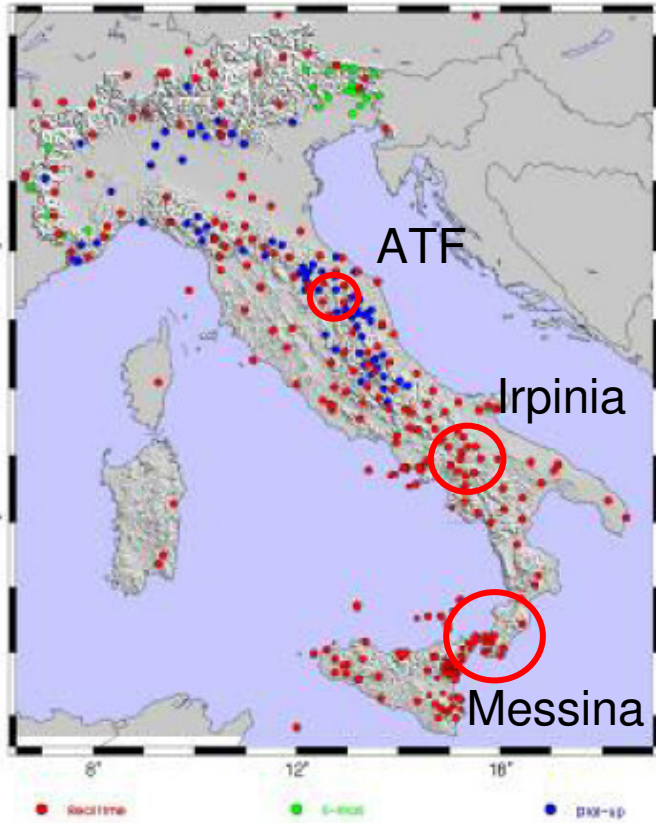


Recent Earthquakes in Italy & INGV Seismic/Geodetic Networks

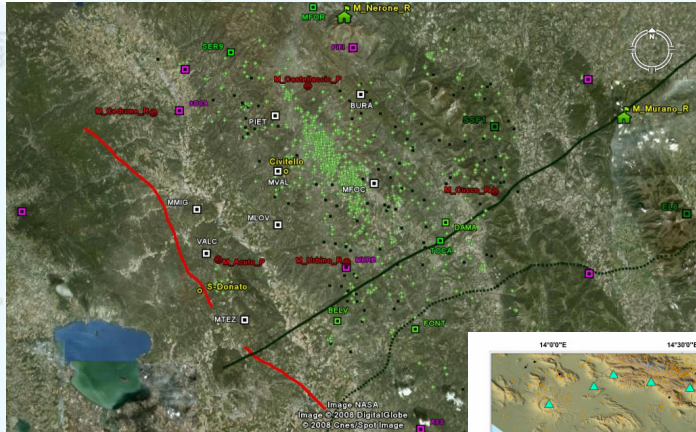


S₅ High-resolution multi-disciplinary monitoring of active fault test-site areas in Italy

List of participants (Research Units)

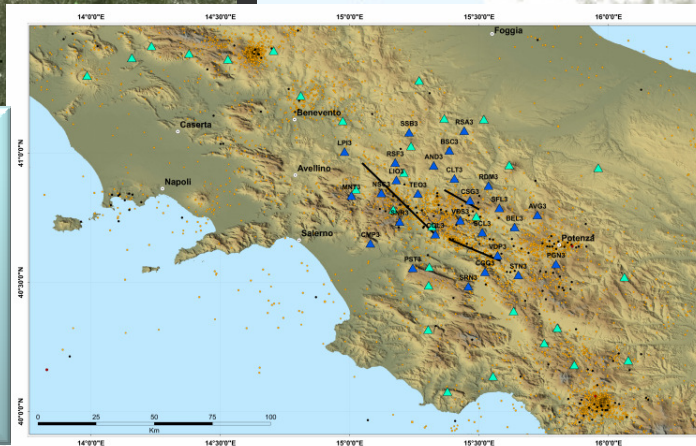
1. **RU1** – Istituto Nazionale Geofisica e Vulcanologia
Responsible: Lauro Chiaraluce (INGV-CNT)
2. **RU2** – University of Perugia
Responsible: Massimiliano Rinaldo Barchi (Department of Earth Science, Univ. Perugia)
3. **RU3** - Istituto Nazionale Geofisica e Vulcanologia
Responsible: Lucia Margheriti (INGV-CNT); Giuseppe D'Anna (INGV-CNT)
4. **RU4** – University of Messina
Responsible: Giancarlo Neri (Department of Department of Earth Science, Univ. Messina)
5. **RU5** - Istituto Nazionale Geofisica e Vulcanologia
Responsible: Antonio Avallone (INGV – CNT)
6. **RU6** – University of Naples “Federico II”
Responsible: Aldo Zollo (Department of Physical Sciences, Univ. Naples “Federico II”)

The three selected test sites

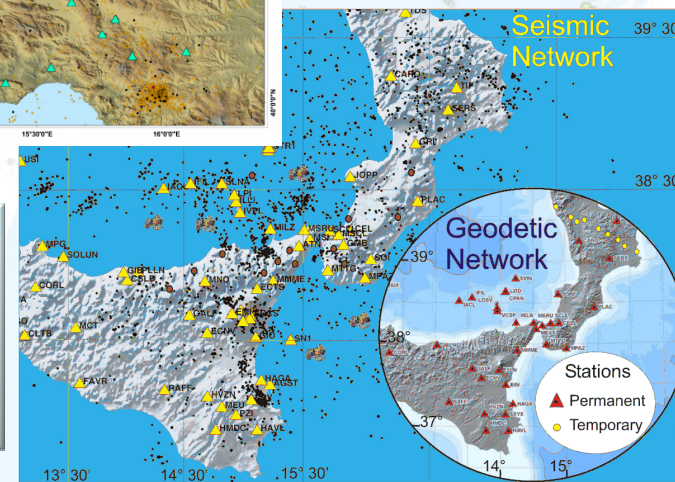


The Alto Tiberina Fault (ATF) test site, located inside the Northern Apennines mountain. Low-angle normal fault, intense microseismicity, moderate earthquakes

The Irpinia fault system test site, located along the Southern Apenninic belt. High angle normal fault, complex fault system, intense microseismicity, moderate to large earthquakes



The Messina Strait test site, which include the southernmost portion of Italy and N-E of Sicily: Calabro-Peloritani arc. Normal fault, controversial dip angle, role of subduction, microseismicity, large earthquakes



General Objectives

- Supporting the ongoing research on selected Italian test sites where advanced monitoring geophysical networks are available or under construction.
- Improving the understanding of earthquake generation processes in Italy and to define the seismic rates in the three selected test sites
- Developing and applying innovative methodologies to data-banks gathered by multi-disciplinary geophysical networks.

Reference Co-financing Projects

ATF : Project “Airplane” Multi-disciplinary research platform on earthquakes and volcanoes

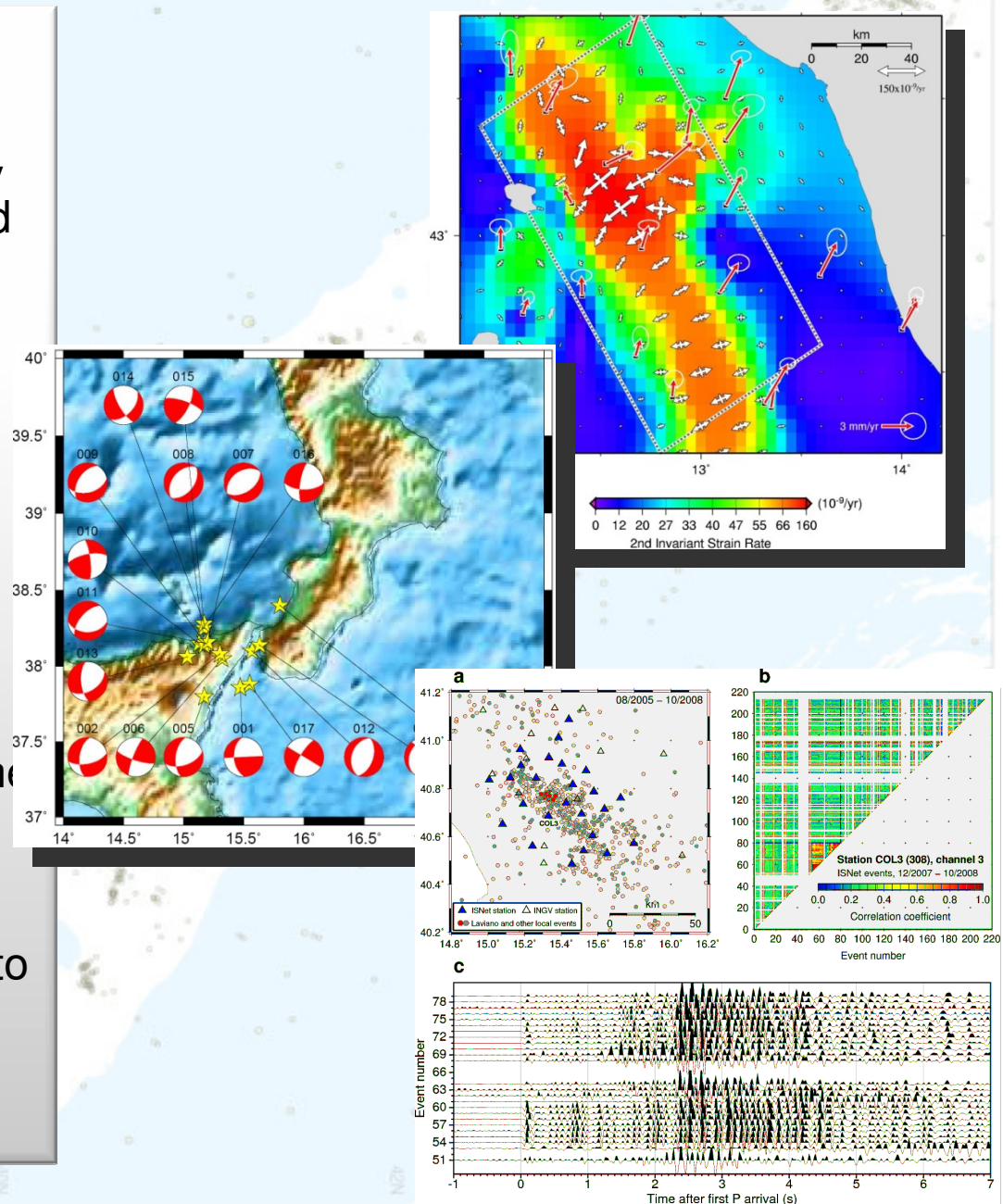
Messina Strait: Project INGV Messina earthquake 1908-2008

Irpinia fault system : Project “Early Warning” – Regional Center of Competences, on Environmental Risks, AMRA

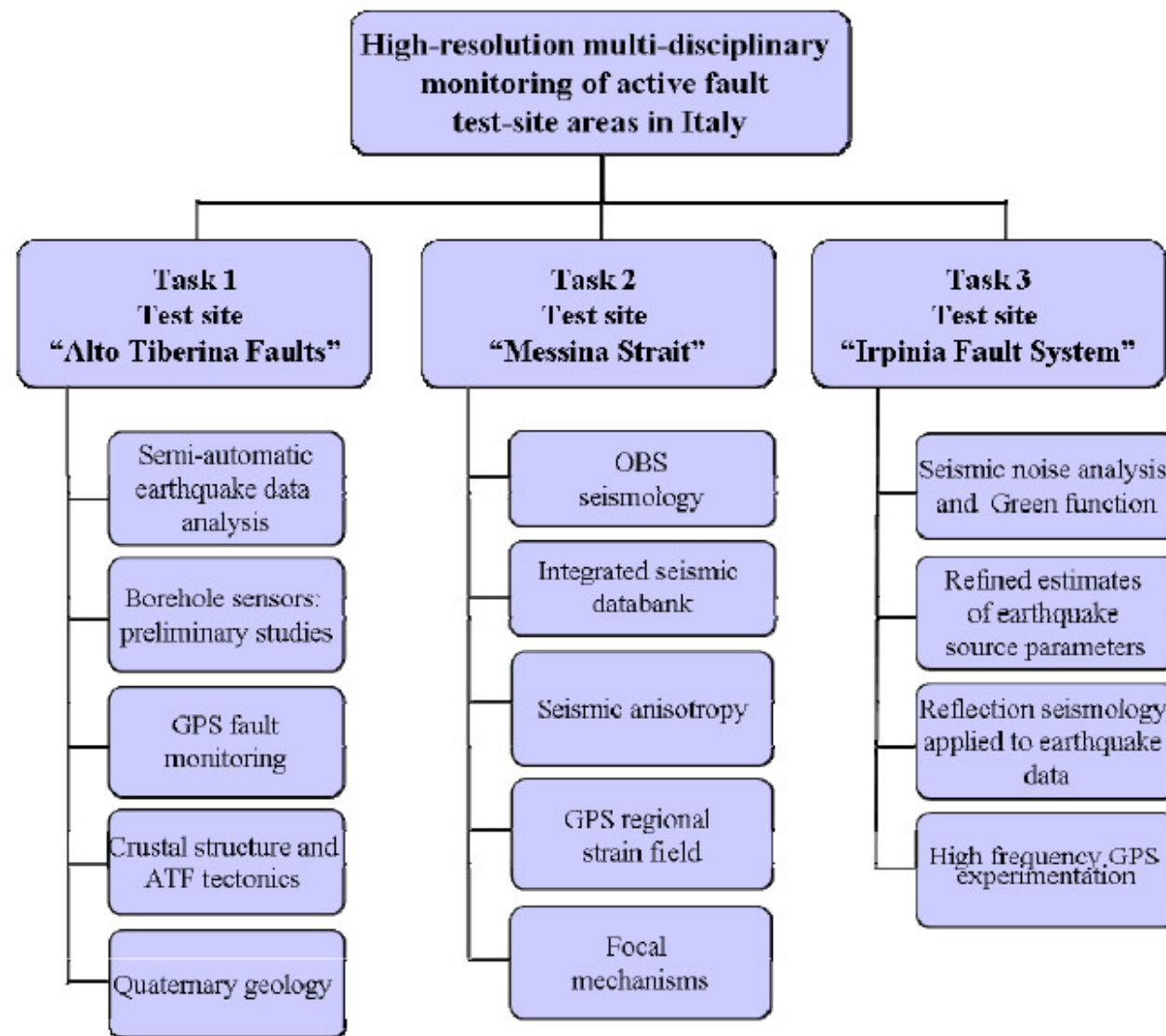
Rome, 19 November 2008

High-resolution multi-disciplinary monitoring of active fault test-site areas in Italy

- To promote an innovative and multidisciplinary research activity on the fault systems monitored by three advanced seismological and geodetic networks .
- To implement analysis and modeling methodologies to be applied to geodetic and seismological data acquired (in real-time and off-line)
- To improve the knowledge of the active faults seismogenetic potential thanks to the high resolution networks available in the test sites (with S1)
- To develop and apply new techniques (potentially real time) to gain information on the space-temporal evolution of the earthquake fractures (with S3)



Project Work Breakdown Structure



Project Management Structure

Coordinators:

Lucia Margheriti, INGV-CNT

Aldo Zollo, Dip. Scienze Fisiche - Università di Napoli "Federico II"

Task responsables:

Task 1 – Lauro Chiaraluce, CNT-INGV

Task 2 – Lucia Margheriti, CNT-INGV

Task 3 – Aldo Zollo, DSF-UNINA

- Close interaction between Task coordinators (i.e. test site responsables) and WP responsables
- Promote frequent task (test-site) meetings for coordinating the planned research activities and surveying of deliverable achievement
- Reporting activity

Principal investigators and
Research topics

Task	WorkPackage PI	Research topic
Task 1. Test site "Alto-Tiberina Fault" Chiaraluce, L., CNT-INGV chiaraluce@ingv.it A high density network including borehole observations for the understanding of physical processes which govern the earthquake generation on low-angle dipping normal faults.	WP1.1 Di Stefano, CNT-INGV raffaele.distefano@ingv.it	Automated seismic data analysis
	WP1.2 Improta, RM1-INGV improta@ingv.it	Imaging the shallower portion of the Tiber basin to optimize the installation of borehole seismic sensors
	WP1.3 D'Agostino, RM1-INGV dagostin@ingv.it	Velocity and strain rate fields across the fault from integration of regional GPS networks.
	WP1.4 Mirabella Università' di Perugia mirabell@unipg.it	Upper crustal structure and tectonic evolution of ATF
	WP1.5 Barchi Università' di Perugia mbarchi@unipg.it	Quaternary tectonics of the ATF region
Task 2. Test site "Messina Strait" Margheriti L., CNT-INGV margheriti@ingv.it An on-land, off-shore integrated seismic network for monitoring the region struck by the M 7, 1908 Messina earthquake and understanding the relationship between present stress regime and earthquake activity.	WP2.1 D'Anna e Mangano CNT-INGV danna@ingv.it ; mangano@ingv.it	Sea Bottom Seismograph installation and data transmission testing through acoustic link
	WP2.2 Moretti, CNT-INGV moretti@ingv.it	Integrated on-land and off-shore seismic data bank and refined earthquake location
	WP2.3 Piccinini RM1-INGV piccinini@ingv.it	Seismic anisotropy analysis aimed at defining the present crustal deformation regime
	WP2.4 Mattia, CT-INGV mattia@ct.ingv.it	Strain field of Calabria and Peloritano regions from GPS data acquisition and modeling
	WP2.5 Neri, Univ. Messina geoforum@unime.it	Fault mechanisms and stress regime orientations in the Messina strait.
Task 3. Test site "Irpinia Fault System" Zollo A., UniNa aldo.zollo@unina.it An advanced, real-time, seismic monitoring infrastructure for the detailed imaging and characterization of a complex normal fault system in southern Apennines.	WP3.1: Festa, UniNA festa@na.infn.it	Seismic noise analysis and Green Functions
	WP3.2: Satriano, UniNa-AMRA scarl satriano@na.infn.it	Refined estimates of micro-earthquake source parameters
	WP3.3 Maercklin, UniNA maercklin@na.infn.it	Reflection/transmission tomography from micro-earthquake data
	WP3.4: Avallone CNT-INGV avallone@ingv.it	High rate GPS for the monitoring of active seismic fault systems in southern Apennines

On a temporary position

Policies about diffusion of results

- Inform coordinators about workshop participation, articles submission etc... (send title, authorship, abstract,...) → web site, reports
- Every publication will have to feature a statement regarding the Financial Institution of research activity (in agreement with co-financing bodies)
- A project web site and a sharing data server will be realized and maintained for the entire duration of the project (CNT-INGV)



Strong points

- The team is mostly composed of young researchers, strongly motivated and highly qualified, with multi-disciplinary competences
- The selected test-sites are equipped with the most advanced technological infrastructures for seismic and geodetic monitoring of active faults → extremely high quality data
- Unique opportunity to develop and apply innovative techniques for data analysis and modeling.

Risks

- Difficulty in know-how transfer between researchers working on different test sites → data/methods exchanges, specific inter-S5 workshops
- Multi-disciplinarity is fine, but generally hard to put into practice → frequent inter-task meetings, stimulate interactions
- Difficulty to well calibrate the instrumental development & data acquisition with innovative research → focus on few targeted research objectives, stimulate the cooperative multi-disciplinary interaction

A map of Italy showing seismic activity with numerous small grey dots. Three large red circles highlight specific areas: one in the north (Alto-Tiberina Fault), one in the center (Irpinia Fault System), and one in the south (Messina Strait). A scale bar on the left indicates 0, 90, and 180 km. A north arrow is at the top center. The map includes latitude and longitude coordinates.

Next presentations

TASK2. The Messina Strait

TASK3. The Irpinia Fault System

TASK1. The Alto-Tiberina Fault

Interaction with other S-projects

progetto	WP/RU	Phase ACT #Semester	I		II		risultato da condividere
			1	2	1	2	
S5		1.3				x	S1
S5		1.4				x	S1
S5		1.5				x	S1
S5		2.2				x	S1; S4
S5		2.4		x			S1
S5		2.4			x		S1
S5		2.5				x	S1
S5		3.1	x	x	x		
S5		3.1		x	x	x	
S5		3.2	x	x	x		
S5		3.2		x	x		S1
S5		3.2			x	x	S1, S4
S5		3.3	x	x			
S5		3.3			x	x	
S5		3.4	x	x			S1
S5		3.4			x	x	

High-resolution multi-disciplinary monitoring of active fault test-site areas in Italy

PHASE SEMESTER		1
Task/RU	WP	
1/1	1.1	Writing and setup of Module 1, to handle the seismic data stream, triggering and phase association.
1/1	1.2	Revision of earthquake catalogues and of commercial profiles. Field survey to select optimal survey sites.
1/1	1.3	Data collection and archiving
1/2	1.4	Bibliographic study. Collection and analysis of the available data and literature, organized in a GIS environment.
1/2	1.5	Geological and geomorphological surveys

PHASE SEMESTER		1
Task/RU	WP	
2/3	2.1	First OBS deployment
2/3	2.2	Development of procedures to have all data in the same format
2/3	2.3	Comparison of different available codes
2/3	2.4	Geodetic survey
2/4	2.5	Preparation of the datasets needed for analyses of earthquakes occurring during 1988-2007
2/4	2.5	Hypocentral locations and start of focal mechanism computations with the different techniques

PHASE SEMESTER		1
Task/RU	WP	
3/6	3.1	Real Time noise data management and processing
3/6	3.1	
3/6	3.2	Real-Time and off-line earthquake data management and processing
3/6	3.2	
3/6	3.2	
3/6	3.3	Earthquake data gathering and standard seismic reflection processing
3/5	3.4	High rate GPS acquisition High-rate GPS processing

Rome, 19 November 2008

Deliverables – Test site ATF

D1	Standard modular automatic procedures for the management and analysis of a continuous seismic data stream	1	1.1
D2	HR and VHR stack sections and Vp images of the basin (500-1000 m deep) and of the shallow fault zones (100-deep) belonging to western splays of the ATF.	1	1.2
D3	Definition of an optimal site for a 200 m deep drilling in the basin to install borehole seismometers	1	1.2
D4	Time series of GPS stations at ATF test site in the ITRF2005 reference frame. GPS velocity field in the ITRF2005 and Eurasian reference frames.	1	1.3
D5	Map of strain rate and geodetic moment rate at ATF test site	1	1.3
D6	Balanced geological sections, derived from depth converted seismic profiles at ATF test site	1	1.4
D7	Isobath maps of the top basement reflector; isobath map of the ATF	1	1.4
D8	Geological and geomorphological map of the from to Città di Castello	1	1.5

Deliverables – Test site Messina Strait

D9	Test of marine seismic deployment and integration of OBS data with on land data.	2	2.1
D10	Test of the acoustic link to get quasi-real time data from OBS stations	2	2.1
D11	Integrated data bank of continuous recordings for the period October 2007-October 2009 at the strait test-site	2	2.2
D12	Refined earthquakes locations in the Tyrrhenian and Ionian regions around to define seismogenic structures	2	2.2
D13	An automatic code for the evaluation of shear wave splitting parameters; orientation and strength of the fracture field in the strait area and its relation with the active stress field study of possible temporal variation in the anisotropy parameters	2	2.3
D14	Processing of all available GPS data for the strait area, map of the horizontal strain-rate field and computation of the inter-seismic strain loading and deep geometry of the 1908 fault	2	2.4
D15	Modelling of the source responsible for the earthquake, by using a numeric approach (i.e. finite element)	2	2.4
D16	Database of focal mechanisms of earthquakes in the Messina Straits over the time period between 1988 and the end of the S5 Project	2	2.5
D17	Map of the stress tensor orientations and simulation of potential damaging earthquakes in the Messina Straits area	2	2.5

Deliverables – Test site Irpinia fault system

D18	Green's function database from ambient seismic noise for the ISNet network (Irpinia test-site)	3	3.1
D19	Resolution analysis for the cross-correlation technique at high frequency	3	3.1
D20	Refined re-picking arrival time catalogue and earthquake locations (Irpinia test-site)	3	3.2
D21	Parametric catalogue of micro-earthquakes including source parameters (Irpinia test-site)	3	3.2
D22	Digital 3 D velocity model including interface and event re-location (Irpinia test-site)	3	3.2-3.3
D23	Catalogue of reflected/converted phase arrival times from micro-earthquake data	3	3.3
D24	Acquisition, storage, analysis and modelling of high-rate GPS data in the Irpinia test site	3	3.4

A map of Italy showing seismic activity with numerous small colored dots (green, yellow, orange, red) representing earthquakes. Three large red circles are overlaid on the map, indicating specific regions of interest. A scale bar in the top left shows 0, 90, and 180 km. The map includes latitude and longitude markings.

Project Meetings

Meeting Scheduling

- About every 4 months Task Leader meeting
- About every 8 months: Coordinators will meet all Research Units Responsibles involved in the Project

(powerpoint presentation will be prepared and circulate periodically)

- Task Leaders will arrange internal meeting with WP responsables when they consider necessary to do