



Project n° EVG1-CT-2000-00026 SESAME

European Commission – Research General Directorate

SESAME

Site EffectS assessment using AMbient Excitations

Sixth progress report

38 months Management report

1 January 2004 – 30 June 2004

SESAME Partnership

1	UJF	University Joseph Fourier	Grenoble
2	Resonance	Résonance Ingénieurs-Conseils SA	Geneva
3	UP	University of Potsdam -	Potsdam
4	ULg	University of Liège	Liège
5	UiB	University of Bergen	Bergen
6	ETHZ	Polytechnic School of Zürich	Zürich
7	ITSAK	Institute of Engineering Seismology and Earthquake Engineering	Thessaloniki
8	ICTE/UL	Institute of Earth and Space Sciences	Lisbon
9	INGV	National Institute of Geophysics and Volcanology	Roma
10	CNR.GSAQ	National Research Council	Milano
11	GPISAS	Geophysical Institute – Slovak Academy of Sciences	Bratislava
12	CETE.Nice	Center of Technical Studies	Nice
13	CNRS	National Center for Scientific Research	Grenoble
14	LCPC	Central Laboratory for Bridges and Roads	Paris

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SESAME project rules

- 1. All the data lent by one of the SESAME project partners can only be used within the framework of the SESAME project. If one partner wants to use the data for another purpose, it is essential that he ask 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 presentation on the SESAME project has the mandatory obligation to acknowledge the EC funding and mention the grant identification.*

Introduction

April 2001	signature of the contract between the partners and the European Commission	
May 2001	<i>1 May 2001</i>	Beginning of the contract
June 2001		First payment of the EC (40%)
July 2001	<i>26-27 June 2001</i>	Kick-off meeting in Grenoble, France
August 2001		
September 2001	<i>29-30 August 2001</i>	Workshop for Task C in Zurich, Switzerland
October 2001		
November 2001	<i>22-26 October 2001</i>	Instrument workshop (TaskA-WP02) in Bergen, Norway
A first progress report sent to the EC		
December 2001		
January 2002		
February 2002	<i>7-8 January 2002</i>	Instrument workshop (TaskA-WP02) in Potsdam, Germany
March 2002	<i>9-11 January 2002</i>	Workshop (TaskA-WP03 & TaskB-WP06) in Potsdam, Germany
April 2002		
May 2002	<i>21-27 April 2002</i>	Task A meeting during the EGS in Nice, France
June 2002	<i>29-30 May 2002</i>	Task C meeting in Zurich, Switzerland
A second progress report including Cost statements (= D03.01) and 2 deliverables (D01.02, D02.09) sent to the EC.		
July 2002		
August 2002	<i>10 July 2002</i>	Review meeting on seismic risk research in the EU
September 2002		
October 2002		Second payment of the EC (37,99%)
November 2002	<i>22-24 October 2002</i>	Work-package meetings in Roma, Italy
December 2002	<i>25-26 October 2002</i>	General SESAME meeting in Roma, Italy
A third progress report including 4 deliverables D04.04 (draft), D05.06, D05.05, D07.05 sent to the EC.		
January 2003		
February 2003		
March 2003	<i>3-14 February 2003</i>	Task B meeting in Potsdam, Germany
April 2003	<i>20-21 February 2003</i>	Task C meeting in Bratislava, Slovakia
May 2003		
June 2003	<i>7-11 April 2003</i>	WP02 meeting during the EGS-AGU-EUG in Nice, France
A fourth progress report including Cost statements (= D10.01) and 5 deliverables D08.02, D09.03, D13.08 (first part), D14.07, D15.06 and the final version of D04.04 sent to the EC.		
July 2003		
August 2003	<i>12-15 June 2003</i>	WP04 meeting in Thessaloniki, Greece
September 2003	<i>16-17 July 2003</i>	Task C meeting in Grenoble, France
October 2003		
November 2003	<i>22-24 September 2003</i>	SESAME Smolenice Workshop (Slovakia)
December 2003		Third payment of the EC (7,01%)
A fifth progress report is sent to the EC.		
January 2004		
February 2004		
March 2004	<i>8-13 February 2004</i>	WP03 meeting in Lisbon (Portugal)
April 2004	<i>16-20 February 2004</i>	Task C meeting in Potsdam (Germany)
May 2004		
June 2004		
A sixth progress report including 5 deliverables is sent to the EC.		

Progress of the Work

The following table shows the timetable of the SESAME project. We have highlighted in yellow the work-packages not finished yet. This report presents a summary of the work done during the last sixth months.

TABLE : Project planning and time table

Phases	WP	Tasks	Year 1	Year 2	Year 3	Year 4 Coming deliverables	Deliverables (finished)
P01			xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx		
	WP01		xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx		
		T01.01	xxxxxxxxxxxx				<i>D03.01*</i>
		T02.01		xxxxxxxxxxxx			<i>D10.01*</i>
		T03.01			xxxxxxxxxxxx	---→ D25.1	
P02 – Task A			xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxx		
Finished ←	WP02		xxxxxxxxxxxx	xxxxxxx			
		T01.02	xxxxxxxxxxxx				<i>D01.02*</i>
		T02.02		xxxxxxxxxxxx			<i>D08.02*</i>
Finished ←	WP03		xxxxxxx	xxxxxxxxxxxx			
		T01.03	xxxxxxx				
		T02.03		xxxxxxx			<i>D09.03*</i>
Finished ←	WP04		xxxxxxx	xxxxxxxxxxxx	xxxxxxx		
		T01.04	xxxxxxx				
		T02.04		xxxxxxxxxxxx			<i>D04.04*</i>
		T03.04			xxxxxxx →		(D16.04 & D20.4)
P03 – Task B			xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxx		
Finished ←	WP05		xxxxxxxxxxxx	xxxxxxx			
		T01.05	xxxxxxxxxxxx				
		T02.05		xxxxxxx			<i>D06.05 & D07.05*</i>
	WP06		xxxxxxxxxxxx	xxxxxxxxxxxx	xxx		
		T01.06	xxxxxxxxxxxx				
		T02.06		xxxxxxxxxxxx			<i>D05.06*; D15.06*</i>
		T03.06			xxx →	---→ D19.06	(D18.06)
Finished ←	WP07		xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxx		
		T01.07	xxxxxxxxxxxx				
		T02.07		xxxxxxxxxxxx			<i>D14.07*</i>
		T03.07			xxxxxxx →		(D21.07)
P04 – Task C			xxxxxxxxxxxx	xxxxxxxxxxxx	xxx		
Finished ←	WP08		xxxxxxxxxxxx	xxxxxxxxxxxx			
		T01.08	xxxxxxxxxxxx				<i>D13.08*</i> –first part
		T02.08		xxxxxxxxxxxx	→		(D13.08)
	WP09		xxxxxxxxxxxx	xxxxxxxxxxxx			
		T01.09	xxxxxxxxxxxx				<i>D02.09*</i>
		T02.09		xxxxxxxxxxxx	→	---→ D12.09	
	WP10			xxxxxxx	xxx		
		T01.10		xxxxxxx	→		
		T02.10			xxx	-→D11.10&D17.10	
P05 – Task D					xxxxxxxxxxxx		
	WP11				xxxxxxxxxxxx		
		T01.11			xxxxxxxxxxxx	---→ D22.11	
	WP12				xxxxxxxxxxxx		
		T01.12			xxxxxxxxxxxx	---→ D23.12	
	WP13				xxxxxxxxxxxx		
		T01.13			xxxxxxxxxxxx	---→ D24.13	

*, the Deliverables in italic have already been sent to the EC with the previous reports;
the Deliverables in brackets are sent to the EC with this report.

I WP01 – T02.01: co-ordination – year 3

The co-ordination is followed by two persons:

Pierre-Yves Bard for the scientific part and Laurence Bourjot for the administrative and financial part.

TABLE 1 : Persons working in the project from January 2004 to June 2004

Partners	Name of the person		Task or WP	Time spent
	<i>Bruno Bettig</i>	<i>S</i>	-	-
	<i>Fabien Blarel</i>	<i>T</i>	-	-
1	Sylvette Bonnefoy	<i>S</i>	WP08	6 M
1	Laurence Bourjot	<i>ACo</i>	WP01	1 M
1	Cécile Cornou	<i>R</i>	Task A & C	6 M
1	Fabrice Cotton	<i>R</i>	WP08	0,5 M
1 (13)	Jean-Luc Chatelain	<i>R</i>	Task D	-
	<i>François Dunand</i>	<i>S</i>	-	-
1 (13)	Bertrand Guillier	<i>R</i>	Task D	-
	<i>Jérôme Noir</i>	<i>S</i>	-	-
1 (14)	Pierre-Yves Bard	<i>R</i>	WP01, Task A,B,C	1 M
1 (14)	Philippe Guéguen	<i>R</i>	Task D	0,3 M
2	Martin Koller	<i>R</i>	Task D	M
2	Corinne Lacave	<i>R</i>	Task D	M
	<i>Julien Rey</i>	<i>R</i>	-	-
3	Matthias Ohrnberger	<i>R</i>	Task B	-
3	Andreas Koehler	<i>S</i>	Task B	-
	<i>Gudrun Richter</i>	<i>R</i>	-	-
3	Frank Scherbaum	<i>R</i>	Task B	-
3	Estelle Schissele	<i>R</i>	Task B	-
	<i>Daniel Vollmer</i>	<i>T</i>	-	-
	<i>Hans Havenith</i>		-	-
4	Denis Jongmans	<i>R</i>	Task B & D	-
4	Marc Wathelet	<i>S</i>	WP07	6 M
5	Kuvvet Atakan	<i>R</i>	Task A & D	-
	<i>Mathilde Böttger</i>	<i>S</i>	-	-
	Margaret Grandison	<i>S</i>	-	-
	<i>Jens Havskov</i>	<i>R</i>	-	-
	<i>Jose Asheim Ojeda</i>	<i>S</i>	-	-
5	Bladimir Moreno	<i>S</i>	Task A & D	-
	<i>Eirik Tvedt</i>	<i>S</i>	-	-
	<i>Terje Utheim</i>	<i>T</i>	-	-
	<i>Jose Asheim Ojeda</i>	<i>S</i>	-	-
	<i>Katharina Wolff</i>	<i>S</i>	-	-
	<i>Gerardo Aguacil</i>	<i>R</i>	-	-
6	Donat Faeh	<i>R</i>	Task A, B, C	-
6	Fortunat Kind	<i>R</i>	Task B	-
	<i>Ivo Oprsal</i>	<i>R</i>	-	-
	<i>Eva Spühler-Lanz</i>	<i>R</i>	-	-
	<i>Johannes Rippberger</i>	<i>R</i>	-	-
	<i>Daniel Roten</i>	<i>R</i>	-	-
	<i>Jochen Woessner</i>	<i>R</i>	-	-
	<i>Jörg Kirsch</i>	<i>R</i>	-	-
	<i>Anastasios Anastasiadis</i>	<i>T</i>	-	-
7	Petros Dimitriou	<i>R</i>	WP04	-
	<i>Bassilios Margaris</i>		-	-
7	Areti Panou	<i>R</i>	WP04	-
7	Alekos Savvaidis	<i>S</i>	WP04	-
7	Nikos Theodulidis	<i>R</i>	WP04	-
	<i>Stratos Zacharopoulos</i>	<i>T</i>	-	-
	<i>Antonio Borges</i>	<i>S</i>	-	-
	<i>Catarina Paz</i>		-	-
8	Pedro Roquette	<i>R</i>	WP03	-
	<i>Gisela Viegas</i>	<i>S</i>	-	-
8	Paula Teves-Costa	<i>R</i>	Task A	-
	<i>Catello Acerra</i>	<i>T</i>	-	-
9	Riccardo Azzara	<i>R</i>	WP04	-
	<i>Roberto Basili</i>	<i>R</i>	-	-
	<i>Paola Bordini</i>	<i>R</i>	-	-
9	Fabrizio Cara	<i>R</i>	WP04	6 M
9	Giovanna Cultrera	<i>R</i>	WP04	-

9	Giuseppe di Giulio	R	WP04	
	<i>Fabrizio Marra</i>	R	-	-
	<i>Sandro Rao</i>	T	-	-
9	Antonio Rovelli	R	WP04	
	<i>Mario La Rocca</i>		-	-
	<i>Rosalba Maresca</i>		-	-
	<i>Gilberto Saccoroti</i>		-	-
10	Rosastella Daminelli	T	WP04	0,1 M
10	Roberto de Franco	R	WP04	0,1 M
10	Alberto Marcellini	R	WP04	0,2 M
10	Antonio Morrone	T	WP04	0,1 M
10	Marco Pagani	R	WP04	
10	Alberto Tento	T	WP04	0,5 M
	<i>Lucia Fojtikova</i>	S	-	-
11	Josef Kristek	R	Task C	1,8 M
11	Miriam Kristekova	R	Task C	0,5 M
11	Peter Moczo	R	Task C	2 M
12	Anne-Marie Duval	R	Task A & D	
12	Etienne Bertrand	R	Task A & D	
	<i>Etor Querendez</i>	R		-
	<i>Jean-François Vassiliades</i>	T	WP02	-
	<i>Sylvain Vidal</i>	T		-

• R = Researcher, S = Student, T = Technician, ACo = Assistant Coordinator

The name in italic are involved in the project, but have not been working in the project during this period.

During the third year of the project (from January 2004 to June 2004), about 40 persons (researchers or engineers, students, technicians and 1 assistant-coordinator) have been involved in the project SESAME for a minimum of 32 man-months (**Table 1**).

- 1 All these persons have met several times to exchange their work and also to do experiments together.
 - **8-13 February 2004** – WP03 meeting in Lisbon (Portugal)
 - to prepare the final version of the J-SESAME software (and SAF format).
 - **16-20 February 2004** – Task C meeting in Potsdam (Germany)
 - to discuss the dispersion curve estimation for synthetic and real data sets computed and acquired within the SESAME project.
- 2 Since January 2004, the partners, in parallel to their work on the project, have participated to different national or international meetings where they have presented a part of the scientific work done in the SESAME project.
 - **ICSDEE & ICEGE 2004** in Berkley (USA), January 2004

Atakan K., A-M. Duval, N. Theodulidis, P-Y. Bard and the SESAME-Team, On the reliability of the H/V Spectral Ratio Technique, *ICSDEE & ICEGE 2004*.

Duval A.-M., J.-L. Chatelain, B. Guillier and the SESAME WP02 team. Influence of experimental conditions on H/V determination using ambient vibrations (noise), *ICSDEE & ICEGE 2004*.
 - **AHPGG (4^a Assembleia Luso Espanhola de Geodesia e Geofísica)** in Portugal, February 2004

Teves-Costa P and M.L. Senos. *Angra do Heroísmo seismic zonation using ambient vibrations*, AHPGG, Portugal, February 2004.
 - **GGS (international Geological Congress)** in Berlin (Germany), 8-12 March 2004

Ohrnberger, M., and Schissele, E., Comparison of Frequency Wavenumber and Spatial Autocorrelation Techniques for Estimating Dispersion Characteristics from Ambient Vibration Array Recordings, 64th annual conference of the German Geophysical Society, March, 8-12, Berlin.

- **Sismica** in Portugal, April 2004
Teves-Costa P, C. Sousa Oliveira and M.L. Senos. Danos *Angra do Heroísmo provocados pelo sismo de 1980. Correlação com as frequências do solo e edifícios. seismic zonation using ambient vibrations*, AHPGG, Portugal, February 2004.
- **EGU (European Geophysical Union)** in Nice (France), April 2004
Bonney-Claudet S., Cornou C., Ohrnberger M., Wathelet M., Bard P.-Y., Fäh D., H/V ratio and seismic noise wavefield. Geophysical Research Abstract, Vol 6, 05057, 2004.
Moczo P., Galis M. & Kistek J., 3D hybrid finite-element - finite-difference computation of seismic motion including rupture propagation modeling. Geophysical Research Abstract, Vol 6, 03347, 2004.
- **IGC (international Geological Congress)** in Thessaloniki (Greece), 2004
Theodulidis et al., 2004. Ambient noise H/V spectral ratio for assessing site effects in urban environments: The case of Thessaloniki city”. Proc. 10th Int. Geol. Congres, Thessaloniki, 2004.



The abstracts are available on the web site:
<http://SESAME-FP5.obs.ujf-grenoble.fr>



- 3** Since the beginning of the project, 32 papers have already been accepted or submitted and several are in preparation
- Atakan K., A.-M. Duval, N. Theodulidis, P.-Y. Bard and the SESAME-Team, 2004. On the reliability of the H/V Spectral Ratio Technique, in *Proceedings of ICSDEE & ICEGE 2004 (11th International Conference on Soil Dynamics & Earthquake Engineering and 3rd International Conference on Earthquake Geotechnical Engineering)*, Berkeley CA, 7-9th January 2004, Volume 2, pp. 1-8.
 - Atakan K., A.-M. Duval, N. Theodulidis, B. Guillier, J.-L. Chatelain, P.-Y. Bard and SESAME-Team, 2004. The H/V spectral ratio technique: experimental conditions, data processing and empirical reliability assessment. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 2268.
 - Atakan K., P.-Y. Bard, F. Kind, B. Moreno, P. Roquette, A. Tiento and SESAME-Team, 2004. J-SESAME: a standardized software solution for the H/V spectral ration technique. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper #2270.
 - Bard P.Y., 2002. Extracting information from ambient seismic noise: The SESAME project (Site EffectS assessment using AMbient Excitations) – *Synopsis of the first year project* (14 p.) submitted and accepted for the review to the EC.
 - Bard P.-Y., and SESAME participants, 2004. The SESAME project: an overview and main results. Proceedings of the 13th World Conference in Earthquake Engineering, Vancouver, August 2004, Paper # 2207.
 - Betti, B., Bard, P.-Y., Scherbaum, F., Riepl, J., and Cotton, F., 2003. Analysis of dense array noise measurements using the modified spatial auto-correlation method (SPAC). Application to the Grenoble area, *Bolletino di Geofisica Teorica ed Applicata*, **42-3/4**, p. 281-304.
 - Bonney-Claudet S., C. Cornou, J. Kristek, M. Ohrnberger, M Wathelet, P.-Y. Bard, D. Fäh, P. Moczo, F. Cotton, 2004. Simulation of seismic ambient noise: I H/V and array techniques on canonical models. Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, Canada, August 2004, Paper # 1120.
 - Cornou C., J. Kristek, S. Bonney-Claudet, D. Fäh, P.-Y. Bard, P. Moczo, M. Ohrnberger, M Wathelet, 2004. Simulation of seismic ambient vibrations: II. H/V and array techniques for real sites. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, Canada, August 2004*, Paper # 1130.
 - Cultrera G., R. Azzara, F. Cara, R. d’Anna, G. Di Giulio, M. S. Giammarinaro, G. Passafiume, A. Rovelli and P. Vallone, 2004. Microtremor Measurements in Palermo, Italy: a comparison with macroseismic intensity and earthquake ground motion. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 915.

- Duval A.-M., J.-L. Chatelain, B. Guillier and the SESAME WP02 team. Influence of experimental conditions on H/V determination using ambient vibrations (noise), in *Proceedings of ICSDEE & ICEGE 2004 (11th International Conference on Soil Dynamics & Earthquake Engineering and 3rd International Conference on Earthquake Geotechnical Engineering)*, Berkeley CA, 7-9th January 2004, Volume 2, pp. 149-156
- Duval A.-M., J.-L. Chatelain, B. Guillier and SESAME Project WP02 Team, 2004. Influence of experimental conditions on H/V determination using ambient vibrations (noise), *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 306.
- Fäh D., Kind F. and Giardini D., 2003. Inversion of local S-wave velocity structures from average H/V ratios, and their use for the estimation of site effects. *Journal of Seismology*, **7**, 449-467.
- Lacave C. and J. Rey, 2004. Is the phase of the one-sided autocorrelogram of the horizontal components of ambient vibrations (Tokeshi's method) able to reveal the fundamental resonance frequency of a site ? *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 3120.
- Koller M., C. Lacave et al., 2004. Practical user guidelines and software for the implementation of the H/V ratio technique : measuring conditions, processing method and results interpretation, *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper #3132.
- Kristek K., Moczo P. and Archuleta R., 2002. Efficient methods to simulate planar free surface in the 3D 4th –order staggered-grid finite-difference schemes. *Studia Geophys. Geod.*, **46**, 2002, 355-381.
- Lacave C. and Rey J., 2004. Is the phase of the one-sided autocorrelogram of the horizontal components of ambient vibrations (Tokeshi's method) able to reveal the fundamental resonance frequency of a site?, 13th WCEE, August 1-6, 2004, Vancouver, B.C., Canada, paper no. 3120.
- Moczo P., Kristek J., Vavrycuk V., Archuleta R. and Halada L., 2002. 3D heterogeneous staggered-grid finite-difference modeling of seismic motion with volume harmonic and arithmetic averaging of elastic moduli and densities. *Bull. Seism. Soc. Am.*, **92**, 3042-3066.
- Ohrnberger, M., E. Schissele, C. Cornou, M. Wathelet, A. Savvaidis, F. Scherbaum, D. Jongmans, and F. Kind, 2004. Microtremor array measurements for site effect investigations: comparison of analysis methods for field data crosschecked by simulated wavefields. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 940.
- Ohrnberger M, E. Schissele, C. Cornou, S. Bonnefoy-Claudet, M. Wathelet, A. Savvaidis, F. Scherbaum and D. Jongmans, 2004. Frequency wavenumber and spatial autocorrelation methods for dispersion curve determination from ambient vibration recordings. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 946.
- Scherbaum F., Hinzen K.-G. and Ohrnberger M., 2002. Determination of shallow shear wave velocity profiles in the Cologne/Germany area using ambient vibrations. *Geophys. Journ. Int.*, **152**, 597-612.
- Teves-Costa, P., L. Senos and C.S. Oliveira, 2004. Correlation between damage distribution and soil behaviour estimated with ambient vibrations. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 1004..
- Theodulidis N., G. Cultrera, A. Tiento, D. Faeh, K. Atakan, P.-Y. Bard, A. Panou and the SESAME-Team, 2004. Empirical evaluation of the horizontal-to-vertical spectral ratio technique: results from the SESAME project. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 2323.
- Cara F., G. Di Giulio and A. Rovelli (2003). A Study on Seismic Noise Variations at Colfiorito, Central Italy: Implications for the Use of H/V Spectral Ratios. *Geoph. Res. Lett.*, vol. 30 (in press).
- Kristek J., Moczo P., 2003. Seismic wave propagation in viscoelastic media with material discontinuities – a 3D 4th-order staggered-grid finite-difference modelling. *Bull. Seism. Soc. Am.* (in press).
- Malischesky, P., and F. Scherbaum: Comparison between Rayleigh H/V ellipticity peak frequency, and fundamental S-wave resonance frequency (in press).
- Ohrnberger, M., Scherbaum, F., Krüger, F., Pelzing, R. and Reamer, Sh.-K., 2004a: How good are shear wave velocity models in the Lower Rhine Embayment (NW-Germany) obtained from inversion of ambient vibrations? *Bolletino di Geofisica Teorica ed Applicata*, in press.

- Panou, A.A., N. P. Theodulidis, P. M. Hatzidimitriou, A. S. Savvaidis and C. B. Papazachos, 2004. Reliability of ambient noise H/V spectral ratio in urban environment: The case of Thessaloniki city (Northern Greece). *PAGEOPH* (in press).
- Theodulidis et al., 2004. Ambient noise H/V spectral ratio for assessing site effects in urban environments: The case of Thessaloniki city". *Bull. Geol. Soc. Greece* (in press).
- Bonnefoy-Claudet S., Cornou C., Fäh D., Bard P.-Y., Wathelet M. & Ohrnberger M., Modélisation numérique du bruit de fond sismique: implication pour déterminer la nature du bruit → submitted to 6th seminar of the AFP (*Association Française de Génie Parasismique*), Cachan (France), July 2003.
- Köhler, A., Ohrnberger, M., Scherbaum F., Stange. S., and Kind F., 2004: Ambient vibration measurements in the southern Rhine graben close to Basle, *Annali di Geofisica* (submitted).
- Ohrnberger M., Scherbaum F., Krüger F., Pelzing R. and Reamer S.K., 2003. How good are shear wave velocity models in the Lower Rhine Embayment (NW-Germany) obtained from inversion of ambient vibrations, *Bolletino di Geofisica Teorica ed Applicata* (submitted).
- Theodulidis et al., 2004. Ambient noise horizontal-to-vertical spectral ratio in site effects estimation and correlation with seismic damage distribution in urban environment: The case of the city of Thessaloniki (Northern Greece). *Soil Dyn. & Earthq. Eng.* (submitted).
- Wathelet M., Jongmans D. and Ohrnberger M. Surface wave inversion using a direct search algorithm and its application to ambient vibrations measurements. *Near Surface Geophysics* (submitted).
- Kristek J., Moczo P. and Kristeková M. Finite-difference Simulation of Ambient Noise in 3D Surface Sedimentary Structures: Part 1 – Method (in preparation).
- *Theodulidis et al., Strong motion data & H/V spectral ratio: The case of strong motion network in Greece (in preparation).*
- *Theodulidis et al., SESAME database (under preparation, to be submitted to Seism. Res. Letters).*

In addition,

→ SESAME related papers with contributions by the UP team funded by the German Research Council:

- Hinzen, K.G., Scherbaum, F. and Weber, B. (2003). On the resolution of H/V measurements to determine sediment thickness, a case study across a normal fault in the Lower Rhine Embayment, Germany, *JEEE*, (submitted), 2003.
- Diallo, M.S., Holschneider, M., Kulesh, M., Scherbaum, F. and Adler, F. (2003). Characterization of seismic waves polarization attributes using continuous wavelet transforms, *Geophysics* (submitted), 2003.
- Köhler, A., Ohrnberger, M., Scherbaum F., Stange. S., and Kind F., 2004: Ambient vibration measurements in the southern Rhine graben close to Basle, *Annali di Geofisica* (submitted), 2004.

→ SESAME related papers with contributions by the LGIT team:

- Dunand, F., P.-Y. Bard, Ph. Guéguen, J.-L. Chatelain, B. Guillier, T. Vassail, 2003. Caractérisation du comportement dynamique des sols et structures par mesures de vibrations ambiantes : Développements récents et questions en suspens, *Journée d'étude F²AS "Recalage calcul / Mesures"* (25/03/2003, Paris), *IPSI, Vol. XXVII, n°1, 15 pages (in French)*



A copy of the papers can be asked to Pierre-Yves Bard



4 At the end of July 2004, seventeen deliverables are available.

- ⇒ D01.02 “*Controlled instrumental specifications*”: a report of 34 pages + 5 appendices.
- ⇒ D02.09 “*FD code to generate noise synthetics*”: in the form of a CD ROM with a report describing the flow chart of the software and canonical structural models.
- ⇒ D03.01 “*First year progress report*”: a report of 41 pages + annexes on the financial aspect of the project.
- ⇒ D04.04 “*Homogeneous data set of noise and earthquake recording at many sites*”: a report of 55 pages + 1 appendix
- ⇒ D05.06 “*Quality control software for in-situ checks*”: a report of 16 pages + 1 appendix.
- ⇒ D06.05 “*Array data set for different sites*”: a report of 33 pages + 1 appendix + 12 CD ROMs containing the data sets.
- ⇒ D07.05 “*Optimum development strategy and quality measure for array layout in view of obtaining surface wave*”: a report of 41 pages + 3 appendices. The complete report will be available on a CD Rom.
- ⇒ D08.02 “*Measurement guidelines*”: a report of 96 pages including 59 figures, accompanied by a DVD archiving all the test data and the corresponding results
- ⇒ D09.03 “*Multi-platform H/V processing software J-SESAME*”: a report of 37 pages describing the software + 1 CD ROM containing the software
- ⇒ D10.01 “*Second year progress report*”: a report of 31 pages + annexes on the financial aspect of the project.
- ⇒ D13.08 “*Report on the nature of noise*”: a report of 45 pages (first part of the deliverable)
- ⇒ D14.07 “*Report on the inversion of velocity profile and Version 0 on the inversion software*”: a report of 40 pages + 2 appendixes including 45 figures
- ⇒ D15.06 “*Interface software*”: a report of 8 pages describing the software tool



The above deliverables have been sent to the EC with the previous progress reports in June 2002, January 2003 and July 2003.

All these deliverables are available on the web site (except the CD ROMs with the data): <http://SESAME-FP5.obs.ujf-grenoble.fr>



- ⇒ D13.08 “*Report on the nature of noise*”: a final report of 50 pages.
- ⇒ D16.04 “*Comparisons of experimentally and theoretically estimated transfer functions with the (H/V) spectral ratio and evaluation of the applicability of the latter in cases of linear or/and non-linear soil behaviour*”: a report of 62 pages + 3 appendixes.
- ⇒ D18.06 “*Continuous Array Processing toolkit for ambient vibration array analysis*”: a report of 84 pages.
- ⇒ D20.04 “*Comparisons of damage distribution in modern urban areas with results from (H/V) sp*”: a report of 73 pages.
- ⇒ D21.07 “*Array measurements: inversion of velocity profile*”: a report of 17 pages describing the software tool “Sesarray”.



The above deliverables are appended to this report.
All these deliverables are available on the web site (except the CD ROMs with the data): <http://SESAME-FP5.obs.ujf-grenoble.fr>



II WP02 – H/V technique – experimental conditions

Leader : Anne-Marie Duval (Partner 12 : CETEMED.LRE – Nice – France)

☺☺ The work package is finished. Two deliverable D01.02 “*Controlled instrumental specifications*” and D08.02 “*Measurement guidelines*” has been produced in June 2002 and July 2003. The final results of this work package will be presented in WP11.

III WP03 – H/V technique – data processing

Leader : Kuvvet Atakan (Partner 5: UIB.ISI – Bergen – Norway)

☺☺ This work package is finished. The deliverable D09.03 “*Multi-platform H/V processing software J-SESAME*” has been produced in July 2003. The final results of this work package will be presented in WP11.

IV WP04 – T03.04: H/V technique – empirical evaluation – year 3

Leader: Nikos Theodulidis (Partner 7 – IESEE – Thessaloniki – Greece)

During the last six months of the SESAME project [1/1/2003 – 30/6/2004] the following tasks have been accomplished / progressed:

- Integration of the two deliverables D16.04 and D20.04 appended to this report;
- Paper writing and submission to national / international conferences and journals as follows:
 1. ”Empirical Evaluation of the H/V spectral ratio technique: Results from the SESAME project” (in Proc. 13WCEE, Vancouver, 2004).
 2. ”Reliability of ambient noise H/V spectral ratio in urban environment: The case of Thessaloniki city [Northern Greece]”, (PAGEOPH, 2004, in press).
 3. “Ambient noise horizontal-to-vertical spectral ratio in site effects estimation and correlation with seismic damage distribution in urban environment: The case of the city of Thessaloniki [Northern Greece]”, (submitted for publication to Soil Dyn. & Earthq. Eng., 2004).
 4. ”Ambient noise H/V spectral ratio for assessing site effects in urban environments: The case of Thessaloniki city”, (Bull. Geol. Soc. Greece & Proc. 10th Int. Geol. Congres, Thessaloniki 2004, in press).
 5. Strong motion data & H/V spectral ratio: The case of strong motion network in Greece (under preparation, to be submitted to an Inter. Journal).
 6. SESAME database (under preparation, to be submitted to Seism. Res. Letters).

In addition two lectures with respect to SESAME –WP04 results were given to ITSAK (Greece), to Aristotle University in Thessaloniki (Greece) and to TEI of Chania (Crete).

☺☺ This work package is now finished. A first deliverable D04.04 “*Homogeneous data set of noise and earthquake recordings at many sites*” has been produced in July 2003. The two deliverables D16.04 “*Comparisons of experimentally and theoretically estimated transfer functions with the (H/V) spectral ratio and evaluation of the applicability of the latter in cases of linear or/and non-linear soil behaviour*” and D20.4 “*Comparisons of Damage Distribution in Modern Urban Areas with Results from (H/V) Spectral Ratio*” are appended to this report. The result of this WP will be presented at the 13th world conference in Earthquake Engineering in Vancouver (August 2004).

V WP05 – Instrument layout for array measurements

Leader: Frank Scherbaum (Partner 3 – UPOTS.GEO – Postdam – Germany)

☺☺ This work package is finished. Two deliverables, one on a tentative strategy for array deployment and performance evaluation D06.05 “*Array data set for different sites*”, and a second on field survey D07.05 “*Optimum deployment strategy and quality measure for array layout in view of obtaining surface wave*” have been sent with the third report.

VI WP06 – T03.06: array measurements – derivation of dispersion curves – year 3

Leader: Frank Scherbaum (Partner 3 – UPOTS.GEO – Postdam – Germany)

Within the work packages WP05 and WP06 of SESAME we have continued to work on the following points: improvement of array processing software, processing testing with synthetically generated ambient noise time series, discussion of processing results within the SESAME array group, presentation and publication of results to a general scientific audience.

Software issues: Since the beginning of 2004 we have continuously work on the stabilization of the array processing software. Especially, several software bugs could be corrected and a number of additional features were added to the software package CAP (Continuous Array Processing). Most important to mention are the following improvements:

- speedup of MSPAC processing by rearranging the logic of computation.
- computation of MSPAC for horizontal components for combined Rayleigh and Love wave dispersion curve estimation.
- interactively selected ring configurations can now be read in for the MSPAC processing.
- speedup of window based CVFK computation using a grid less simplex-simulating annealing approach for finding the semblance maximum.
- shell script creation for fast visualization of output results from CAP.

Array group discussion: In February we hosted the SESAME array group meeting for discussion of dispersion curve estimation for synthetic and real data sets computed and acquired within the SESAME project (for details, please see the workshop minutes). Before the workshop, from mid of January to the end of February, we were happy to welcome Giuseppe di Giulio from INGV in Rome, who stayed with us at the University of Potsdam to analyse the ambient vibration array data of the Colfiorito experiment acquired in summer 2002.

Presentation and Publication: In January we prepared and submitted a paper to *Annali di Geofisica* on the results of ambient vibration measurements in the southern Rhine graben area close to Basle (Köhler et al., 2004). Another paper on the verification of the shallow shear wave velocity structure obtained from ambient vibration measurements in the Lower Rhine Embayment by independent methods (Ohrnberger et al., 2004a) has been revised in January, accepted for publication in *Bolletino di Geofisica Teorica ed Applicata* and is now in press. A work related to the comparison of array methods for ambient vibration processing has been presented at the national German conference of Geophysics in March (Ohrnberger and Schissele, 2004). The extended conference abstracts for the 13th world congress of earthquake engineering have been prepared and submitted in March (Ohrnberger et al., 2004b, Ohrnberger et al., 2004c). In the months May and June we were working mainly in the preparation of the final deliverables D18.06 and D19.06 related to the work package WP06.

Synthetic testing: After the array group discussion in February and the manuscript preparation for the 13th WCEE this year, we felt that there was the need to continue specific tests on synthetically created ambient noise data. One of the main questions we hope to answer is the influence of the attenuation structure on the processing results of the dispersion curve analysis. This work is still ongoing.

☺ Two deliverable, D05.06 “*Quality control software for in-situ checks*” and D15.06 “*Interface software*” have already been sent with the previous reports. The deliverable D18.06 “*Continuous Array Processing toolkit for ambient vibration array analysis*” presenting the user manual for the software package CAP is appended to this report. The last deliverables D19.06 “*FK/SPAC capabilities and limitations*” will be presented in October 2004.

VII WP07 – T03.07: array measurements – inversion of velocity profile – year 3

Leader: Denis Jongmans (Partner 4 – ULGG.DGO – Liège – Belgium)

During this period, the inversion software has been intensively used on available datasets (synthetic noise and real cases) giving the opportunity of fixing remaining bugs and suggesting some slight improvements. The main efforts have been made on the SPAC inversion and on the final uncertainty estimation.

The direct SPAC inversion developed last year has proved to be a robust approach. Practical experience demonstrated the necessity of a pre-selection step to select the “good” samples among the measured SPAC curves. The tests are based on the global consistency of the available data curves, with a view of defining a unique dispersion curve for all array apertures. They were all implemented in a new command line called “spac2disp”. This feature is the topic of a paper to be submitted soon to the BSSA.

We tested the possibility of using the Sambridge resampling code to estimate the final covariance matrix and all 1D or 2D marginal probabilities. This led to inconsistent results, probably due to an internal bug. We did not have sufficient time to make a complete analysis of Sambridge's code. We concentrated on a simpler method to extract the 1D marginal probability of the shear wave velocity at each depth. After running a certain number of inversions on the same data with different parameterizations, the developed tool can gather all models on a single plot. An estimation of the best Vs profile (given the data curves) with its uncertainties is easily deduced.

☺☺ This work package is now finished. A first deliverable D14.07 “*Report on the inversion of velocity profile and Version 0 on the inversion software*” has been produced in July 2003. The second deliverable D21.07 “*PC version of the inversion software*” describing the software is appended to this report.

VIII WP08 – T02.08: nature of noise wavefield – year 2

Leader: Pierre-Yves Bard (Partner 1 – UJF.LGIT – Grenoble – France)

From January 2004 up to now, the work of the WP08 was dedicated to synthesize the results obtained from the noise sources parametric study; the paper devoted to this topic is going to be submitted. According to the previous results, we investigate the nature of noise wavefield in more realistic structures such as gradient layers. The first results, shows that, higher modes of Rayleigh waves can be excited, and can be predominant in noise wavefield.

In the meantime, simulations of 1D canonical models defined in the SESAME consortium have been performed. Most of the H/V ratios and array analysis on these noise synthetics have been performed during the Task B+C Potsdam meeting in February. A synthesis of the results will be presented on a poster presentation in the 13th WCEE conference, August 2004 in Vancouver. Although the simulations have been already performed, we have decided to re-compute all the 1D canonical models. This work is motivated by the new implementation of version of Hisada's code, which allows simulating longer noise time series.

☺☺ This work package is now finished. The deliverable D13.08 «*Nature of noise wavefield*» has been produced in July 2004. The first part of the deliverable D13.08 is devoted to the results of the survey of the scientific literature dealing with seismic noise (already presented in deliverable D13.08 part I, in July 2003). The second part of the deliverable presents the results of the parametric study of noise sources in 1D case.

IX WP09 – T02.09: numerical simulation of noise – year 3

Leader: Peter Moczo (Partner 11 – IGSAS.SD – Bratislava – Slovakia)

This WP is finished and the analysis of the canonical models lead to a paper submitted to the 13th World Conference on Earthquake Engineering (August 2004) and to a paper that will be submitted very soon to an international revue (see deliverable about the nature of noise wavefield). Besides, during spring 2004, some additive canonical models involving structures having different gradient velocities were computed in order to 1) better understand the results from the array analysis performed using noise synthetics and actual noise for Grenoble basin and 2) to precise the key role played by such structures in generating harmonic surface waves and body waves.

☺ ☹ A first deliverable D02.09 “*FD code to generate noise synthetics*” in the form of a CD ROM with a report describing the flow chart of the software and canonical structural models has been sent to the EC in June 2002. The next step will be the deliverable D12.09 “*Report on parameter studies*” presenting the numerical simulations for a selected set of canonical models which undergo some delay, and is now scheduled for October 2004 (see the reason of this delay below).

The main reason for the delay is the following: as mentioned in the activity report for WP10 (see below), longer time series will be computed this summer for the 1D canonical models (2 weeks of computation). The resulting noise synthetics will be incorporate in the SESAME synthetics noise database.

X WP10 – T02.10: simulation of real sites – year 3

Leader: Donat Fäh (Partner 6 – ETHZ – Zürich – Switzerland)

From January to February 2004, the activity of the WP10 has been as follows:

- analysis of the first synthetics for real sites (Grenoble and Colfiorito basins) and canonical models during a workshop in Potsdam last February. For Colfiorito and Grenoble sites, synthetics were compared to actual noise. This work lead to the submission of two papers for the 13th World Conference on Earthquake Engineering (Bonney-Claudet et al, 2004; Cornou et al., 2004). After this workshop, it was decided to:
 - compute simple canonical models (large and narrow 2D valleys having the same velocity structure as for the Grenoble basin) in order to clarify the array analysis estimates obtained for the Grenoble basin by using real and synthetic data sets. Four additive canonical models were thus computed this spring.
 - modify the Hisada's code in order to be able to generate several minutes of noise for 1D canonical models. This improvement was also performed this spring.
- computation of 6 additive minutes of noise for Colfiorito model (8 weeks of computation)
- computation of 4 additive minutes of noise for Grenoble model (6 weeks of computation)
- in june, Jozef Kristek came to Grenoble in order to fix numerical instabilities encountered during the modelling of the Basel model and to set up the 3D transfer function for Colfiorito model
- computation of the 3D transfer function for Colfiorito basin (8 days of computation)

The research plan for this summer is:

1. to analyse additive minutes of noise synthetics for Colfiorito and Grenoble and cross-comparison with actual noise data. The results of this analysis will be presented during the WCEE conference and during the ESC2004 conference that will held in Potsdam in September;
2. to compute Basel model (6 weeks of computation) and analyse the data;
3. to compute Grenoble's 3D transfer function (a few days);
4. to build a noise database that will include noise synthetics for canonical models and real sites.

☺ ☹ This work package has started at the beginning of year 2. Due to the heavy computational requirements, some delay is anticipated in the deliverable D11.10 "Set of noise synthetics for H/V and array studies from simulation of real sites" and D17.10 “Overall comparisons for test sites”. The main reasons for the delay are:

The main reason for the delay is the time needed for computation: data analysis for Colfiorito and Grenoble sites are almost finished. Since Basel model and Grenoble's 3D transfer function have however to be run and analysed, the deliverables (D12.09, D11.10 and D17.10) will be send together with a complete description of the noise database. Noise synthetics for canonical models will also be included in this database.

XI WP11 – T01.11: scientific outcomes

Leader: Pierre-Yves Bard (Partner 1 – UJF-LGIT – Grenoble – France)

One important component of Task D "Dissemination of results", is to have the results of the project as widely disseminated as possible in the scientific and engineering community. In order to achieve that goal, extensive discussions during the last general meetings (Roma, 2002; Somlenice Castle, 2003), and many email exchanges, indicated the following tracks to be followed:

- organization of a special session, at a *world* scale, on the occasion of the 13th World Conference of Earthquake Engineering in Vancouver (August 1-6, 2004);
- organization of a special session, at a *European* scale, on the occasion of the XXIXth European Sesimological Commission held in Potsdam (September 12-17, 2004);
- looking for a special issue in a scientific journal allowing to reach the various communities involved in earthquake engineering, to present the main results and products in a synthetic way;
- publishing more focused sceintific papers in peer reviewed journals.

The following lines briefly describe what has been achieved regarding each of these 4 tracks.

1. Special session at XIII WCEE Vancouver

The Conference organizers answered positively to our request to have a special session devoted to "Sesame-related" topic. This session, entitled "Site Characterization for Site Effects Studies Using Ambient Vibrations", will take place on Wednesday, August 4, afternoon. A total of 34 communications will be presented in this session, out of which 13 will present various aspects of the SESAME project; in particular, the first half of the session will be devoted to the project, with 5 oral presentations, the first one with an overall presentation of the SESAME project, and the 4 others presenting successively the results and accomplishments for each of the 4 tasks.

All the papers (10 to 15 pages long each) will be distributed on site in the Conference Proceedings on an electronic support (CD).

SESAME oral presentations

- [1] Bard P.-Y., and SESAME participants, 2004. The SESAME project: an overview and main results. Proceedings of the 13th World Conference in Earthquake Engineering, Vancouver, August 2004, Paper # 2207.
- [2] Atakan K., A.-M. Duval, N. Theodulidis, B. Guillier, J.-L. Chatelain, P.-Y. Bard and SESAME-Team, 2004. The H/V spectral ratio technique: experimental conditions, data processing and empirical reliability assessment. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 2268.
- [3] Cornou C., J. Kristek, S. Bonnefoy-Claudet, D. Fäh, P.-Y. Bard, P. Moczo, M. Ohrnberger, M Wathelet, 2004. Simulation of seismic ambient vibrations: II. H/V and array techniques for real sites. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, Canada, August 2004*, Paper # 1130.
- [4] Koller M., C. Lacave et al., 2004. Practical user guidelines and software for the implementation of the H/V ratio technique : measuring conditions, processing method and results interpretation, *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper #3132.
- [5] Ohrnberger, M., E. Schissele, C. Cornou, M. Wathelet, A. Savvaidis, F. Scherbaum, D. Jongmans, and F. Kind, 2004. Microtremor array measurements for site effect investigations: comparison of analysis methods for field data crosschecked by simulated wavefields. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 940.

SESAME poster presentations

- [6] Duval A.-M., J.-L. Chatelain, B.Guillier and SESAME Project WP02 Team, 2004. Influence of experimental conditions on H/V determination using ambient vibrations (noise), *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 306.
- [7] Atakan K., P.-Y. Bard, F. Kind, B. Moreno, P. Roquette, A. Tendo and SESAME-Team, 2004. J-SESAME: a standardized software solution for the H/V spectral ration technique. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper #2270.

- [8] Theodulidis N., G. Cultrera, A. Tento, D. Faeh, K. Atakan, P.-Y. Bard, A. Panou and the SESAME-Team, 2004. Empirical evaluation of the horizontal-to-vertical spectral ratio technique: results from the SESAME project. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 2323.
- [9] Cultrera G., R. Azzara, F. Cara, R. d'Anna, G. Di Giulio, M. S. Giammarinaro, G. Passafiume, A. Rovelli and P. Vallone, 2004. Microtremor Measurements in Palermo, Italy: a comparison with macroseismic intensity and earthquake ground motion. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 915.
- [10] Teves-Costa, P., L. Senos and C.S. Oliveira, 2004. Correlation between damage distribution and soil behaviour estimated with ambient vibrations. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 1004.
- [11] Ohrnberger M, E. Schissele, C. Cornou, S. Bonnefoy-Claudet, M. Wathelet, A. Savvaidis, F. Scherbaum and D. Jongmans, 2004. Frequency wavenumber and spatial autocorrelation methods for dispersion curve determination from ambient vibration recordings. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 946.
- [12] Lacave C. and J. Rey, 2004. Is the phase of the one-sided autocorrelogram of the horizontal components of ambient vibrations (Takeshi's method) able to reveal the fundamental resonance frequency of a site ? *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, August 2004*, Paper # 3120.
- [13] Bonnefoy-Claudet S., C. Cornou, J. Kristek, M. Ohrnberger, M. Wathelet, P.-Y. Bard, D. Fäh, P. Moczo, F. Cotton, 2004. Simulation of seismic ambient noise: I H/V and array techniques on canonical models. *Proceedings of the 13th World Conference on Earthquake Engineering, Vancouver, Canada, August 2004*, Paper # 1120.

2. Special session at XXIX ESC Potsdam

In this case also, the Conference organizers answered positively to our request; however, due to a very big pressure, the "noise" session was merged with others devoted to site effects and seismic microzonation, so that the final session title is "*Nature of noise wave field and recent developments in microzonation*"; it will take place on Thursday afternoon, September 16th and Friday morning, September 17th. A total of 36 papers will be presented in this session, out of which 6 come from the SESAME project. Only the abstracts will be distributed, no special paper has been written.

SESAME ESC presentations:

- [1] Bonnefoy-Claudet S., C. Cornou, M. Ohrnberger, M. Wathelet, P.-Y. Bard P.-Y., F. Cotton F., D. Fäh 2004. Excitation of Rayleigh waves higher modes in seismic ambient noise. *XXIXth European Seismological Commission, Session F3, September 2004*.
- [2] Cornou, C., G. Di Giulio, M. Ohrnberger, J. Kristek, M. Wathelet, 2004. Simulated Vs observed seismic ambient noise in the Colfiorito basin: site effect estimation and noise wavefield characteristics. *XXIXth European Seismological Commission, Session F3, September 2004*.
- [3] K. Atakan, P.-Y. Bard, F. Cara, J.-L. Chatelain, G. Cultrera, A.M. Duval, B. Guillier, F. Kind, B. Moreno, P. Roquette, A. Tento, P. Teves-Costa, 2004. J-SESAME: a dedicated software for H/V spectral ratios. *XXIXth European Seismological Commission, Session F3, September 2004*.
- [4] M. Kristeková, D. Fäh, 2004. Computation of the h/v ratio using time-frequency analysis with continuous wavelet transform. *XXIXth European Seismological Commission, Session F3, September 2004*.
- [5] M. Ohrnberger, E. Schissele, C. Cornou, M. Wathelet, 2004. Reliability of dispersion curve estimates obtained from ambient vibration array analysis. *XXIXth European Seismological Commission, Session F3, September 2004*.
- [6] A. Panou, C. Cornou, N. Theodulidis, P. Hatzidimitriou, P.-Y. Bard, and C.B. Papazachos, 2004. Modelling of ambient noise horizontal-to-vertical spectral ratio in laterally varying structures: the case of the city of Thessaloniki (Northern Greece). *XXIXth European Seismological Commission, Session F3, September 2004*.

3. Special issue in a journal

A. Ansal, secretary general of the European Association of Earthquake Engineering, attended the SESAME Smolenice castle meeting in Fall 2003, and offered to devote an issue of the EAEE journal "*Bulletin of Earthquake Engineering*" to the SESAME project. As EAEE and BEE are touching a very wide community throughout Europe and Mediterranean basin, we accepted this proposal. The final decisions on the synthetic papers to be written in that issue will be taken during the SESAME last plenary meeting next October.

4. Focused papers

During the Smolenice meeting, a plan was established and agreed upon on the various specific papers that could be written on the basis of SESAME results. The following lines are indicating, for each task, the list of papers that was considered, as well as their present status paper.

Task A

- Conference papers (apart from 13WCEE and XIX ESC):

2 papers at 11th SDEE-EGE Conference (Berkeley, CA, USA, Jan.2004) papers:

Atakan K., A-M. Duval, N. Theodulidis, P-Y. Bard and the SESAME-Team, On the reliability of the H/V Spectral Ratio Technique, ICSDEE & ICEGE 2004 (Berkeley), CA, USA.

Duval A.-M., J.-L. Chatelain, B. Guillier and the SESAME WP02 Team, Influence of experimental conditions on H/V determination using ambient vibrations (noise), ICSDEE & ICEGE 2004 (Berkeley), CA, USA.

- Specific papers **already written, at least as a first draft**

Paper on "Instrumentation" based on Bergen WP02 tests (Guillier et al.): 1st draft written, under revision.

Paper on "Experimental conditions" based on WP02 experimental tests reported in D08.02 deliverable on "Measurement guidelines (Chatelain et al.): 1st draft written, under revision.

- Specific papers **still in preparation**

JSESAME paper (to be submitted to SRL (electronic seismologist) or Computer Geosciences and/or Special Issue of the BEE (?)). This paper can be sent together with another paper about the WP04 database (an article in SRL). Still in preparation

Empirical evaluation of the H/V technique (Haghshenas, Bard et al.): still in preparation

- Individual papers on WP04 **already written, at least as a first draft**

Paper on Colfiorito on the stability of H/V measurements: *written, GRL*

Cara F., G. Di Giulio and A. Rovelli (2003). A Study on Seismic Noise Variations at Colfiorito, Central Italy: Implications for the Use of H/V Spectral Ratios. *Geoph. Res. Lett.*, vol. 30 (in press).

Thessaloniki seasonal variation of noise (empirical comparison paper) : *written and submitted to Pageoph*

Azores case study : *1st draft written, under revision*

- Individual papers on WP04 **still in preparation**

Thessaloniki : an other paper on comparison of H/V ratios with observed damage

Paper on strong motion network data comparison of weak, strong and noise data (Greek case)

Palermo: comparison of H/V ratios with observed damage

A common paper for all the six case studies for WP04

Task B

- **Already written, at least as a first draft**

Ohrnberger, M., Scherbaum, F., Krüger, F., Pelzing, R. and Reamer, S.K., 2003. How good are shear wave velocity models in the Lower Rhine Embayment (NW-Germany) obtained from inversion of ambient vibrations?, *Bolletino di Geofisica Teorica ed Applicata* (submitted).

Wathelet M., Jongmans D. and Ohrnberger M. Surface wave inversion using a direct search algorithm and its application to ambient vibrations measurements. *Near Surface Geophysics* (submitted).

Malischesky, P., and F. Scherbaum: Comparison between Rayleigh H/V ellipticity peak frequency, and fundamental S-wave resonance frequency, in press

Köhler, A., Ohrnberger, M., Scherbaum F., Stange. S., and Kind F., 2004: Ambient vibration measurements in the southern Rhine graben close to Basle, subm. to *Annali di Geofisica*.

- **Still in preparation**

Marc Wathelet: Direct inversion of SPAC

Matthias Ohrnberger: Comparison of different methods for the determination of dispersion curves (first version however published in Vancouver)

Alexandros Savaidis: Determination of dispersion curves and comparison with those obtained from geotechnical models for the Greek data sets

Estelle Schissele: The influence of Pre/post selection

Task C

Paper 1 : Review paper from the literature survey: S. Bonnefoy. *Under preparation for Earth Science review, first draft almost completed.*

Paper 2: Noise modelling Part I: Simulation (Bratislava group: J.Kristek / P.Moczo). *First draft almost completed*

Paper 3: Noise modelling II: Parameter studies and constraints on source properties (S. Bonnefoy) *First draft complete, under revision*

Paper 4 : Canonical models / 3D models (C. Cornou) Goal: ? Relevancy of H/V technique and array processing techniques for 3D structures. *Still in preparation, but preliminary version already written for Vancouver*

Paper 5 to 9: Real sites: *In preparation*

5. Grenoble : C. Cornou + S. Bonnefoy

6. Colfiorito : INGV

7. Basel : C. Cornou

8. Liège : M. Wathelet

9: a synthesis paper: overall comparison

Paper 10: Time Frequency analysis (M. Kristekova + D. Fäh): *In preparation*

Up to now, the emphasis has thus been put mainly on most urgent publications, i.e., the Vancouver Conference. A significant amount of work remains to be done for paper writing; however, the preparation of Vancouver and Potsdam presentations helped a lot in maturing the subjects. This paper writing issue will be a major concern during the last plenary meeting in "Les Houches"

XII WP12 – T01.12: H/V user guidelines

Leader: Corinne Lacave (Partner 2 – Resonance – Genève – Switzerland)

The objective of this workpackage is to build the basis for practical application of the research results. To this aim, guidelines for single station ambient vibration measurements and their interpretation will be elaborated. Minimum quality requirements for the practical use of the H/V technique will be fixed, standard processing software will be provided on a CD-ROM with a use manual, and - as far as possible - scientific explanations will be given.

One of the main goals of SESAME is to recommend standard procedures for processing (WP02). In order to have this task complete, the project will also deliver the corresponding software. Such software should be well-documented and easy to use with different formats and should be compatible on different computer platforms. Therefore, it will be distributed as a CD-ROM with a built-in user manual.

The guidelines content has been defined and will be in the form of a brochure that consists of the following parts:

General content of the guidelines:

1. Technical requirements for measurements
2. Data processing standard
3. Interpretation guidelines

Appendices:

- b. "Good" and "bad" examples illustrating the merits and limitations
- c. Physical explanations
- d. "Field summary" + "Field-sheet"
- e. Evaluation of the similarity between a reference and a tested parameter

Since spring 2004, WP12 participants have been working on the developments of each part of the guidelines, on the basis of the research results from other workpackages. The WP12 is primarily based on the outcomes of task A (WP01, WP02, WP03), but also on the results of the other WP, in particular of WP07 (nature of noise wave field) and WP10 (scientific outcomes).

This writing process is still ongoing, as well as the associated review process. Each part of the guidelines is submitted to a group of internal reviewers for comments and suggestions for improvements. Then, the revised guidelines will be reviewed by some external experts and tested in practice by a team of seismological engineers which is not involved in the present research project. The experience of that team will be used to make final adjustments.

In order to maximize their dissemination, these user-guidelines will be presented during a special theme session at the 13th World Conference on Earthquake Engineering (Vancouver, August 2004), with the title "Site characterisation for site effect studies using ambient vibrations". This theme session will mainly report the results of the SEAME project.

A draft version of the guidelines will be ready for the 13WCEE meeting, at the beginning of August 2004. It is hoped and anticipated that the elaborated guidelines become an inter-nationally accepted quality standard for single station ambient vibration measurements and their interpretation.

XIII WP13 – T01.13: Recommendations for quality array measurements and processing

Leader: Denis Jongmans (Partner 4 – ULGG.DGO – Liège – Belgium)

The array processing may be split in 2 independent parts: the signal processing and the Vs profile inversion. Those 2 aspects were intensively discussed during the last meeting in February 2004 in Potsdam, gathering all partners working on synthetic and real datasets interpretation.

Among available array processing methods, 4 were systematically applied to all case studies: CVFK1 (sliding windows), CVFK2 (average cross spectral matrix), CAPON and SPAC. There is no reason to discard one of them and the main conclusion is: that the use of various combinations of analysis methods may allow to prevent [...] misinterpretation by providing complementary information on ambient vibration wavefield characteristics (Orhnberger et al., 13th World Conference on Earthquake Engineering to be held in Vancouver, August 2004). The detailed capabilities of each methods are still under study.

The efficiency and the flexibility of the inversion software as well as the interest of introducing a priori information into the inversions are demonstrated by case studies and synthetics, topic of an already accepted paper (special issue about surface waves from NSG) and of 2 other papers to be submitted to the BSSA.

XIV To conclude this sixth report

As outlined in the sections describing each active work package, the project is progressing normally, and there does not exist any major problem that jeopardize the chance of success of this project. Even, if some deliverables undergo some delays, these delays are always well explained, and remain under control. For this reason, we decided, with all the partners, to ask for a six months prolongation to the EC, which has been accepted.

The project will be finished in October 2004.

The next reports are:

- a progress report foreseen for October (report 7: minutes of “Les Houches” meeting + a copy of the abstracts presented during the special theme session in Vancouver);
- **the final report** foreseen for December 2004-January 2005 with the TIP.

The last meeting for the project SESAME will be in Les Houches, near Chamonix (France), from:

Sunday 3 October 2004 to Tuesday 5 October 2004

SESAME important dates

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 meeting
5	Sept. 2001			
6	Oct. 2001			Bergen – Oct 22-26 Task A - WP02
7	Nov. 2001	First progress report: 6 th months report		
8	Dec. 2001	(AGU)		
9	Jan. 2002	Potsdam – Jan 7-8 TaskA-WP02	Potsdam – Jan 9-11 TaskA-WP03 & TaskB-WP06	
10	Feb. 2002			
11	March 2002			
12	April 2002			During the EGS – Nice – April 21-27 Task A- WP02- WP 03- WP 04 D1, D2 → sent with D3 in June 03
13	May 2002		Zürich Task C meeting	D3: Progress report 1 (due on 30/06/02)
14	June 2002	Second report: first year progress report + Deliverables D1, D2 & D3		
15	July 2002			
16	Aug. 2002			
17	Sept 2002	(ECEE London) (ESC Genoa)		
18	Oct. 2002		Roma – Oct 22-26 Oct 22-24: WP02, WP03, WP04, WP09-10 meetings Oct. 25-26: General SESAME meeting	D5, D6, D7 → sent with the third report
19	Nov. 2002			
20	Dec. 2002		(AGU)	D4 draft sent with the third report
	Dec. 2002	Third report: 18 th months report + Deliverables D5, D6, D7 & a draft of D4		
21	Jan. 2003			
22	Feb. 2003	Potsdam – Feb. 3-14 Task B meeting	Bratislava – Feb. 20-21 Task C meeting	
23	March 2003			
24	April 2003		During the EGS-AGU-EUG Nice – April 7-11 WP02 meeting	D8, D9, D13 (first part), D14, D15 → sent with the fourth report
25	May 2003			D10: Progress report 2 (due on 30/06/03)
26	June 2003		Thessaloniki – June 12-13 WP03-WP04 meeting	
	July 2003	Fourth report: 2 nd year report + Deliverables D8, D9, D10, D13, D14 & D15		
27	July 2003		Grenoble – July 16-17 Task C meeting	
28	Aug. 2003			
29	Sept. 2003		Smolenice – Sept 22-24 Scientific Workshop	
30	Oct. 2003			
31	Nov. 2003			
32	Dec. 2003		(AGU)	
	Jan 2004	Fifth report: 32 th months report		
33	Jan. 2004			
34	Feb. 2004	Lisbon – Feb. 8-13 WP03 meeting	Potsdam – Feb. 16-20 Task C meeting	
35	March 2004			
36	April 2004			EGU – Nice (25-30 apr.)
37	May 2004			
38	June 2004			
39	July 2004			
	July 2004	Sixth report: 38 th months report + Deliverables D13, D16, D18, D20 & D21		
40	August 2004		Vancouver – August 1-6 13 th world conference in Earthquake Engineering	
41	September 2004		Potsdam – September 13-17 ESC	
42	October 2004	Les Houches – Oct. 3-5 Final Meeting		D11, D12, D17, D19, D22, D23, D24
43	November 2004			
44	December 2004			D25: Final report