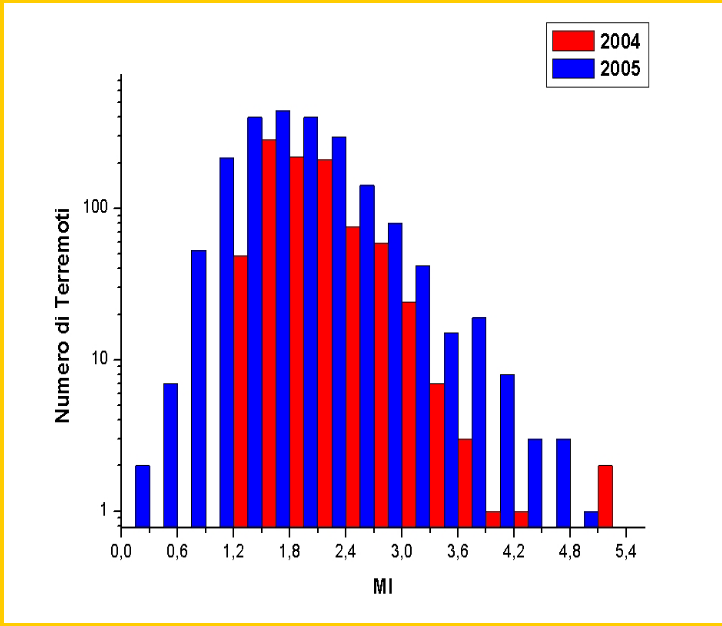
21/5/ 2003
Mw 7.2

Tsunami a Mallorca
Dopo 30'

DATA

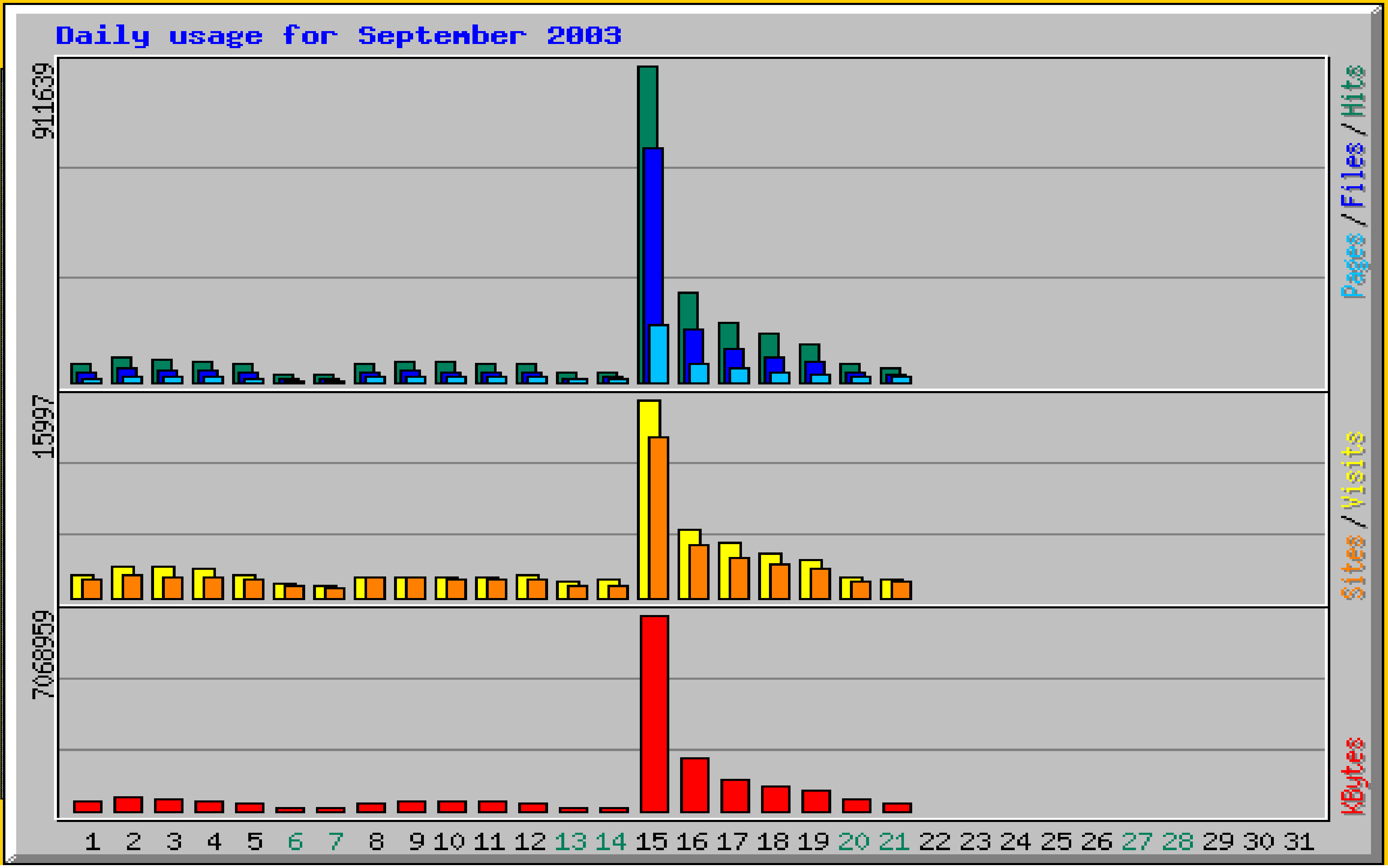
Sismicità 2005





Oltre 5000 eventi rilevati, 550 comunicati

Distribuzione dei DATI




Progetti futuri

PEGASO Project

PotEnziamento di reti Geofisiche e Ambientali SOttomarine

(Enhancement of underwater geophysical and environmental networks)

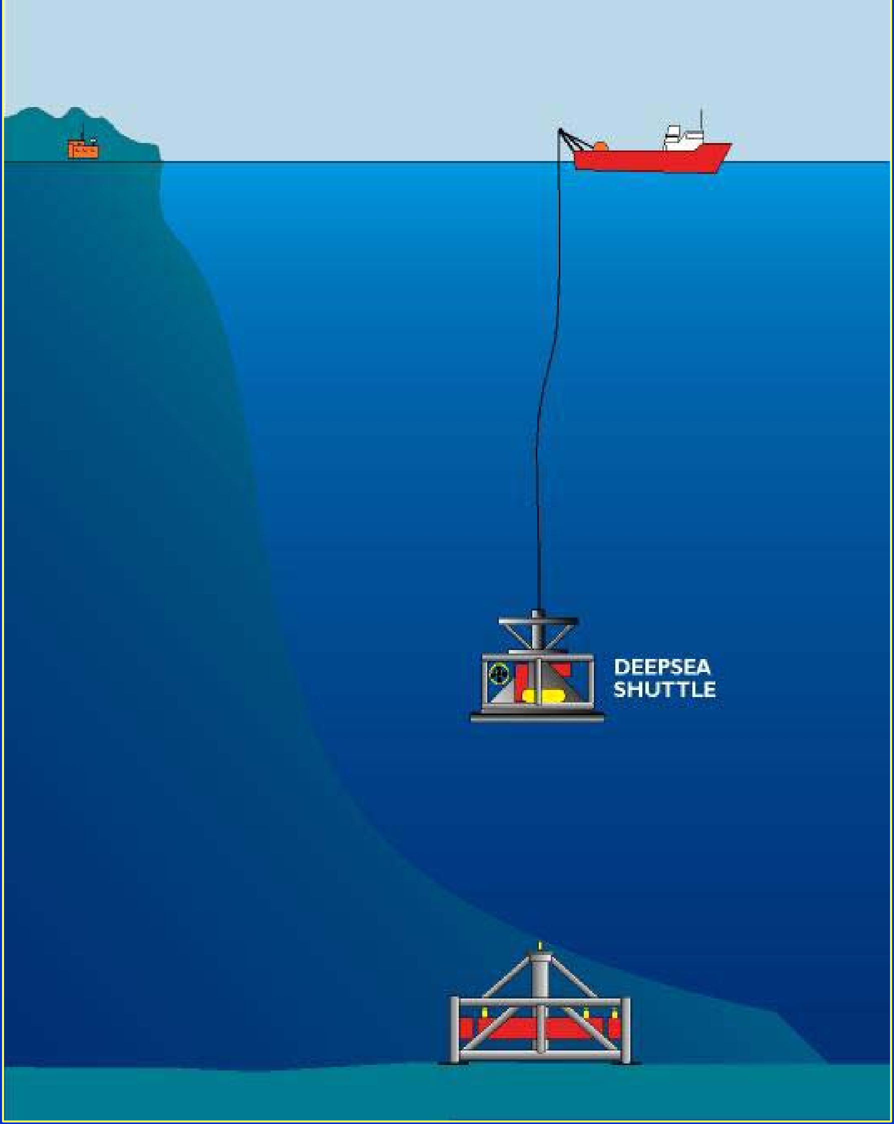
Funded by “REGIONE SICILIANA”
(2006 -2008)

OBJECTIVE: Realisation of an underwater system for the deployment, recovery and connection of complex deep-sea structures, servicing the existing infrastructure off-E. Sicily

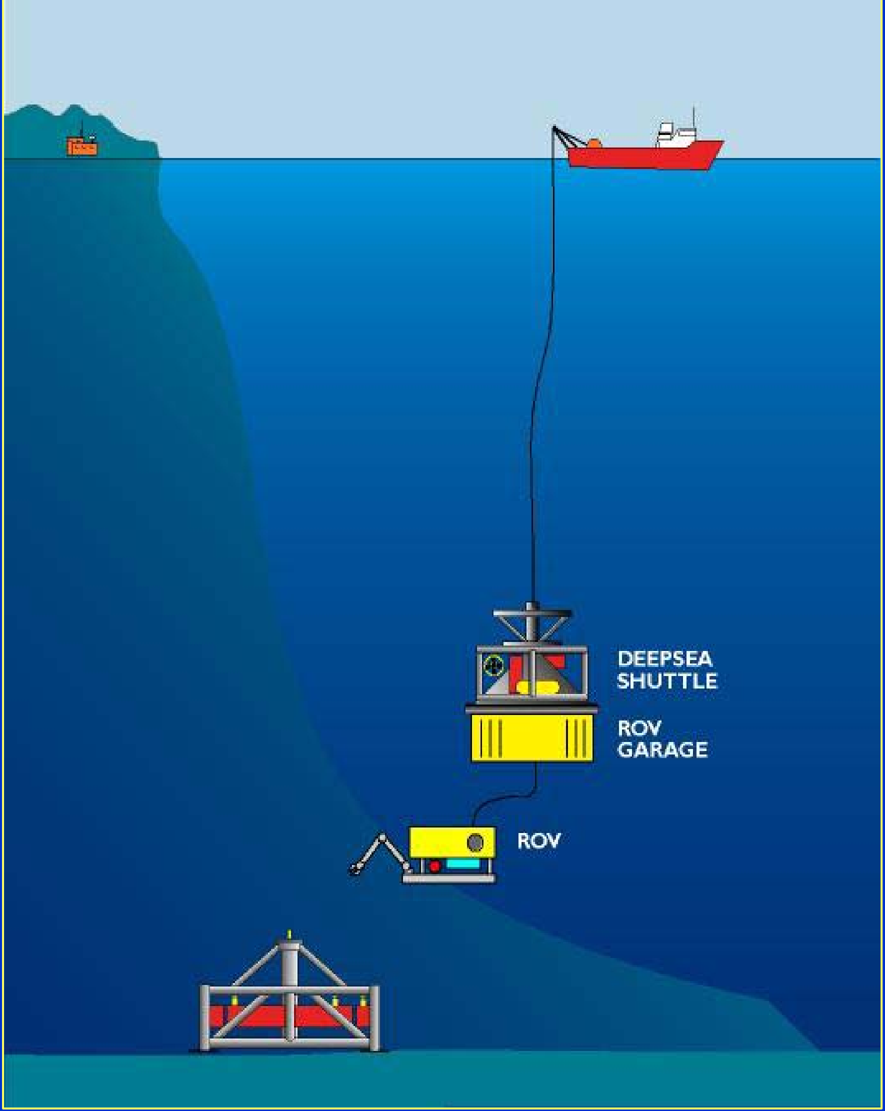
Max operating depth 4000 m

PEGASO Project

Deep-Sea Shuttle (DSS)

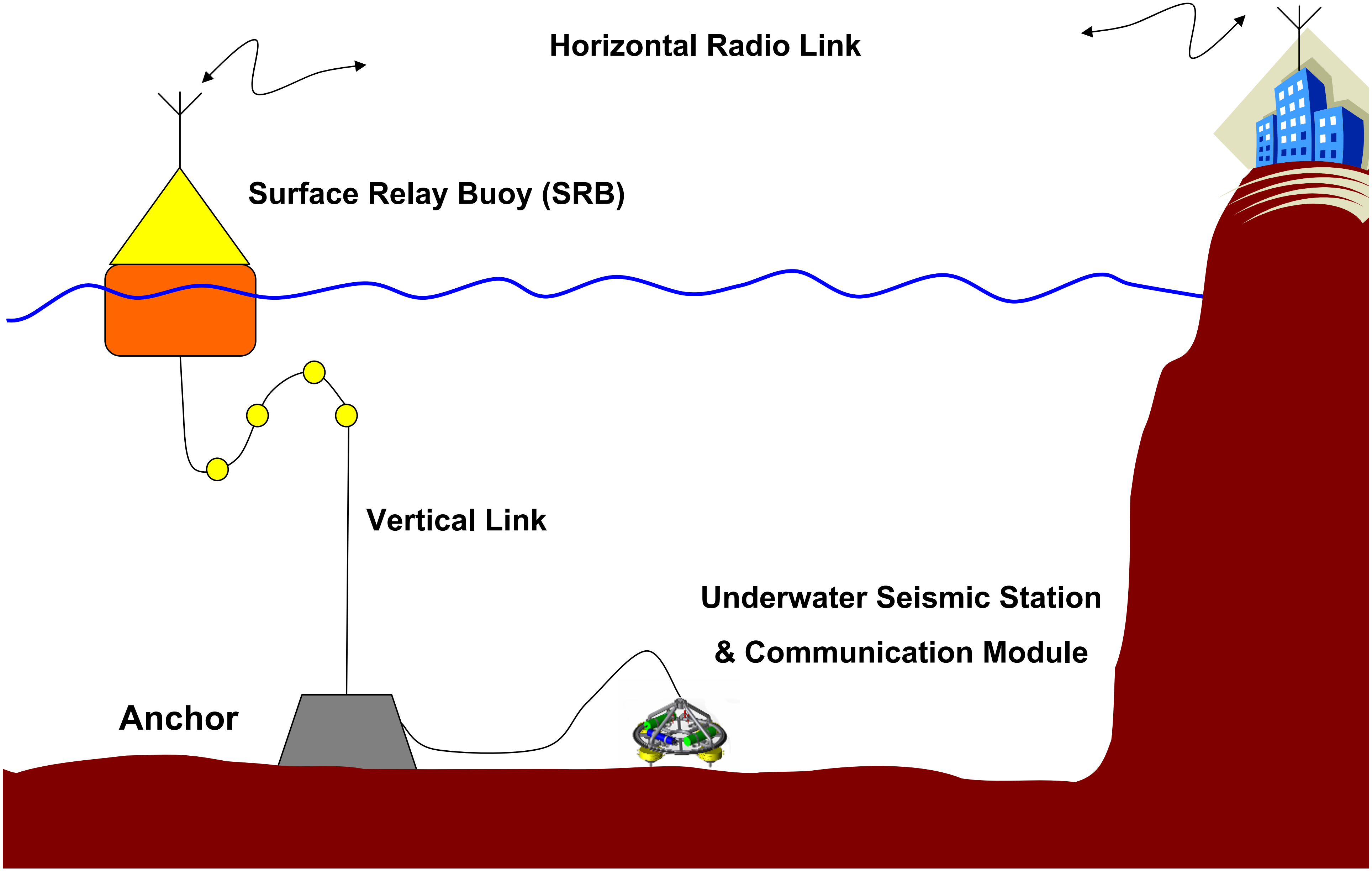


Customised ROV (C-ROV)




7 INGV-OBS (Ocean Bottom Seismometer)
Operativity: 6000 m
Autonomy: up to 18 months
Data acquisition and recovery systems
VBB seismic sensor
DPG (Differential Pressure Gauge)

Underwater Real-Time Seismic Station




Finanziata nell’ambito
del progetto SICIS
Isola Stromboli
Isola di Ustica
Isola Panarea
Isola Filicudi
Isola Salina
Isola Alicudi
Isola Lipari
38.45 N 13.70 E
Isola Vulcano
Golfo
Golfo di Patti
Golfo di Castella Mar
Golfo di Palermo
Réggio di Calábria
Isola di Levanzo
Golfo di Termini
Gibilmanna Observatory
Isola Favignana
Isola Grande
Catánia
Sicilia (Sicily)
Golfo di Catania


Grazie per l’attenzione