



Organisation of TESTS on observatory methodologies on cabled ESONET observatory sites			
Partner:	INGV		
Contact for these activities	Name:	Paolo FAVALI	
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TEST SITES			
Do you propose a cable site for tests?		Yes <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
Water depth?	2100 m	Distance from the shore ?	25 km
Please join a description of the infrastructure : junction, connectors, interfaces , existing sensors and instruments; servicing operations (availability of ROV, cost by day...)			
TESTED EQUIPMENTS			
Do you propose any equipment to test		Yes <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
Do you know of any European company who could be interested to provide equipment for tests		Yes <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
Do you know of any not ESONET Institution who could be interested to provide equipment for tests		Yes <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
	Model	Deployment time	Provider
CTD	SeaBird SBE-37	2009	INGV
Oxygen			
Turbidity	WetLab		
Fluorescence			
Chemical analyser			
3-C single-point current meter	Nobska MAVS-3	2009	INGV
ADCP	RDI Workhorse 600kHz	2009	INGV
PH probes			
Penetrometer			
Geophone			
Hydrophones	OAS E-2PD SMID prototype	2009	INGV
Accelerometer	IMU Gladiator	2009	INGV
Still camera			
Video camera			
Lights			
Temperature probes			
Samplers			
3-C Broad -band seismometer	Guralp CMG 1T	2009	INGV
Scalar magnetometer	GEM Overhauser Sentinel	2009	INGV
Vectorial magnetometer	INGV prototype	2009	INGV
Gravity meter	IFSI-INAF prototype	2009	INGV
Absolute pressure sensor	Paroscientific 8CB4000-I	2009	INGV
Differential pressure gauge	University San Diego	2009	INGV
Underwater mateable connectors	ODI electro optical ROV mateable connectors	2005, 2006, 2007, 2008, 2009	INGV INFN

Acoustic modem			
Power and real time data transmission systems	Custom		INFN INGV
Qualification Tests			
Can you offer testing facilities at your institution?			Yes <input checked="" type="checkbox"/> NO <input type="checkbox"/>
	Range	procedure reference	Comments
Temperature			
vibration			
.....			
SENSOR CALIBRATION			
Can you offer calibration facilities at your institution?			Yes <input type="checkbox"/> NO <input type="checkbox"/>
	Range	procedure reference	Comments
Temperature			
Conductivity			
Pressure			
Oxygen			
Currentmeter			
OTHER COMPONENTS			
Are you planning to provide other devices/components for in-situ testing			Yes <input type="checkbox"/> NO <input type="checkbox"/>
	Reference		
Bio fouling protection system			
Deep sea acoustic transmitter for calibration			
TEST PROGRAM			
TEST 1 Description (5 lines)	Tests on deployment/recovery of underwater systems and accurate positioning on the seabed of modules cabled to the NEMO-SN1 observatory by means of a new underwater vehicle (deep-sea shuttle) and ROV in an area where seafloor monitoring modules and devices are presently operating.		
TEST 2 Description (5 lines)	Tests of connections/disconnections of modules/platforms by ROVs to JB and tests of functioning and data transfer to shore.		
TEST 3 Description (5 lines)			

Comments: The tests will be performed in cooperation with INFN

Description of the infrastructure

The Eastern Sicily infrastructure consists of a shore laboratory, a 28 km long electro-optical (hereafter e.o.) cable connecting the shore lab to the deep-sea lab. The shore laboratory hosts the land termination of the cable, the on-shore data acquisition system and power supply for underwater instrumentation. The shore laboratory has also a radio link (maximum speed 56 Mbps) to LNS-INFN that allows link (100 Mbps/1Gbps) to the internet. The underwater cable is an umbilical underwater e.o. cable, armoured with an external steel wired layer, containing 10 optical single-mode fibres (standard ITU-T G-652) and 6 electrical conductors (4 mm² area). At about 20 km E from the shore, the cable is divided into two branches, roughly 5 km long each, that reach two different sites namely Test Site North (TSN, latitude $37^{\circ}\pm 30'810''$ N, longitude $015^{\circ}\pm 06'819''$ E depth 2100 m) and Test Site South (TSS, latitude $37^{\circ}\pm 30'008''$ N, longitude $015^{\circ}\pm 23'034''$ E, depth 2050 m). The TSN cable branch has 2 conductors and 4 fibres directly connected to shore. The TSS branch has 4 conductors and 6 fibres.

In January 2005 INFN and INGV performed a sea operation onboard the *Pertinacia-Elettra C/L* vessel to recover the underwater cable terminations TSN and TSS and to install, on them, two underwater frames. Each frame, made of grade 2 titanium, is equipped with a pair of e.o. connectors. The two frames were deployed on the seabed. The e.o. connectors are made to be handled by ROV to allow plugging and unplugging of underwater experimental apparatuses, avoiding further recovery operations of the main cable. During the same naval campaign two experimental apparatuses were deployed, plugged and put in operation. The seismic and environmental monitoring station Submarine Network 1 (SN1), designed and operated by the INGV (Istituto Nazionale di Geofisica e Vulcanologia) was connected to the TSN termination and the ONDE (Ocean Noise Detection Experiment) station was deployed and connected to the TSS termination.

The NEMO Phase-1 project [was realised in order to validate the technological solutions proposed by INFN for the construction of the so called *km³ high energy neutrino detector*. NEMO Phase-1 consisted in the deployment and operation of prototypes of the critical elements of the km³ detector: a junction box (JB) and a tower hosting optical sensors and data acquisition/transmission electronics. The JB provides connection between the main electro-optical cable and the detector structures. It has been designed to host and protect from the effects of corrosion and pressure, the opto-electronic boards dedicated to the distribution and the control of the power supply and digitized signals. The JB is working and is fully usable for deep-sea experiments. The JB offers optical several fibre links and power connection (380 VAC 3 phase, 3 kW in total) to several end users. Connections to end users are realised through four e.o. ROV mateable connectors.

The Eastern Sicily infrastructure includes underwater handling capability to manage experiments, such a capability consists of a deep-sea light-class ROV with 2 manipulators (SeaEye Cougar, 4000-m operative depth) and a deep-sea shuttle able to deploy and recover on the seafloor heavy systems (40 kN, the systems have to be equipped with a compatible mechanical interface).