MINUTES of the SESAME Kick-Off Meeting

Grenoble (France), June 26-27 2001

In addition to a first "get-together" of all partners, the basic objectives were:

- to recall the general administrative and scientific frameworks of this project,
- to recall the main objectives of each task and work packages,
- to agree on immediate actions (next months to first year),
- to establish a tentative schedule for the whole duration of the project (especially for meetings dates and locations).

The present minutes can not keep track of the richness of all the discussions that occurred during the meeting; their aim is basically to indicate all the decisions that were taken and are to be implemented by the corresponding task leaders, work package leaders and partners.

I Partners attending the meeting

All partners, except partner number 3 from Belgium, were present to the meeting.
Table 1 give the name, address, phone and fax numbers of all the persons involved (at this date) in the project.

II Schedule of the meeting

See the attached file "kick-off schedule".

III Scientific matters

III.1 Task A – H/V Technique (Tuesday, June 26 PM)

The whole afternoon was dedicated to Task A - H/V technique. It started with an overview presentation by K. Atakan, which was followed by more detailed presentations of each work package by A.-M. Duval (WP02: Experimental aspects, measurements and stability), K. Atakan (WP03: Data processing) and N. Theodulidis (WP04: Experimental evaluation).

K. Atakan insisted upon the immediate actions to be taken:

- to send available data sets with description (WP04)
- to send available routines, algorithms, software (WP03)
- to make an inventory of sample equipment for testing (WP02)
- to agree the processing workshop: location and time (WP03)
- to agree the in-house testing : location and time (WP02)
- to agree on the free-field testing sites and times (WP04)
- to agree on the specific meetings schedule for Task A (group leaders)
- to establish sub-groups for individual tests within each WP
- to plan individual working / discussion meetings within each WP

III.1.1 WP02 (Experimental conditions : A-M Duval)

This work package is dedicated to investigations on the required experimental conditions for warranting the stability and reproduction of measurements.

The work thus basically consists on two distinct topics:

- instrument calibration and testing, both in an absolute and relative sense (i.e., to obtain the sensor – data acquisition system response and detection level, and to perform comparisons between all instruments that will be used in the project.
- assessing the actual effects of experimental conditions (soil/sensor coupling, wind, cable length, traffic, etc…)

The following decisions were taken:

- *A instrumental in-house testing of instruments will take place in Bergen from October22 to October 26. This experiment will be placed under the responsibility of the UiB team, who has a great experience in instrumental testing. In order to best organise this testing, AM Duval and K. Atakan will ask for a list of acquisition systems and sensors used in the consortium, so as to achieve an as comprehensive as possible test (an initial list has circulated during the meeting - **Table 2**).*
  The analysis of the tests will be performed in a uniform way by the Bergen team. This test will lead to the first deliverable at the end of the first year.
- *Concerning experimental conditions, a list of wished tests will be established under the supervision of* AM Duval. *Each category of test should be performed by at least two teams. It is not necessary to wait neither for the results of the in-house instrumental testing to start the work, nor for a common software to process the data: every partner having a presumably good instrumentation (24 bits acquisition, sensitive velocimetric sensor) can start performing these tests, and process the data with its own usual software as a first step.*
  However, in a second step, the same data will be reprocessed taking into account the calibration results and the common software. All information regarding these tests is to be sent to AM Duval.

III.1.2 WP03 (Data processing, K. Atakan)

This WP is devoted to investigations on the various data processing alternatives and is intended to produce a standard processing software based on the most robust alternative.

It will consist of the following steps:

- collecting existing algorithms for each processing step
- identifying the best (robustness – simplicity – resolution) solution based on comparisons with representative data sets
- designing and implementing this solution by a dedicated sub-group taking into account several criteria in relation with its expected wide distribution (flexibility, transportability, modularity, ...)
- distributing for evaluation and review within the consortium
- propose a final version for dissemination and user guidelines (WP12)

The following decisions were taken for the immediate future:

- *Every partner involved in this WP should send very rapidly (early September at the latest) to the WP leader some short information on the main characteristics of the software he is using. For safety, the WP leader should send an email call for collecting this information (an initial list has circulated during the meeting – **Table 3**)*
- *The core-group of partners for the analysis of existing software and design of the common one, will consist of the Bergen, Grenoble, Milano, Potsdam, Roma and Zürich teams. The Lisbon, Nice and Thessaloniki teams will actively participate in the evaluation and internal review step.*
- *A software meeting will be convened in Potsdam on December 3-5 or January 9-11, 2002 (in connection also with WP06)*
- *There exists a possibility of having the future software endorsed by the IASPEI "Commission of Practice". In that aim, it should be put on the agenda on its next meeting at the IASPEI General Assembly in Vietnam (August 2001). P-Y Bard will thus send a one-page summary to J. Havskov and K.*

Atakan, and to K.Kudo as well as the leader of the joint IASPEI/IAEE working group on the Effects of Surface Geology, and to W. Stephenson (New-Zealand geological Survey) who proposed a worldwide action on the H/V technique.

➠ ➠ ➠ **Important remark**

An error has been noticed in the technical annex, which has to be indicated by the co-ordinator to the scientific officer in Brussels, and corrected: ***there has been a swap between deliverables D04.03 and D09.04****. The deliverable of WP03 is indeed the "multi-platform H/V processing software" which should be denoted as D09.03.*

III.1.3 WP04 (Empirical evaluation, N. Theodulidis)

This WP is intended to perform an objective, purely experimental assessment of the reliability of the H/V technique, by comparing its results with those of other, well established experimental techniques. It will also compare H/V results with observed damage on recent earthquakes.

It will consist of the following steps:

- collecting existing data sets with both earthquake recordings on site/rock reference pairs, and microtremor measurements
- performing experimental measurements of ambient vibrations at a few selected sites
- processing all these data sets with the same softwares
- achieving a systematic and homogeneous comparison of H/V results with site-to-reference weak and strong motion data,
- comparing also the H/V results with damage observations for a few well documented cases
- comparing experimentally and theoretically estimated transfer functions with H/V ratios on very well constrained sites

The discussion revealed that there exist a lot of data sets (Italy, Greece, France, Switzerland), but a mandatory criterion for accepting one in the homogeneous collection, is the availability of the original time histories (to allow a re-processing with a common procedure).

The following decisions were taken for the immediate future:

- *Every partner involved in this WP should send very rapidly to the WP leader information regarding the existing data sets with either micro-tremor and earthquake recordings, or micro-tremor measurements and damage observations. The WP leader will send an email call for collecting this information with a common format .(****see the email send by Nikos Theodulidis on July, 5 to each partner****).*
- *Only a limited number of "test-sites" where specific micro-tremor measurements will be performed with this project will be selected. The preliminary list is Volvi (Greece), Colfiorito (Italy), Grenoble (France), Basel (Switzerland), and one site in Belgium (Uccle and/or Liège).*

➠ ➠ ➠ **Important remark**

As indicated above, the first deliverable of WP04 is indeed an "homogeneous data set of noise and earthquake recordings at many sites" which should be denoted as D03.04.

III.2 Task B – Array measurement techniques (Wednesday, June 27 AM1)

F. Scherbaum presented first an overview of Task B (Array measurement techniques). He then detailed WP05 (Instrumental layout for array measurements) and WP06 (Derivation of dispersion curves). Only very brief information on WP07 (Inversion of velocity profile) was given, because of the absence of the WP leader (D. Jongmans). Three short presentations were then done by F. Scherbaum, D. Faëh and P-Y Bard, about the ongoing works related with this Task, respectively, in Germany, Switzerland and Grenoble,

III.2.1 WP05 (Instrumental layout, F. Scherbaum)

This WP is intended to assess the dependence of the array performance on the experimental conditions: array geometry, aperture, number of sensors, sensor types, timing accuracy.

It will address three main topics:

- testing the array performance with synthetic data: the goal here is to derive a kind of "quality function" for phase velocity determination
- testing the calibration accuracy using reference sensors (recent experience pointed out a very large sensitivity to phase uncertainties in the sensor response).
- performing field measurements at a few selected test-sites with an already existing, quantitative and reliable information on site conditions and structure. Investigations will focus on three specific items: (1) deployment strategies, (2) penetration depth and (3) test performance of overall processing (altogether with WP06 and WP07).

III.2.2 WP06 (Derivation of dispersion curves, F. Scherbaum)

This WP aims at developing a semi-automatic processing system for array analysis of ambient vibrations, based on frequency-wave number and spatial auto-correlation methods. Besides providing all the necessary facilities to obtain dispersion curves, the system should allow for rapid in-situ quality control of the array performance.

The main issues are:

- what is the optimum balance between resolution and robustness, and which is the processing technique that leads to that optimum (many versions of f-k analysis, SPAC) ?
- what is the array geometry required by each processing technique ?
- how to unambiguously identify the actual surface wave mode ?
- designing an automated signal processing (for rapid in-situ quality control)
- what kind of pre-processing is necessary ?

The work plan is:

- comparing different array processing methods; performance tests using synthetic data .
- modifying the already existing "MERAPI" software (Potsdam) based on f-k analysis developed for a volcano monitoring system, in order to include other processing techniques (SPAC), data pre-processing, and instrument equalization to correct for phase delay distortion.
- designing an automated signal processing (for rapid in-situ quality control of the array performance)

The needed input is:

- available array processing codes
- data from earlier array experiments
- choice of test-sites

III.2.3 WP07 (Inversion of velocity profile)

In the absence of D. Jongmans, it was simply recalled that the objective of this WP is the development of a flexible software allowing to retrieve the Vp and Vs velocity profiles from the dispersion curves in an easy and reliable way. A particular attention will be paid to the introduction of a priori information which can greatly help to constrain the model during the inversion process.

➠ ➠ ➠ ***Post meeting important information:*** *the difficulties faced by D. Jongmans after his move to Grenoble are solved, a PhD student from Liège will actually work full time on this topic*.

III.2.4 Lessons from ongoing work

F. Scherbaum presented the ongoing projects in the Köln area (lower Rhine embankment). The Aggrippina project involves the Univ. of Potsdam group and a collaboration with ETH Zürich (D. Faëh), and concerns directly both the array measurements and H/V technique. Very interesting results were presented as to the correspondence between ellipticity and dispersion curves for Rayleigh waves, resulting in a combined inversion of dispersion curves derived from array measurements and H/V curve derived from single station measurements. Some problems remain to be solved however, especially as to the identification / separation of several surface wave modes. In addition, new instrumental layouts are being tested (roll-along profiles), and coupled with other array processing techniques (slant-stack), which look very promising.

Despite the fact that another much bigger project is run by GFZ in the same area, it will not be possible to propose the Köln area as a test site within the next 3-year period.

Two other local projects of the Potsdam group focus were shortly mentioned: the first concerns the study of the crustal structure from ocean generated micro-seims, and the second one investigates the theoretical relationships between the S-wave fundamental frequency, and the frequency where Rayleigh waves exhibit the larger horizontal ellipticity.

D. Faëh presented his recent work on an advanced analysis of the H/V curve. One one hand, he proposes a technique to isolate Rayleigh wavelets in the ambient vibration recordings, so as to concentrate the derivation of H/V ratios on these wavelets. On the other hand, he showed that for horizontally layered structures with high-enough impedance contrast, there exist a stable part in the H/V curve, corresponding to the frequency band between the first peak (minimum in V), and the following trough (minimum in H). The immediate consequence is the possibility to invert the velocity profile from single station H/V measurements.
The example applications in northern Switzerland are really impressive.

Other work is presently underway in Zürich concerning about array techniques, and meaning of H/V frequency in 2D valleys.

P.-Y. Bard presented the ongoing work on the SPAC technique, with applications to the Grenoble area. For this particular, very low frequency site (fundamental frequency around 0.25-0.3 Hz), SPAC technique seems to provide more reliable results (lower and more realistic phase velocities) than standard f-k analysis at low frequencies. The results it provides are consistent with the known structure of the site, based on a deep borehole drilling, seismic reflection and refraction experiments, and dense gravimetric survey. More work remains to be done, however, to use the information on the horizontal component, and for a robust inversion of the velocity profile (WP07).

III.2.5 Summary of decisions for Task B

The following decisions were taken for the immediate future:

- *The software meeting already planned in Potsdam (December 3-5 or January 9-11) from H/V processing will also address the array processing techniques. In order to prepare that meeting, all involved partners should send to the task leader (F. Scherbaum) information on their array processing codes (method, language, etc.).* ***(see the email "Array codes" sent by Frank Scherbaum on July 10)***
- *The specific additional array measurements will be organised on the various potential test-sites selected for the project (Basel, Colfiorito, Grenoble, Volvi, Uccle/Liège). For final decisions and preparation of experiments, F. Scherbaum requires from the respective teams (i.e., Zürich, Roma, Grneoble, Thessaloniki, Liège), as much logistical, geotechnical and geophysical information as possible.* ***(see the email "Array test sites" sent by Frank Scherbaum on July 10)***
- It was agreed upon that the advanced analysis of H/V curves (single or combined inversion of velocity profile) would be performed within the framework of Task B (and not Task A).

III.3 Task C – Physical background and noise simulation (Wednesday, June 27 AM2)

At first, P.Y Bard gave a rapid overview of Task C, which is on the upstream side of the project and is intended to provide background information to the three other tasks as to the real physical composition of noise wavefield, as well as a powerful numerical tool to generate realistic noise synthetics.

Then the three specific work packages were given more detailed presentations by P.-Y. Bard (WP08: Nature of noise wavefield), P. Moczo (WP09: Numerical simulation of seismic noise) and D. Faëh (WP10: Simulation for real sites)

III.3.1 WP08 [Nature of noise wavefield, P.-Y. Bard]

Its basic objective is to clarify – and as much as possible to improve - our knowledge about the physical nature of a noise wavefield, with special emphasis on urban areas.

The main issues to be addressed all concern the actual composition of noise wavefield:

- proportion between surface and body waves
- proportion between Rayleigh and Love waves

- porportion between fundamental and higher surface wave modes (*a very important issue*)

The workplan is:

- Update the literature survey
- selection of array data (already available, or obtained within WP05)
- specific data analysis in relation to the above mentioned issues
- analyse also the origin of those waves (azimuth, anthropic or natural origin, correlation with weather conditions)
- analysis of the site to site variability

The actions for the immediate future are:

- *Update the literature survey : F.Scherbaum offers the possibility of translation of Figure captions from a few selected Japanese papers, while N. Theodulidis outlines the importance of "Russian school" and the possibility of getting detailed information through P. Dimitriu.*
- *selection of available array data (same as WP05): only long records are useful for this WP*

III.3.2 WP09 [Numerical simulation of seismic noise, P. Moczo]

This WP focuses on the development and validation of numerical models producing realistic noise synthetics. It will mainly use Finite-Difference techniques (FD) with spatially and temporally random surface sources, and include parameter studies to investigate the ability of H/V and array techniques, applied on synthetics, to recover the information on the structure.

The main issues are:

- choosing an appropriate, powerful numerical technique allowing to consider realistic cases (3D geometry, large velocity contrasts, high Poisson ratio, large and non homogeneous damping)
- how to generate realistic noise in the chosen numerical schemes
- comparing the information retrieved from synthetics (H/V, array processing) and the input model for a representative set of geological structures.

The workplan is tightly related to these issues. The main numerical technique is nevertheless already chosen, it will be the Finite Difference code using a Displacement Velocity Stress formulation with combined Core Memory Optimization developed by the Bratislava team. For horizontally layered structures however, it may be complemented by other techniques such the discrete wavenumber, or modal summation approaches.

- definition of seismic noise sources and implementation in the code
- selection of representative, "canonical" models
- forward computations with parameter studies and derivation of "synthetic" H/V ratios and array recordings
- inverse analysis of synthetics and comparison with input model parameters

The actions for the immediate future are:

- *Organization of a WP meeting in Zürich on August 29-30 to discuss about noise generation and canonical models: all participants are asked to answer the forthcoming email request by P. Moczo.*
- *Implementing the choices made at that meeting in the Bratislava code.*

WP10 [Simulation for real sites, D. Faëh]

This WP is an extension of the previous one to real sites, where, in addition to the good knowledge of the structure, field measurements are already or will be available. It will thus allow a final cross-checking between actual noise observations, noise synthetics from numerical simulations, and the known geological structure and local site effects.
As it is scheduled to start on month 16, no immediate actions are to be taken.

III.3.3 Summary of decisions for Task C

- *A meeting will be organised in Zürich on August 29-30 to decide about a) the noise generation process in numerical codes, and b) on canonical models to be selected. Concerning the latter topic, Every partner is asked to answer P. Moczo's request on "most appropriate" canonical models before August 26.*
- *Every partner is asked to send his list of bibliographic reference on seismic noise (microtremors, microseisms, all kinds) to LGIT Grenoble in order a) to constitute an as comprehensive as possible*

bibliographic base and b) to feed the literature survey and synthesis that is to be performed at LGIT. In case the corresponding papers are not easily available, partners are kindly requested also to send a copy to Grenoble. Of course, once established, this list will be distributed amongst the consortium.

III.4 Task D – Practical implementation and guidelines (Wednesday, June 27 PM1)

This task is scheduled to start only at month 25. M. Koller thus made only a very brief overview.
Besides the objectives already listed in the technical annex, he also proposed to agree on a "glossary" of words and expressions to be used so as to also "standardize" the vocabulary and better understand each other. This has to be thought through in the coming year.

As it is planned to distribute a robust, flexible and transportable software for the H/V processing, J. Havskov made a brief presentation of the SEISAN software, which has been developed for many years in Bergen and already includes some of the functionalities that would be very useful for the H/V software (portability, database, web interface to process one's own data through internet, free access, comprehensive user manual).

All partners are thus invited to visit the SEISAN web pages at http://www.ifjf.uib.no (items *"Seismology pages"*, then "*Software development"*). As this software package will be extensively used for the in-house testing, its use and the possibility of inclusion of the H/V software in the SEISAN general package.

IV Administrative and Financial Matters

Technical Annex / Description of work

The attention has been drawn on some aspects of the final version of the Technical Annex (Description of Work):

- the WP have been renumbered slightly differently from the original proposal: WP01 now corresponds to the co-ordination work, and all other WPnn have been shifted from n to n+1: the official numbering to be used throughout the project is the final one of the technical annex.
- There has been a mistake in the numbering of deliverables D04.03 and D09.04, which should be corrected as detailed in section III.

Financial follow-up

In order to facilitate the redaction of the Periodic Cost Statement, Laurence Bourjot will do the financial follow-up for each partner. For this, she will send to every partner a table (see the example below) where all the expenses concerning the project SESAME have to be noted. The partner has to send back this table every three months.

This information will also be entered into the netboard software. All partners have to indicate Laurence Bourjot whether they prefer to enter it by themselves, or to have her entering it.

Partner name: Gaston Currency used: French Francs Total Budget: 83 000,- FF

Date of purchase	Description of the expenses ***	Durable equipment	Sub-contracting	Travel	Consumables	Computing	Others
10 jan	air tickets for the meeting in Grenoble			7 564,60			
11 feb	BRUNER: small material for sampling				3 213,00		
5-marc	LENNARTZ: one MARS 88	15 645,00					
	Sub-total	*15 645,00*	*0,00*	*7 564,60*	*3 213,00*	*0,00*	*0,00*
	TOTAL	26 422,60 FF		Remind	56 577,40 FF		

***: A copy of each expense has to be keep by the partner.**

⇨ Time sheet follow-up

As it is mentioned in the contract, time of work for each person working on the project SESAME has to be registered. For this, Laurence Bourjot will send to each partner a table or will send you instructions on how to use the time sheet which are in the Netboard software Vit@mib. This will be only at the beginning of September. At this date, Laurence will also explain, in particular, for each partner, who has to fill up the time sheet.

⇨ Project Website

The website for the SESAME project will be done by Philippe GUEGUEN (Grenoble) and Marco PAGANI (Milano) with the help of Bertrand Guillier from Grenoble. As a first step, it will include a simple page hosted at LGIT Grenoble with links to every partner.

⇨ Logo

Anne Marie Duval will ask the CETE of Aix-en-Provence to make some suggestions for a logo. Three points must feature in the logo:
- the acronym of the project (SESAME)
- the European stars,
- the notion of array and noise.

⇨ Consortium agreement

All the partners attended the meeting have decided not to have a Consortium agreement but have defined two rules concerning the SESAME project

1. **All the data lent by one of the SESAME project partners can only be used within the framework of the project SESAME. If one partner wants to use the data for an other purpose, it is essential that he asks for an utilization agreement to the data owner.**
2. **Each time the SESAME project partners make a presentation concerning the project SESAME, they must inform the co-ordinator of the project and as much as possible send a copy of the presentation. Moreover, each presentations on the SESAME project have the mandatory obligation to acknowledge the EC funding and mention the grant identification.**

⇨ Miscellaneous

Table 4 is a summary of all the important Dates (Task meeting, General meeting, Workshop,...)

Reminder of what has to be done by each partner in the next months (August – September).

Task A – H/V Technique: WP02 (Experimental conditions : A-M Duval)

➜ see Table 2 "List of aquisition systems and sensors used in the consortium", make some corrections if necessary and send your remarks to A.-M. Duval

➜ send to A.M. Duval a list of wished tests.

Task A – H/V Technique:WP03 (Data processing, K. Atakan)

➜ see Table 3 "short information on the main characteristics of the software used by each partner", make some corrections if necessary and send your remarks to K. Atakan

Task A – H/V Technique : WP04 (Empirical evaluation, N. Theodulidis)

➜ see the email send by N. Theodulidis on July, 5 to each partner and do not forget to give an answer if you have not already done it.

Task B – Array measurement techniques (F. Scherbaum)

➜ all involved partners should send to F. Scherbaum information on their array processing codes (method, language, etc.), according to his email "Array codes" of July 10.

➜ all involved partners should send to F. Scherbaum information on the test sites they are responsible for, according to his email "Array test sites" of July 10.

Task C – Physical background and noise simulation

➜ all partner should send their list of bibliographic reference on seismic noise (microtremors, microseisms, all kinds) to P.-Y. Bard.

Financial follow-up and time sheet

➜ Laurence Bourjot will send to each partner a table to register the expenses of the project and instructions on the table time sheet at the beginning of September.

TABLE 4 : SUMMARY of SESAME important dates (as of August 08, 2001)

	Months	Week 1	Week 2	Week 3	Week 4
1	*May 2001*				
2	*June 2001*				Kick-off Meeting-Grenoble
3	*July 2001*				
4	*Aug. 2001*				**Zürich – Aug 29-30** Task C
5	*Sept. 2001*				
6	*Oct. 2001*				**Bergen – Oct 22-26** Testing of instruments TaskA - WP02
7	*Nov. 2001*				
8	*Dec. 2001*	**Postdam – Dec 3-5** Software & Array processing techniques TaskA-WP03 & TaskB-WP06	(AGU)		
9	*Jan. 2002*		**Postdam – Jan 9-11** Software & Array processing techniques TaskA-WP03 & TaskB-WP06		
10	*Feb. 2002*				
11	*March 2002*				EGS – Nice
12	*April 2002*				D1, D2
13	*May 2002*				D3: Progress report 1
14	*June 2002*				D4
15	*July 2002*				
16	*Aug. 2002*				
17	*Sept 2002*	(ECEE London)			
18	*Oct. 2002*	General Meeting - Roma			D5, D6, D7, D8
19	*Nov. 2002*				
20	*Dec. 2002*		(AGU)		
21	*Jan. 2003*				D9
22	*Feb. 2003*				
23	*March 2003*				EGS – Nice
24	*April 2003*				D11, D12, D13,D14, D15
25	*May 2003*				D10: Progress report 2
26	*June 2003*				
27	*July 2003*	Scienitific Workshop - Bratislava			D16, D17, D18, D19
28	*Aug. 2003*				
29	*Sept. 2003*				
30	*Oct. 2003*				D20,D21
31	*Nov. 2003*				
32	*Dec. 2003*		(AGU)		
33	*Jan. 2004*				
34	*Feb. 2004*				EGS – Nice
35	*March 2004*				
36	*April 2004*			General Meeting - Nice	D22, D23, D24
37	*May 2004*				D25: Progress report 3
38	*June 2004*				D25; Final report

TABLE 2 : List of acquisition systems and sensors used in the consortium

Group	Sensors	Instrument (acquisition)
1 UJFG.LGIT	Le 3D Lennartz L22 CMG 5 Guralp CMG 30 Guralp CMG 40 Guralp	LEAS Cityshark REFTEK
2 Résonance		
3 Uni Potsdam	Le 3D 5sec KS2000 broadband	MARS lite
4 Uni Liège	? ?	? ?
5 Uni Bergen	LYC CMG 40 T 4,5 HZ RANGER FBA23	GEOSIG SEISLOG
6 ETH Zurich	Le 3D 5sec Le 3D 1sec	MARS 88 self-developed Noise Instrument
7 ITSAK Thessaloniki	FBA-23 FBA-11 Episensor (?)	K22 ETNA
8 Uni Lisbon	Le 3D 1sec Le 3D 5sec MARS 1sec	Reftek MARS Lite SSR – Kinematics (?)
9 INGV Rome	CMG 5 CMG 40 Le 3D 5sec CMG 3 (?) Episensor (?) STS 2 (?)	Mars Lite Mars 88 REFTEK self-developed recorder
10 CNR.GSAQ Rome	Le 3D 5sec MARK L4C/3D	MARS 88 Lennartz M 24 Lennartz
11 Uni Bratislava		
12 CETEMED.LRE	Le 2D 5sec MARK L4C L 22 AP 4,5 HZ AP	MARS 88 Lennartz opt. disk MARS lite Lennartz LEAS Hathor 3

TABLE 3 : Characteristics of the software used by each partner

Group	Format	Platform
1 UJFG.LGIT	ASCII, SAC	Unix, Linux, Sun, MAC
2 Résonance	ASCII, SAC, FAMOS	Windows, Unix (IBM)
3 Uni Potsdam	ASCII, GSE, MSEED	Unix,, Linux
4 Uni Liège	????	??????
5 Uni Bergen	GSE, SEISAN	Windows, Unix, Linux
6 ETH Zurich	ASCII, GSE	Windows, Unix
7 ITSAK Thessaloniki	ASCII	Windows, Unix
8 Uni Lisbon	ASCII, SEISAN	Windows
9 INGV Rome	ASCII, SAC	Unix, Linux
10 CNR.GSAQ Rome	ASCII, SAC	Windows, Unix, Linux
11 Uni Bratislava		
12 CETEMED.LRE	ASCII, ISAM	Windows, Unix, Matlab