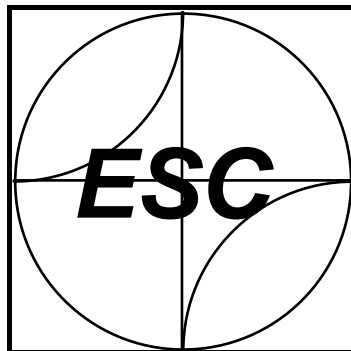


IUGG International Union of Geodesy and Geophysics
IASPEI International Association of Seismology and Physics
Of the Earth's Interior

EUROPEAN SEISMOLOGICAL COMMISSION

Activity Report 1998-2000
and
Report of the XXVII General Assembly 2000

Lisbon, Portugal



Web: www.gserg.nmh.ac.uk/esc/

Edited by

P. Suhadolc
Secretary General

and

Alice B. Walker
Assistant Secretary

PREFACE

The XXVII General Assembly 2000 was held at the University of Lisbon in Lisbon, Portugal, on invitation of the Institute of Geophysics "Infante D. Luis" of the University of Lisbon. The location provided an excellent place to convene 25 symposia and workshops with more than 420 papers for about 400 participants.

The weather was sunny for most of the conference time, but in spite of that the number of participants attending the sessions and workshops was high.

The Local Organizing Committee and its chairman Prof. Luis A. Mendes Victor worked hard to make the meeting a success and we would like to express our most sincere thanks to them. In particular, dr. Jorge Cristina, M. Inês Rio and Prof. Paula Teves Costa earn special recognition for their profound commitment to the organization.

In the framework of the ladies program some nice and instructive tours to historic places in and around Lisbon were organized. An excursion to Cabo de Roca and Sintra took place during the meeting and a post-conference tour to the Azores Islands was organized after the meeting.

Owing to the support granted by the LOC, a number of scientists mainly from Eastern European countries could be hosted during the meeting, but many could not make it in spite of the granted support. The Bureau of the ESC wants to express its deepest gratitude and appreciation.

There was only one change in the ESC-Bureau this time. Prof. Claudio Eva, replaced dr. Avi Shapira as Vice president, who has concluded his term. We all thank Avi Shapira for his very much appreciated help in the Bureau in the past four years.

Some changes have occurred within the subcommissions, chairpersons and several working groups have been redefined. This will certainly bring new life and fresh ideas to the ESC activities.

I urge everybody to regularly check the ESC Homepage on the Internet in order to read the latest ESC related news and be thus informed on the ongoing ESC activities.

ESC is looking forward to its XXVIII General Assembly in the city of Genova and appreciates very much the interest and efforts of our colleagues in Italy.

Peter Suhadolc
ESC Secretary General

THE XXVII ESC GENERAL ASSEMBLY
LISBON, 10 - 15 SEPTEMBER 2000
University of Lisbon

Meeting of the Bureau
Sunday, September 10, 2000

Participants: L Mendes Victor, A Shapira, D Giardini, P Suhadolc, A B Walker

Agenda

1. Changes in Bureau
2. Appointments
3. Titular Members
4. Next GA
5. Tel Aviv Administrative Proceedings
6. Sub-commissions
7. Miscellanea

1. Changes in the Bureau

A Shapira (Vice-Pres.) is resigning, having served for two terms.

2. Appointments

Nominating Committee: D Mayer-Rosa, S Gregersen, R Stefansson

Resolutions Committee: C-I Trifu, M Garcia Fernandez, T Van Eck

3. Titular members

13 Titular members (B Muco, Albania; A Yelles-Chaouche, Algeria; R Verbeiren, Belgium; E A Botev, Bulgaria; V Vavrycuk, Czech rep.; S Gregersen, Denmark; D Rouland, France; K Macropoulos, Greece; Z Weber, Hungary; D Jaser, Jordan; T Van Dam, Luxembourg; M Radulian, Romania; M Zouari, Tunisia) are newly appointed for the period 2000-2002. France has appointed D Rouland only informally for the time being.

S Gregersen will be the proxy of E Hjortenbergt for Denmark, J Fonseca will be proxy of J Trampert for Luxembourg, M Manic will be proxy of V Mihailov for Macedonia FYRO, J Niewiadomski will be proxy of S Gibowicz for Poland, M Radulian will be proxy for D Enescu for Romania, P Labak will be proxy of P Moczo for Slovakia and A Gosar will be the proxy of J Lapajne for Slovenia.

Egypt, Italy, Monaco, Morocco and the UK did not react to the letters of the General Secretary inviting to appoint a Titular member. Suggestions for Titular members from these countries are discussed.

Albania is again an IUGG member and thus an ESC member. In the last four years Albania was having observer status in the ESC.

An Application for membership has been received from Estonia (T All proposed as Titular member). Estonia is satisfying all the conditions required to be

a member of ESC (members of IUGG) and there are, therefore, no restrictions for its ESC membership.

4. Next General Assemblies

An invitation by the Dipartimento del Territorio e delle Risorse (DIP.TE.RIS) of the University of Genova (Italy) for 2002 has been received. The titular members will vote on the 2002 venue at the ESC Council on Thursday.

5. Tel-Aviv 1998 Proceedings

Published in 1999 by the (Editors: P Suhadolc, A B Walker). The Bureau acknowledges with thanks the big effort in the publication and distribution of the volume.

6. Subcommissions

H Vinnik is resigning from the positions of Subcommission chairperson and the Vice-Chairperson, H Aichele, is also retiring. The Bureau acknowledges with thanks their long and fruitful service to the ESC.

7) Miscellanea

No items are raised.

Meeting of the Executive and Local Organizing Committees Sunday, September 10, 2000

Participants: L Mendes Victor, A Shapira, D Giardini, P Suhadolc, A B Walker, K Makropoulos, H Aichele, C-I Trifu, J Mechie, J Zschau, D Slejko, A Ansal, C Browitt, J Cristina

Agenda

1. The Lisbon 27th General Assembly
2. Tel Aviv 1998 Proceedings
3. Changes in the Bureau and Sub-commissions
4. SC & WG
5. Nominations
6. Miscellanea

1. The Lisbon 27th General Assembly

L Mendes Victor opened the meeting, welcoming the delegates to the 27th ESC General Assembly in Lisbon. He outlined his personal aspirations for the outcomes of the meeting, particularly in the light of recent catastrophic Turkish earthquakes. They brought into focus deficiencies in our understanding and ability to improve the safety of our communities under the threat of such events.

In response to an invitation from P Suhadolc, J Christina outlined the facilities available within Lisbon University for conducting this 27th Assembly. He

reported that the excursion will return on Tuesday at 19:00. There is a dinner hosted by the Mayor of Lisbon on that day at 20:30.

The Executive acknowledges with thanks the excellent work done so far.

2. Tel Aviv 1998 Proceedings

The Tel Aviv Administrative Proceedings have been published and were distributed in early 1999. The Executive Committee acknowledges with thanks the effort in the timely publication and distribution.

A Shapira noted that the only problem encountered had been with the finances owing to the limited attendance of 250 delegates. He considered that 300 should be considered the "break-even" target number. He commented that the young seismologist training courses, both in Tel Aviv and Lisbon, were successful and important but the numbers of students were disappointing, at around 15 people. He recommended a more vigorous advertising campaign.

3. Changes in the Bureau and Subcommissions

P Suhadolc reminded members that the bylaws required the President and Vice President to serve no more than two terms; the secretary can serve indefinitely. Sub commission chairpersons were limited to three terms. P Suhadolc thanked A Shapira for his commitment over the past 4 years. In the subcommissions, a replacement is needed for Lev Vinnik and H Aichele. P Suhadolc reported that it is the responsibility of the subcommissions to propose subcommission chairpersons. The Council will elect to these posts taking account of those recommendations.

4. SC & WG

Reports of the activities of the SCs and WGs have been received before the conference except for SC-E. P Suhadolc asked J Zschau to improve this for the next Assembly. Subcommission chairpersons outlined the level of activity of their working groups.

5. Nominations

P Suhadolc announced the names for the nominations committee: D Mayer Rosa, S Gregeresen and R Steffanson, and the Resolutions committee: C-I Trifu, T Van Eck and M Garcia Fernandez. He explained that resolutions should be given to the resolutions committee by Wednesday evening so that they can be typed and presented to the ESC Council on Thursday afternoon.

A Walker will continue to represent ESC on the EMSC executive, P Suhadolc will represent the ESC on the ORFEUS board of directors and D Slejko will represent ESC in EAEE. These appointments are valid until the year 2000 as stated in the Reykjavik proceedings.

6. Miscellanea

D Giardini presented the emerging model for seismic hazard assessment for the whole of the Mediterranean region. It will be integrated with neighbouring hazard assessments and he hopes to publish a European hazard map with the

approval of the ESC. The emerging hazard maps will be presented as posters during the Assembly and comments and recommendations are invited and welcome.

P Suhadolc drew the committee's attention to the proposed Assisi workshop for March 2001, which will bring together ESC, Eurogeosurveys and the Europrobe community, with a focus on seismic risk.

Opening Plenary Session Monday, September 11, 2000

Present: About 150 participants.

1. General Activity Report of the ESC President

Ladies and gentlemen,

Let me present a short review of ESC activities in the years 1998-2000.

The Proceedings of the XXVI General Assembly of the European Seismological Commission in Tel Aviv were edited, printed and distributed. We congratulate the whole editorial staff, particularly A Shapira, R Hofstetter, P. Suhadolc and A. Walker, and express our sincere thanks to them.

The ESC Bureau met twice since the Assembly in Tel Aviv: in July 1999 during the Birmingham IUGG General Assembly and in January 2000 in Lisbon to prepare this Assembly. A business meeting was held in Birmingham, where a number of suggestions for the scientific programme of this Assembly were discussed. The third training course for young seismologists prior to the Lisbon Assembly was approved and financial support from IASPEI granted.

During the last two years (1998-2000), most of the Subcommissions and Working Groups were active either organizing workshops or participating in international conferences, such as the IUGG conference in Birmingham.

Highlights include: the completion of a European strong motion database which is being distributed on a CD-ROM by Nick Ambraseys as a result of a project co-ordinated within the joint ESC-EAEE WG on "Strong Motion Studies". A hazard map for the Mediterranean region is being produced in the framework of the working group on "Seismic hazard assessment". A poster session is being presented at this Assembly.

The participation of the working group on Volcanism and Earthquakes at this Assembly is particularly welcome. A field trip to the Azores at the end of the week will complement the working group activities.

Several workshops have been organised by ESC working groups. Among them, the Poljce, Slovenia workshop on seismic risk assessment methodologies and the International Workshop on "Broadband Array Seismology" held in Grafenberg. Together with Europrobe and Eurogeosurveys, the ESC has agreed to co-sponsor a workshop in Assisi in March 2001

which will focus on Seismic Risk in the European Region. The Turkish earthquakes and the potential for a more multi-disciplinary approach to understanding the threats in the European-Mediterranean region have stimulated the initiative.

Following the tradition started at the previous Assemblies, several papers to be presented at this Assembly have been already published in a book you have received at registration.

The bureau and the Local Organizing Committee have invested a great effort in preparing this Assembly and I am confident the outcome will advance our understanding of earthquake activity, the risks posed to our communities and the mitigation measures that can be taken to reduce their impacts on society.

2. Obituaries

L. Constantinescu (1914-1997)

L Constantinescu was born on 26 November 1914 and died on 29 November 1997. He graduated at the University of Bucharest in 1935 and defended the Ph.D thesis in 1941 in physics. He followed training stages in geomagnetism at Potsdam (1944) and Prague (1946).

He was professor of Geophysics at the Institute of Oil, Gases and Geology between 1949 and 1973 and at the Bucharest University between 1973 and 1997. He carried out a rich scientific activity in the field of seismology, geomagnetism and gravimetry, as founder director of the National Observatory of Geomagnetism (1943 - 1958), head of the Seismological Department, director of the Center for Geophysical Research of the Romanian Academy (1961 - 1970) and professor at the University of Bucharest. He was Titular member of the Romanian Academy.

His scientific activity, resulted in many books and scientific papers, represents a remarkable contribution in geophysics, characterized by a modern view and high competence. Together with Sabba S. Stefanescu, Liviu Constantinescu was creator of the Romanian school of geophysics. Strong personality, man of vast and brilliant culture, he was beloved by generations of students.

In the field of seismology, his research brought out significant contributions related to earthquake focal mechanism, structure of the Earth crust, seismicity, seismotectonics of Romania, earthquake precursory phenomena.

As vicepresident of the International Union of Geodesy and Geophysics (1967 - 1971), titular member of the European Seismological Commission (until 1992), vicepresident of this commission (1972 - 1976), member and vicepresident of the Coordination Committee of the PNUD-UNESCO Project for the Study of the Balkan Region Seismicity (1970 - 1977), president of the Romanian National Committee of Geodesy and Geophysics, etc., Liviu Constantinescu proved his high aptitude and skill in promoting and organizing scientific research at national and international level.

We shall always remember him with great respect and thanks!

(M. Radulian/D. Enescu)

Victor João de Sousa Moreira (1925-2000)

Ing. Victor de Sousa Moreira, retired Director of the Department of Geophysics of the Instituto Nacional de Meteorologia e Geofísica (INMG), died on January 30, 2000, at the age of 74. He was born in 1925 in Lisbon. He received a M.S. degree from University of Lisbon and completed the Geography Engineer Course in 1948.

He was a senior officer of the Serviço Meteorológico Nacional of Portugal, since 1951, working in the sector of Seismology and Geomagnetism. For 5 years he was Director of the Geophysical Service of “Instituto Nacional de Meteorologia e Geofísica”.

Among the national and international responsibilities, Ing. Victor Moreira has been:

- Head of the Department of Geophysics and Astronomy (1961-1965) of the “Serviço Meteorológico de Angola”
- National representative or delegate of Portugal in the IV, VIII, XII, XIII ESC General Assemblies (1970)
- Member of Sub-Commission “Tsunamis” and President the W.G. (Tsunamis 1976-1988)
- Representative of the INMG in EU, NATO, EGS and Ibero-Maghreb Projects, Meetings or General Assemblies.

The interests of Ing. Victor Moreira during his 42 years of activity were focused on Seismicity, Seismotectonics, Tsunamis and Deep-seismic Sounding Experiments in Portugal. The results of his work were presented in National or International Conferences, published in International Journals and National Institutional Reports.

Ing. Victor Moreira devoted his long activity to the development and promotion of seismology in Portugal.

We shall remember his contributions with great respect and thanks.

(L.A. Mendes Victor)

John Drakopoulos (1937-1999)

Professor John Drakopoulos, a leading figure of the scientific and academic community of Greece, passed away suddenly in Athens on April 29, 1999. He was at the peak of his academic career, while serving as Vice Rector of the University of Athens, after a successful research activity of 35 years, both in Greece and abroad.

He was born in Agios Nikolaos of Arcadia (Greece). He studied Physics at the University of Athens, where he continued his studies receiving a postgraduate degree in Electronics. Nevertheless it was Seismology, the science of the vibrant Earth, that eventually captured his imagination and won him over. In 1964 he commenced his career as a researcher in the Geodynamic Institute of the National Observatory of Athens and in 1965 as a research assistant in the Laboratory of Seismology of the University of Athens, working under Professor Angelos Galanopoulos. In 1968 he was conferred with the title of the Doctor of Seismology of the University of Athens and in 1970-1971 he carried out post-doctoral work at the International Seismological Institute of Tokyo, specializing in Engineering Seismology.

In 1979 he was elected by unanimous vote as Professor of Seismology of the University of Athens and was also appointed Director of the Geodynamic Institute of the National Observatory of Athens. During the period 1982-1994 he served as

Chairman of the Faculty of Geology of the University of Athens, Director of the Geodynamic Institute of the National Observatory of Athens and Director of the National Earthquake Planning and Protection Organization. In 1994 he was elected Vice Rector of the University of Athens, a position to which he was re-elected in 1997.

During his career, John Drakopoulos served as National Representative in Seismology at various European and international organizations. In 1992 he was elected Vice President of the ESC for four years. From the early 1970s, together with other renowned scientists in the Balkan seismological community, (the late Vit Karnik, to mention one), he was a pioneer in the opening of borders and collaboration between the Balkan countries in seismological matters.

His research contributions have been valuable and pervasive, covering a broad range of seismological and geoscientific topics, as affirmed by his 220 papers published in Greek and international journals. He was a pioneer in microzonation studies in Greece, a European country with major earthquake risk.

Professor Drakopoulos was a caring and devoted teacher, with a touch of inspiration that captivated his audience. He extended his guidance to both under- and post-graduate students and supervised many doctoral candidates. In his capacity as both academic teacher and Director of major Hellenic seismological institutes, John Drakopoulos supported modern seismology in Greece. Many of today's leading Greek seismologists and geophysicists were promoted under his guidance.

John Drakopoulos has been an accepted and influential public figure. He will be remembered as the solemn teacher who allayed the fears of the public, after the earthquake catastrophes that all too often tantalize the country. He was known and beloved by all Greeks. On an international level, the seismological community is mourning a leading member, a close friend, and the young Greek seismologists a great and unselfish supporter.

John's memory survives through his wife Helen and his two daughters Katerina and Maria. He will always live in our hearts.

(K. Makropoulos and V. Kouskouna)

Lev N. Rikounov (1928-1999)

Lev Nikolaevich Rikounov was born on April 12, 1928 in the town of Yakhroma, Moscow region. In 1951 he graduated from the physical faculty, Moscow State University. All scientific life of Lev Nikolaevich was connected with the physical faculty of the Moscow State University, where he worked as a scientific researcher, senior lecture, Professor, and the Head of the Cathedra. In 1984 Lev Nikolaevich was elected as a Correspondent Member of the USSR AS and in 1998, the Academician of RAS.

L.N.Rykounov was one of the first USSR seismologists who began to apply and develop the method of physical modeling. He was the first who used the three-dimensional solid model of the Earth for studying the diffraction of seismic waves

on the Earth's core and estimation of its rigidity. He carried out the cycle of studies of influence of local heterogeneities on the field of surface waves, which was very important for the development of modeling as well as for initiation of new problems of surface wave propagation.

Application of these ideas to natural conditions enabled the development of the physical model of storm microseismic noise, elaboration of methods of recognition and estimation of characteristics of lateral heterogeneities in the Earth's crust, and monitoring of cyclone processes. The studies of structure of the Earth's crust of seas and oceans resulted in construction of seismometric systems disposed on the bottom, which initiated the new direction in deep seismic sounding, whose efficiency and economy provided its wide use in the world geophysical practice. The specially created portable autonomous instruments and mobile networks of stations, "mobile research sites", opened the possibility to study detailed characteristics of dynamic processes in the Earth's crust on the basis of recording weak and micro-earthquakes.

The further development of this work was the study of weaker seismic phenomena, seismic emission. L.N.Rikounov together with his colleagues showed that even seismic noise permanently generated by geodynamic processes carried a large volume of geophysical information. They revealed the seismic response of the medium on external strain disturbances in the frequency range of about 30 Hz that is unusual for seismology, which initiated the development of new field in geophysics, the microscale seismology based on concepts about active self-organizing media and realizing the information from seismic noise field (noise tomography and monitoring of the dynamic state of active zones).

Studying the seismicity of various regions of the Earth, L.N.Rikounov noted the global asymmetry of the planet: rifts and extension dominate in one hemisphere and arcs and compression, in the other. He formulated the hypothesis that this asymmetry of the Earth is conditioned by the nonequilibrium state of its deep structures, first of all, the Earth's core. The study of dynamical features of nonequilibrium characteristics resulted in the concept of "node points" of the field of failure (the zones of adjustment of island arc with transform faults).

We shall always remember him!

(dr. Yuri Tyupkin)

3. Call of Titular Members

1998-2000

Country	Titular member	Confirmed or proposed	Presence/Proxy
Albania	B Muco	27.08.98	
Algeria	M Benhallou	06.08.96	
Austria	W Lenhardt	31.07.96	√

Belgium	Th Camelbeeck	14.09.94	√ R Verbeiren
Bulgaria	D Jordanov	13.06.96	
Croatia	M Herak	05.06.98	
Czech rep.	J Sileny	02.09.96	√
Denmark	E Hjortenberg	19.08.96	√ S Gregersen
Egypt	M Dessokey	16.07.96	
Finland	P Heikkinen	13.08.96	
France	A Deschamps	09.02.94	
Germany	F Scherbaum	12.09.96	
Greece	J Drakopoulos	12.09.94	√ K Macropoulos
Hungary	T Zsiros	16.09.94	
Iceland	R Stefansson	23.07.96	√
Ireland	A W Jacob	12.08.96	√
Israel	G Shamir	25.08.96	
Italy	C Eva	26.07.96	√
Jordan	Z El-Isa	12.09.96	
Lebanon	C Tabet	07.08.96	√
Luxembourg	J Trampert	27.08.98	J Fonseca
Macedonia FYRO	V Mihailov	04.09.96	√ M Manic
Monaco	P Mondielli	12.09.96	
Morocco	D Ben Sari	16.08.96	
Netherlands	R Sleeman	12.09.96	
Norway	J Havskov	31.07.98	
Poland	S Gibowicz	30.08.98	J Niewiadomski
Portugal	L Mendes Victor	10.07.96	√
Romania	D Enescu	18.08.96	√ M Radulian
Russia	Y Tyupkin	13.08.96	
Slovakia	P Moczo	07.08.98	√ P Labak
Slovenia	J Lapajne	02.03.94	√ A Gosar
Spain	J Badal	25.08.98	√
Sweden	O Kulhanek	15.08.96	√
Switzerland	D Giardini	21.06.98	√
Tunisia	M Allouche	08.09.94	
Turkey	R Yilmaz	28.01.94	
UK	I Stimpson	08.04.94	
<u>Observer status</u>			
Malta	P Galea	31.07.98	√

4. Activity reports of the Subcommissions

Short versions of activity reports of the Subcommissions are delivered by:

SC-A: "Seismicity" - K Makropoulos

SC-B: "Data Acquisition and Interpretation" - H Aichele

SC-C: " Physics of the Earthquake Source " - C-I Trifu

SC-D: "Crust and Upper Mantle Structure" - J Mechie

SC-E: "Earthquake Prediction" - J Zschau

SC-F: "Engineering Seismology" - D Slejko

The full reports, as received, are to be found in the Subcommission section.

5. Announcements

- The Nominating and Resolutions Committees are announced:

Nominating Committee

D Mayer-Rosa

S Gregersen

R Stefansson

Resolutions Committee

C-I Trifu

T Van Eck

M Garcia Fernandez

- Resolutions are adopted by the ESC-Council (should be transmitted in writing to the Resolution Committee on the day before the Council) and are posted at least 12 hours before the Closing plenary.

6. Opening of the General Assembly

The President declares the 27th General Assembly of the European Seismological Commission open, and wishes much success to all participants.

Opening Ceremony
Monday, September 11, 2000

University of Lisbon Choir

Welcome speeches by:

- Vice-President of the University of Lisbon, V Prof Doutor. David Ferreira
- President of the Instituto de Meteorologia, Dr. Fernando Quintas Ribeiro
- Dean of the Engineering Faculty, Eng., Eduardo Cansado Carvalho
- President of ESC, L A Mendes Victor

Address of ESC President

Ladies and gentlemen

The development of Seismology and the related fields of earth sciences, during the last decades, are giving more visibility to the role of the qualified experts in the definition of the policies that has to be adopted to assure the safety of societies.

As far it concerns the field of risk sciences the improved understanding of earthquakes is becoming to provide some guidance in teaching society rulers, managers and technicians how to build safer homes, schools and factories and how to keep safer and sustainable environment.

People are very sensible when talking about large earthquakes and a key question is formulated:

Are earthquakes unpredictable, perhaps reflecting a process of self-organized criticality? Can the strange attractors of this process be detected? This obvious non-linear challenge is frozen by the enormous amount of manipulated data that have been used for self-promotional purposes, as it occurs in many other areas of science.

First of all, knowing that earthquake prediction (in the sense of forecasting location, magnitude and date) is not feasible today, the improvement of the ability to predict how earthquakes will affect specific structures of the society in identified dangerous locations, has been considered fundamental, calling for more emphasis in the areas of prevention.

Lisbon was damaged by one of the major historical earthquakes, 1st Nov 1755. This rare event, in terms of the human life duration, was very well reported, following a very wise decision of the kingdom of Portugal. So, in order to get well-documented information about the damaging effects of the earthquake, the Prime Minister of Portugal has requested a complete national evaluation of the

devastating consequences of the event. Since then, many scientists have been looking for models of earthquake disaster effects noting that this is not just a field of modern science, it is a notable public issue.

The absence of actual method of prediction has been sometimes calling the attention of politicians that are beginning to point out that more than 30 years of research have yet to produce a viable system of earthquake prediction and more exhaustive rule of prevention in any scenario of society organization. Nevertheless, in the absence of positive advancement on earthquake forecasting, when the seismic history of the area is carefully studied, requesting the intervention of experts the pattern of earthquake occurrence, even if complex and erratic, can guide the statistical assessment of the hazard in order to predict future disturbances. Basic insights in the field of seismology have been discovered thanks to the pluridisciplinary projects integrating geologists, historians, geographers and engineers; as a result of the rising rate of urbanization, the poor performances of engineered urban structures have reached alarming proportions, calling for a better dialogue between urban experts on soil mechanics, seismology and earthquake engineering. Surface geology is one of the major factors of earthquakes damages. The difficulty to detect some of the dynamic parameters by available scientific instruments, is not favouring the link between model simulations and real data, theory and practice.

The major tasks of monitoring the natural earth's phenomena, like earthquakes have been greatly facilitated by the modern information technologies promoting well-adapted structures for alerting in case of earthquake or tsunami disasters. Plans of earthquake monitoring on the basis of the geography of seismicity, delimitating hazard regions, are providing almost real time data at the disposal of scientific and technical institutions, allowing examination, transmission, analysis and processing of information, improving the viability in the assessment of the related natural hazard.

The governments have to encourage and support scientific and technological research in this specific domain, and to spread the use of advanced results mobilizing the relevant departments to take measures for successful actions and defining responsibilities and rules, in order to ensure the safety of people, property and society in general.

The XXVII General Assembly of the ESC, in the scope of the early ones, will continue to be a very important forum of discussions about those scientific domains necessary to implement and to improve the understanding and the safeguard of the Planet Earth. (Dear attendees) allow me to express my sincere wishes of fruitful work and very pleasant stay in our city, hoping that many of you being for the first time in Portugal will return soon.

Meeting of the ESC Council

Thursday, September 14, 2000

Present: Titular Members and Executive Committee

The ESC President welcomes all delegates and thanks the Secretary General P Suhadolc and the Assistant Secretary A Walker, for their important contributions to the organisation of this 27th ESC General Assembly. He also announces the names of the people he has invited as observers to the meeting: The representative of Armenia that has applied for ESC membership, Prof. S Balassanian.

1. Presence of a quorum

P Suhadolc ascertains the presence of the quorum. 34 out of 49 are present.

2. Appointment of the Election Chairman and tellers

F Scherbaum is proposed as Election Chairman, A Gosar and M Herak as tellers. The proposal is approved.

3. Next ESC General Assemblies

P Suhadolc informs the Council that an invitation has been received by the ESC Bureau for the organisation of the XXVIII ESC General Assembly in the year 2002 from the Dipartimento del Territorio e delle Risorse (DIP.TE.RIS) of the University of Genova (Italy).

No other candidatures are raised from the floor.

There being no objections to a public vote, the nomination was carried unanimously by a show of hands; 34 votes in favour, none against and no abstentions. Contact person C Eva.

In response to a request from P Suhadolc, C Eva thanks the Council approving this candidature and invites all ESC members to attend the ESC Genoa Assembly. The date will be the first week of September. It is noted that EAEE will meet in London during the second week of September. The 2002 ESC General Assembly will be, therefore, organized by the Department of Earth Sciences of the University of Genoa (Italy). Contact person: C Eva.

P Suhadolc asks the floor if there are any candidatures for the General Assemblies after 2002. The Titular member for Austria W Lenhardt raises the candidature of the University of Vienna to organize the 29th General Assembly in Vienna in 2004. The candidature is acknowledged with thanks.

4. Elections

The Election Chairman F Scherbaum takes over the presidency and asks the Nominating Committee to present the candidates for the Bureau in sequential order.

Soren Gregersen, member of the Nominating Committee, points out that there is one matter to be discussed before the slate of candidates for officers of the ESC is presented.

According to the ESC By-laws it is not possible to elect more than one officer from each one country. When the Nominating Committee has considered the best possible slate for the election for the coming 2-year period they have found several candidates from one country.

This condition of the By-laws is there to protect our European Commission from being dominated by one nation. The Nominating Committee judgment is that there is no danger of national dominance by this exception for one administrative period of two years.

The Nominating Committee prefers to bring up this question before presenting names, so it can be discussed independently of individual candidates.

The Nominating Committee, therefore, asks the Council to decide on: "The ESC Council decides for the coming two-years period to accept two officers of the Bureau from one country, as an exception to the existing By-laws."

P Suhadolc confirms that this condition is in the Article 5 of the By-laws.

L Mendes Victor asks the floor if there are any comments on this issue.

J Zschau asks why the exemption should be there only for a two-year period. C Browitt proposes to have the By-laws amended at the next Assembly in order to have more flexibility on this strict condition. P Suhadolc points out that the Council is sovereign and can always allow for such exemptions if there is a need for it. After some general discussion it is agreed to keep the Bylaws as they stand.

L Mendes Victor then asks the Council to vote on the proposal of the Nominating Committee. There are no objections that the election is carried out by show of hands. The proposal is adopted unanimously.

The President of the Nominating Committee D Mayer-Rosa presents the candidates in sequential order.

Results of the elections:

- Bureau:

President: L Mendes Victor is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands. L Mendez Victor is elected (votes: 31 yes, 0 no, 3 abs.)

Vice-Presidents: For the first of the two Vice-presidents C Eva is presented. No further candidates are raised from the floor. Election is carried out by show of hands. C Eva is elected (33 yes, 0 no, 1 abs.)

For the second of the two Vice-presidents D Giardini is presented. No further candidates are raised from the floor. Election is carried out by show of hands C D Giardini is reelected (33 yes, 0 no, 1 abs.)

Secretary General: P Suhadolc is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands. P Suhadolc is elected by show of hands (33 yes, 0 no, 1 abs.)

Assistant Secretary: A B Walker is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands. A B Walker is elected by show of hands (33 yes, 0 no, 1 abs.)

P Suhadolc gave warm words of thanks to A Shapira for his vice presidency and for organising the successful Tel Aviv Assembly.

- Subcommissions

SC-A: K B Makropoulos is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands (33 yes, 0 no, 1 abs.) K B Makropoulos is elected.

SC-B: A Shapira is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands (33 yes, 0 no, 1 abs.). L Shapira is elected.

SC-C: C-I Trifu is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands (34 yes, 0 no, 0 abs.). C-I Trifu is elected.

SC-D: J Mechie is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands (33 yes, 0 no, 1 abs.). J Mechie is elected.

SC-E: J Zschau is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands (33 yes, 0 no, 1 abs.). J Zschau is elected.

SC-F: D Slejko is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands (33 yes, 0 no, 1 abs.). D Slejko is elected.

P Suhadolc asked the subcommission chairpersons to deliver a short summary of their activities and report any changes in the sub-commissions.

For SC-A, K Makropoulos reported that M Stucchi was the new vice Chairperson and that three working groups have been cancelled; "European Earthquake Catalogue", "Ibero-Maghrebian Region" and "Central and Eastern Europe". The working group on "Statistical Models of Earthquake Occurrence" is now the responsibility of P Burton. In addition, one working group has been renamed from "Seismotectonic Analysis" to "Seismogenetic Structures", responsible C Eva.

For SC-B, H Aichele reported that A Shapira is the new chairperson of the subcommission, K Klinge is Vice Chairperson and I Oprsal is secretary. F Riviere

has replaced B Dost as chairman of the working group on "Data Centres and Data Exchange" and that the working group on "Microseisms" has been cancelled.

For SC-C, A Deschamps reported that M Meghraoui is the new secretary and G Bock is now responsible for the working group on "Moment Tensor Inversion on a Regional Scale".

For SC-D, J Mechie reported that there were no changes in the subcommission.

For SC-E, J Zschau reported the following changes: the working group on "Field observations", has changed its name to "Field and Laboratory observations" and a new working group on "Earthquake Triggering" has been formed, responsible G Papadopoulos.

For SC-F, D Slejko reported that the only change in the SC occurred in the working group on "Earthquake Hazard" that has two new responsables: M J Jimenez and Ch Papaioannou. He also pointed out that each of the four working groups has a specific goal to reach in the next two years.

5. Titular Members

P Suhadolc informs the Council that he has received two applications for new ESC Titular members: Estonia and Armenia. Both countries fall in the geographical area defined in the ESC By-laws, but only Estonia is at present a full IUGG member, whereas Armenia has recently submitted its application. All criteria are fulfilled for Estonia becoming a member of the ESC. The appointed Titular member from Estonia T All could not make it to Lisbon. The Bureau, therefore, asks the Council to vote on the new member: 34 votes yes, 0 against, 0 abstentions. Estonia is accepted as the 39th member of the ESC.

The Bureau proposes to the Council to grant observer status to Armenia until this country is a full member of IUGG and asks the Council to vote on the new observer: 34 votes yes, 0 against, 0 abstentions. Armenia is accepted as an observer in the ESC. P Suhadolc invites S Balassanian to say a few words.

S Balassanian thanks the Council for granting Armenia observer status and looks forward to a good future interaction.

The Bureau then proposes the confirmation of Titular Members appointed by their respective countries. P Suhadolc reports that he has not received the official letters of appointment for the Titular members of Austria, France, Egypt, Italy, Lebanon, Monaco, Morocco and the UK. The Bureau proposes to the Council that W Lenhardt is appointed Titular member for Austria, D Rouland for France, M Dessokey for Egypt, C Eva for Italy, C Tabet for Lebanon, P Mondielli for Monaco, B Tadili for Morocco and A Walker for the UK, pending their approval by their respective National Committees for IUGG.

P Suhadolc noted that there was a complication in respect of notification of the Titular member for Spain, insofar the nominating letter appointed A Roca Adrover as IASPEI representative. The Bureau proposes he serves also as ESC

representative. P Suhadolc asks the Spanish Titular member for his comment on this issue. J Badal commented that this was caused by the establishment of a new Authority in Spain for such appointments and that the difficulty would be cleared up in the near future.

P Suhadolc reads the names of the proposed Titular members and points out to the Council the newly appointed ones: A Yelles-Chaouche (Algeria), R Verbeiren (Belgium), E A Botev (Bulgaria), V Vavrycuk (Czech rep.), S Gregersen (Denmark), T All (Estonia), D Rouland (France), K Makropoulos (Greece), Z Weber (Hungary), D Jaser (Jordan), T Van Dam (Luxembourg), M Radulian (Romania), A Roca Adrover (Spain), M Zouari (Tunisia), A Walker (UK).

The Council, unanimously, approves the following list of Titular Members for the Administrative period 2000-2002:

<u>Country</u>	<u>Titular member</u>	<u>Confirmed</u>	
Albania	B Muco	05.09.00	
Algeria	A Yelles-Chaouche	22.06.00	
Austria	W Lenhardt	14.09.00	
Belgium	R Verbeiren	13.07.00	
Bulgaria	E A Botev	19.07.00	
Croatia	M Herak	13.07.00	
Czech rep.	V Vavrycuk	14.07.00	
Denmark	S Gregersen	22.06.00	
Egypt	M Dessokey	14.09.00*	
Estonia	T All	24.07.00	New Member
Finland	P Heikkinen	01.08.00	
France	D Rouland	14.09.00	
Germany	F Scherbaum	02.08.00	
Greece	K Macropoulos	14.09.00	
Hungary	Z Weber	07.08.00	
Iceland	R Stefansson	27.06.00	
Ireland	A W Jacob	08.07.00	
Israel	G Shamir	12.08.98	
Italy	C Eva	14.09.00*	
Jordan	D Jaser	04.07.00	
Lebanon	C Tabet	14.09.00*	
Luxembourg	T Van Dam	06.07.00	
Macedonia Fyr	V Mihailov	14.09.00	
Monaco	P Mondielli	14.09.00*	
Morocco	D Tadili	14.09.00*	
Netherlands	R Sleeman	28.08.00	
Norway	J Havskov	21.06.00	
Poland	S Gibowicz	08.07.00	
Portugal	L Mendes Victor	31.07.00	
Romania	M Radulian	01.09.00	
Russia	Y Tyupkin	22.06.00	

Slovakia	P Moczo	31.07.00
Slovenia	J Lapajne	21.06.00
Spain	A Roca Adrover	04.07.00
Sweden	O Kulhanek	27.06.00
Switzerland	D Giardini	18.07.00
Tunisia	M Zouari	21.07.00
Turkey	Y Iravul	02.08.00
UK	A B Walker	14.09.00*
<i><u>Observer status</u></i>		
Malta	P Galea	31.07.98
Armenia	S Balassanian	14.09.00

* = proposed by ESC Bureau

6. Resolutions

M Garcia Fernadez, President of the Resolutions Committee, presents each resolution. With minor amendments the following resolutions have been adopted.

Data from historical monuments

Considering

that seismic hazard assessments depend generally on knowledge of the effects of earthquakes over long periods of time (up to at least 500 years),

Recognising

that most historical records prior to 1900 are focused on damage to monumental buildings such as castles, churches, mosques and towers,

the ESC recommends

that a basic 'code of practice' be established for the evaluation of the effects of earthquakes on historical monuments taking into account their structural integrity together with their regional and time dependent characteristics.

Macroseismic field investigation missions

Considering

that a damaging earthquake is a unique opportunity to collect pertinent data which otherwise might be lost; and that this fact refers specially to macroseismic data, which have to be collected in the immediate aftermath, before the cleaning and reconstruction process has started.

the ESC recommends

to explore possibilities that a field investigation team be formed for immediate post-earthquake surveys collecting and evaluating macroseismic data;

that the new EMS-98 scale, should be applied;

that the data gathered on these missions is disseminated rapidly to the whole seismological community via the Internet and subsequent publications;

that ESC countries welcome this initiative to explore the possibilities and identify the difficulties of implementing such field investigating missions;

that European institutions and other sources will be approached for financial support under ESC auspices.

Thanks

Acknowledging

the hard work of the Local Organising Committee in arranging the XXVII General Assembly of the ESC in Lisbon, and noting the success of the sessions, and fruitful outcomes of many meetings and debates, the ESC Council

thanks

the LOC for all their efforts in this city of the famous 1755 earthquake, which have resulted in such a memorable conference.

7. Discussion

No issues are raised from the floor.

Closing Plenary

Friday, September 15, 2000

1. Address by ESC President

The President thanks all participants for the scientific contributions and the Local organising committee, in particular for the successful work done during this meeting.

2. The new Bureau 2000-2002

The new ESC Bureau 2000-2002 is introduced:

President: L Mendes Victor (Portugal)
Vice President: D Giardini (Switzerland)
Vice President: C Eva (Italy)
Secretary General: P Suhadolc (Italy)
Assistant Secretary: A B Walker (UK)

3. Confirmation of the Subcommittee Chairpersons

SC-A: "Seismicity"	K Makropoulos
SC-B: "Data Acquisition and Interpretation"	A Shapira
SC-C: "Source Physics"	C-I Trifu
SC-D: "Crust and Upper Mantle Structure"	J Mechie
SC-E: "Earthquake Prediction"	J Zschau
SC-F: "Engineering Seismology"	D Slejko

4. Confirmation of Titular Members

The General Assembly confirms the ESC Titular members (see list under point 4 of ESC Council meeting) for 2000-2002.

5. The next General Assembly

The next General Assembly in Genova 2002 is announced with thanks to the Dipartimento del Territorio e delle Risorse (DIP.TE.RIS) of the University of Genova (Italy).

6. Proceedings and publication

All authors of oral or poster papers will have the option of publishing in special volumes of journals. Authors will be invited by the Conveners with special letters.

7. Adoption of resolutions

The resolutions accepted by the ESC-Council are read one by one and adopted by the General Assembly.

8. Closing word of the ESC President

The President L Mendes Victor thanks, on behalf of the ESC, all participants and the Local Organising Committee for the excellent conference and invites everybody to attend the XXVIII ESC General Assembly in Genova.

ESC SUBCOMMISSIONS AND WORKING GROUPS

Activity Reports

SC-A Seismicity of the European Region

Bureau 1998-2000

Chairperson: K Makropoulos (Greece)
Vice-Chairperson: J Bonnin (France)
Secretary: Z Schenkova (Czech Republic)

Working Groups 1998-2000

1. European Earthquake Catalogue. Responsible: J Bonnin (France)
2. Ibero-Maghrebian Region. Responsible: L Mendes-Victor (Portugal)
3. Historical Seismology. Responsibilities: C Hammerl (Austria), M Stucchi (Italy);
Sub-topics and responsible: Important Historical Earthquakes (C Hammerl, Austria), Historical Earthquake Data (M Stucchi, Italy)
4. Central and Eastern Europe. Responsible: Z Schenkova (Czech Republic)
5. Volcanism and Earthquakes. Responsible: J Neuberg (UK), R Carniel (Italy)
6. Seismotectonic Analysis. Responsible: C Eva (Italy)
7. Statistical Models of Earthquake Occurrence. Responsible: G Papadopoulos (Greece)
8. Personal Computers in Seismicity Studies. Responsible: M Garcia-Fernandez (Spain), N Voulgaris (Greece)

Activity Report 1998-2000 by K.C.Makropoulos

During the XXVI General Assembly held in Tel Aviv, Israel, from August 23 to 28, 1998, the main activities of SC-A working groups for the previous two years (1996-1998) were presented through 4 scientific sessions, 2 workshops and 1 special symposium with a total of 78 oral and poster presentations corresponding to about 27% of the scientific work presented during the Assembly.

During the last two years (1998-2000), most of the Working Groups were active by either organizing workshops or participating in international conferences like the General Assemblies of the IUGG, EGS, EUG and ASC. More specifically:

WG 3, reformed during the previous Gen. Assembly in Tel Aviv with the title "**Historical Seismology**", held its first workshop from 1-5 September 1999 in Macerata, Italy, dealing with very important and sensitive subjects like: "ways and means of intensive and extensive historical investigation", "damage and intensity assessment", "completeness of data" etc. A web site of the WG is now available (<http://emidius.irrs.mi.cnr.it/HistSeism/home.html>).

The WG on the "**Seismicity of Central and Eastern Europe**" have shown once again, considerable activity. Members of the Group participated in workshops

organized in the frame of EU funded INCO-COPERNICUS projects like the "Assessment of Seismic Potential in European Large Earthquake Area", (ASPELEA), and the "European Network on Seismic Risk, Vulnerability and Earthquake Scenarios", (ENSeRVES). Both projects are on their final stage. At the same time, they contributed to the "Global Seismic Hazard Assessment Program", the well-known GSHAP, by compiling Earthquake Hazard Maps for Czech Republic, Poland and Slovakia and to the Third Level Seismo-geographical Regionalisation. A noteworthy initiative taken by members of this group was the establishment of a regional geodynamic network covering broad neighboring regions of the Czech Republic and Poland. Two workshops on the subject, (Nov. 1998 and April 2000), have already taken place and the results published in a special issue of the journal for Central Europe Exploration Geophysics, Remote Sensing Data and Environment, 2/99,1999.

The WG on "**Volcanism and Earthquakes**" has continued to be a place for scientific discussion about the seismic data acquired on volcanoes, both by permanent monitoring networks and by specific experimental setups. In particular, more and more importance was directed to the analysis of broadband data, offering considerable new insights into the volcano dynamics. During the last two years, the annual workshops took place in Paratunka, a geothermal field near the capital of Kamchatka Petropavlovsk and in Acrotiri on Santorini, Greece, respectively. Abstracts and list of participants for each workshop can be seen in the WG's website. The proceedings of the 1996 workshop were published as a special issue of *Annali di Geofisica*, last year, (V.42, n.3, 1999), while the ones from the 1997, Lake District workshop are in press (JVGR). The annual workshop for this year will take place in the Azores. The web page of the WG is: http://earth.leeds.ac.uk/esc_wg/

The members of the WG on "**Statistical Models of Earthquake Occurrence**" were mainly involved with the final stage of ASPELEA "Assessment of Seismic Potential in European Large Earthquake Areas" and the research collaboration of several institutes and individuals who are active in the WG, within the frame of this project. Discussion for future activities is planned during the Lisbon meeting.

The WG on "**Personal Computers in Seismicity Studies**", is planning to join the initiative taken in Birmingham at the IUGG to create a IASPEI/FDSN/ORFEUS PC Working Group. One of the first activities of the new Working Group will be to implement a specific page devoted to PC software at ORFEUS Website, while the PCSL will be still available.

All the above, briefly described, activities during the past two years of our Subcommission- A: Seismicity of the European Region, will also be expressed through oral and poster presentations during the present General Assembly which is about to start.

Bureau 2000 – 2002

Chairperson: K Makropoulos (Greece)

Vice-Chairperson: M Stucchi (Italy)

Secretary: Z Schenkova (Czech Republic)

Working Groups 2000 – 2002

1. Historical Seismology. Responsibilities: C Hammerl (Austria), M Stucchi (Italy)
2. Volcanism and Earthquakes. Responsibilities: J Neuberg (UK), R Carniel (Italy)
3. Seismogenetic structures. Responsible: C Eva (Italy)
4. Statistical Models of Earthquake Occurrence. Responsible: P Burton (UK)
5. Personal Computers in Seismicity Studies. Responsibilities: M Garcia-Fernandez (Spain), N Voulgaris (Greece)

SC-B Data Acquisition Theory and Interpretation

Bureau 1998-2000

Chairperson: L Vinnik (Russia)
Vice-Chairperson: H Aichele (Germany)
Secretary: B Dost (Netherlands)

Working Groups 1998-2000

1. Data Centers and Data Exchange. Responsible: B Dost (The Netherlands)
2. Data Processing and Interpretation. Responsible: F Scherbaum (Germany)
3. Microseisms. Responsible: E Hjortenberg (Denmark)
4. Theory of Seismic Wave Propagation and Deep Earth Structure. Responsible: P Malischewski (Germany)
5. History of Seismometry. Responsible: G Ferrari (Italy)
6. IASPEI Manual on Seismological Observatory Practice. Responsible: P Bormann

Activity Report 1998-2000

by H Aichele, P Malischewsky and G Ferrari

An ESC workshop on Broadband Array Seismology was held at SZGRF Erlangen (details on the web-page <http://www.szgrf.uni-erlangen.de/workshop.html>).

In February 22-25, 1999 a workshop of the Working Group on Digital Seismology of the German Geophysical Society and Working Group of Data Acquisition of the ESC was held by the Seismological Central Observatory Gräfenberg (SZGRF) in cooperation with the Institute of Geosciences of the University of Potsdam. In form of lectures and guided exercises, the workshop provided an introduction into the analysis and interpretation of Digital Broadband Array Data for seismologists and advanced students.

The working group "**Theory of Seismic Wave Propagation**" of the Subcommittee SC-B "Data Acquisition, Theory and Interpretation" is intended to be a platform for all people within the seismological community who are interested in solving more fundamental problems connected with seismic wave propagation and related problems. This working group was created to build upon the great progress achieved by present seismic tomography initiatives. Further improvements are anticipated using the large amount of seismic data for a better understanding of the Earth's interior through a deeper knowledge of the behaviour of seismic waves in non-ideal media. The participation of well-known scientists in the sessions of this working group supports this development. But there is no permanent membership within this working group. At the ESC assembly in Tel Aviv (1998) the session was announced under the title "Theory of Wave Propagation and New Techniques of Data Processing" with the conveners Peter G. Malischewsky, Dan Loewenthal and Vladimir Shtifelman. There were 9 contributions which covered a great spectrum from optimal use of tomography data over waveguide problems up to coda analysis.

The conveners of the session in Lisbon (2000) under the title "Wave Propagation in Heterogeneous Media" were Fabio Romanelli, Peter G. Malischewsky and Tatyana B. Yanovskaya. 12 papers were presented covering fundamental questions of surface wave theory, 3D modelling of global seismic wave propagation, trapped waves, source and site effects, effect of heterogeneity and anelasticity and others. The papers were discussed thoroughly.

Between the assemblies the working group is kept alive by mutual consultations of all people who are interested in theoretical problems of wave propagation, among them J. Badal, S. Gregersen, H. Igel, R. Kind, G. L. Kosarev, P. G. Malischewsky, V. Maupin, Th. Meier, L. A. Molotkov, G. Mueller, O. Novotny, F. Romanelli, F. Scherbaum and T. B. Yanovskaya.

The recent experiences conducted in Italy with the TROMOS project (since 1990) and in Europe with the ESC WG "**History of Seismometry**" (HoS, since 1992) have increased the international seismological community's interest in research into the history of seismology (Ferrari 1997 and 2000). At the beginning of 1999

within the scope of the IASPEI Committee on Education, a Sub-Committee called "Historical Instruments and Documents in Seismology" was created with the goal of promoting: (1) research, inventory, and restoration of historical instruments, recordings, station bulletins, papers and scientific correspondence; (2) the preservation and reproduction of seismograms and historical documents, especially scanning/digitising into computer files, (3) testing of techniques for scientific investigation concerning all historical seismic data.

In the two-year period 1999-2000 the activity of the WG was combined with that of the S-C with the joint objectives of better sensitising the seismological community as well as the historians of science towards recovering, cataloguing and studying the historical materials of seismology.

The first concrete initiative of this collaboration between the IASPEI S-C and the ESC WG HoS has been the creation of an instruments database (about 2,500) and a database of their respective observatories and stations (more than 650) which were operating all round the world between the end of the 19th century and the 1970s. The database also acquires information on the availability of historical seismograms and the biographical notes on scholars, instrument designers and instrument makers. The census was carried out on the basis of numerous bulletins, publications relating to the individual instruments of the observatories and some specific publications (Ferrari 2000). The database, a preliminary version of which is already available, presented at Lisbon within the scope of the WSB-3 "Historical Instrumentation and Documents in Seismology", is being continually updated. Since December 1999, a summary and preliminary version of the database has also been made available on the Internet (Web S-C, 1999-2001).

The state of the research, ranging from scientific contributions to the processing of the recovered historical data and new proposals, has been presented and discussed within the scope of the 2 WS held at the XXII IUGG General Assembly in Birmingham (19-30 July 1999) and the XXVII ESC General Assembly in Lisbon (10-15 September 2000), respectively.

References

- Ferrari, G. (1997a). Cultural and Scientific Value of Seismology's Heritage in Europe: Why and How to Preserve, in Ferrari (1997b), in *Proceedings of the Workshop: Historical Seismic Instruments and Documents: a Heritage of Great Scientific and Cultural Value*, Luxembourg, May 16th - 18th, 1994. Walferdange (Grand Duchy of Luxembourg), Conseil de l'Europe, Cahiers du Centre Européen de Géodynamique et de Séismologie, vol.13, Luxembourg, 1-30.
- Ferrari G., 2000, The New IASPEI Sub-Committee on Historical Instruments and Documents in Seismology: Goals, Objectives and First Results, *Seismological Research Letters*, 71, 553-561. Web page of the S-C (1999-2001), Historical Instruments and Documents in Seismology, December 1999, http://www.sga-storiageo.it/sga/english/his_en.htm

Bureau 2000-2002

Chairperson: A Shapira (Israel)
Vice-Chairperson: K Klinge (Germany)
Secretary: I Oprsal (Czech rep.)

Working Groups 2000-2002

1. Data Centres and Data Exchange. Responsible: F Riviere (France)
2. Data Processing and Interpretation. Responsible: F Scherbaum (Germany)
3. Theory of Wave Propagation and Deep Earth Structure. Resp.: P Malischewski (Germany)
5. History of Seismometry. Responsible: G Ferrari (Italy)
6. IASPEI Manual on Seismological Observatory Practice. Resp.: P Bormann (Germany)

SC-C Physics of the Earthquake Sources

Bureau 1998 - 2000

Chairperson: C-I Trifu (Romania)
Vice-Chairperson: A. Deschamp (France)
Secretary: H Dufumier (France)

Working Groups 1998 - 2000

1. Paleoseismicity. Responsible: M Meghraoui (Algeria)
2. Focal parameters determinations. Responsible: C-I Trifu (Romania)

Activity Report (1998 - 2000) by C-I. Trifu, M. Meghraoui and K. Atakan

Between 1998 and 2000, the Sub-commission Physics of the Earthquake Sources has coordinated two working groups: one on Paleoseismology, and the other one on Determination of the Seismic Moment Tensor. A short account of the activities related to these groups is given in the following.

Working Group on Moment Tensors (WGMT)

Scope

The Moment Tensor group aims to stimulate discussions, debates and new ideas among European scientists interested in this area of research, in order to facilitate the process of algorithm evaluation for various applications and possible standardization. The main activities during the past two years were (1) the construction of a web page for posting of data, software, and the organization of an Internet based working group on this topic; (2) the organization of a workshop on

moment tensor determination; and (3) the preparation of a special volume on the same subject at Tectonophysics.

Activities

(1) Internet group

A web page has been designed and is currently working fine. The page can be found at <http://www.esg-solutions.com/workgroup.htm>. The user is required to register in order to get access to the working group posted information. Those interested in this topic are asked to join in, and contribute. Both data sets and software are badly needed in order to boost up this activity. Despite expectations following the Tel Aviv meeting, owing to time constraints, Rami Hofstatter has been unable to achieve the anticipated level of direction. As a consequence, the WG is looking for an enthusiastic individual who can take this further.

(2) Workshop

Scientific sessions dedicated to WGMT will be held in Lisbon, during the coming ESC General Assembly. A series of 14 contributions have been announced, divided into oral and poster sessions. The poster session will take place Tuesday, September 12, whereas the oral session will be held Wednesday morning, September 13. Although the contributions will not include comparative studies, based on data sets processed with alternative algorithms, as initially intended, they are representative for both theoretical and practical aspects related to the determination of the fracture mechanism.

(3) Special volume

It has been discussed and agreed with Tectonophysics to host a special volume on the Determination of the Seismic Moment Tensor (responsible C-I. Trifu). In an attempt to organize a representative volume on the current research status in this field, contributions will not be limited to participants in the ESC's sessions in Lisbon. A call for papers will be sent out later in the year, and manuscript submissions will be due by mid-spring 2001. We aim to have this volume on the shelves before the next ESC General Assembly in Genoa, Italy, September 2002.

Future plans

The group will continue to work within the framework of the newly designed web page, and will attempt to facilitate comparative studies regarding the evaluation of fracture mechanisms based on alternative approaches. The editing of a special volume of Tectonophysics will represent a major task over the next two years. Finally, together with the ESC Bureau, the Sub-commission will study the possibility of offering a training course for young scientists at the ESC General Assembly to be held in 2002.

Working Group on Paleoseismology (WGP)

Scope

The Paleoseismology group in Europe has engaged several lines of activities in the last two years. The main objectives have been (a) to develop scientific programmes within the European frame institutions and at the national level, and

(b) to expend paleoseismological studies in different European and Mediterranean countries. We report here on these different activities emphasizing the large potential of paleoseismological studies in Europe and surrounding regions.

Activities

(1) Scientific Programmes and Workshops

The previous projects PALEOSIS and FAUST funded by the European Commission (EC, DG XII) provided the opportunity of conducting paleoseismological research and the formation of scientific groups across European geological and geophysical laboratories. PALEOSIS programme (June 1998 – March 2000) was devoted to the study of large earthquake potential in regions with low level of seismicity in Europe. FAUST is a three-year programme (1998 – 2001) to identify active faults and constitute a data bank of known seismogenic faults in Europe. These programmes involved several scientists from different countries all over Europe and results are being published in international scientific journals.

Members of the working group contributed to the preparation of workshops and summer schools on the behaviour of active faults and recurrence models of large earthquakes. After the successful session and field trip along the Dead Sea Fault during the Tel Aviv meeting (Sept. 1998), the ESC General Assembly in Lisbon has now two sessions with active faulting and paleoseismology topics. The European Geophysical Society meeting in Nice (March 1999 and 2000) and the European Union of Geosciences in Strasbourg (April 1999) welcomed sessions and contributions dealing with paleoseismic studies.

The Istituto Nazionale di Geofisica (Italy) in cooperation with the ICL-ILP, organized in Rome a workshop on “Earthquake Recurrence: State of the Art and Directions for the Future”. The ILP-WGP cooperation is proceeding within the worldwide data bank of paleoseismic parameters of active faults. Several members of the WGP also contributed to the Hokudan meeting in Japan, a workshop devoted to the international “active fault research for the new millennium” and organized by the Hiroshima University. The European Centre for Geodynamics and Seismology (ECCGS, Luxembourg) provided continuous support and collaboration with scientific projects, mainly for the lower Tagus Valley in Portugal; a one-day field trip along the main active faults is organised prior to the ESC meeting.

Tectonophysics has devoted a special volume to paleoseismology which was issued in July 1999 related with the September 1997 IASPEI general assembly in Thessaloniki (Greece). The PALEOSIS project ended in March 2000 with a workshop at Han sur Lesse (Belgium) and a proceeding of contributions is in preparation in a special issue of the journal *Geologie in Mijnbouw*. A special volume on Paleoseismology is in preparation for the *Journal of Seismology* in relation with the summer school university in “Active Faulting and Paleoseismology” organized in July 1998 in Luxembourg.

(2) New projects in earthquake-prone areas

Active faulting studies performed in the frame of the European and national research programmes have opened doors for the identification of new active zones

and related scientific problems associated with the long-term behaviour of seismogenic faults. Several regions of the upper and lower Rhine graben, the Alps and Pyrenees, Catalonia and Andalusia, the lower Tagus Valley and active faults in Austria and Bulgaria are the sites of extensive investigations on active faults. Seismic parameters obtained from the geologic records of earthquakes are currently integrated in models of the seismic hazards assessment.

The large earthquakes in Turkey and the RELIEF project

Following the August and November 1999 destructive seismic events in northwest Turkey, several European scientists expressed their interest in the coseismic surface ruptures and long-term behaviour of the seismogenic faults. Some of them had the chance to study the epicentral region. A working group constituted by geologists and geophysicists from Turkey (ITU Istanbul), Italy (ING Rome), United Kingdom (Brunel University and Imperial College London), France (IPG of Strasbourg and Paris), Norway (University Bergen), and Switzerland (ETH Zurich), have immediately after the disaster prepared and submitted the multidisciplinary project RELIEF (Reliable Information on Earthquake Faults) to the 5th framework programme of the European Commission (EC DGXII). The RELIEF project consists of an integrated study of the epicentral area mainly focused on the physics of earthquake faults and their static and dynamic behaviour. A large part of the RELIEF project is devoted to paleoseismology.

Regrettably, the EC DGXII did not support the project. Moreover, besides the Japanese (JGS) and American urgent interventions and projects (USGS and SCEC), no comparable and consistent joint European projects on the active faulting behaviour, physics of the source and paleoseismology are currently being funded.

Future plans

Over the next period of time, the research work of the groups PALEOSIS and FAUST will focus on the EC project *Slow Active Faults in Europe*. Among our priorities, will be achieving a permanent stand-by mechanism of support for immediate response to large earthquakes through European funding agencies. European universities and scientific institutions are increasingly interested in the development of active faulting and paleoseismology as a tool for the understanding of earthquake-prone areas. The ING Rome in collaboration with other institutions will organize a school in paleoseismology with training courses and field investigations in Spain in November 2000. A field-training course in paleoseismology along the North Anatolia Fault organized by the IPG Strasbourg, ITU Istanbul and University of San Diego, was previously programmed for 2000 and is now postponed to 2002 due to the recent large earthquakes.

Bureau 2000-2002

Chairperson:	C-I Trifu (Romania)
Vice-Chairperson:	A Deschamps (France)
Secretary:	M Meghraoui (Algeria)

Working Groups 2000-2002

1. Paleoseismicity. Responsible: M Meghraoui (Algeria), K Atakan (Norway)
2. Moment tensor inversion on a regional scale. Responsible: G Bock (Germany)

SC-D Crust and Upper Mantle Structure

Bureau 1998 – 2000

Chairperson: J Mechie (Germany)
Vice-Chairperson: A Guterch (Poland)
Secretary : P Maguire (UK)

Working Groups 1998 – 2000

1. Surface Wave and Tomographic Studies of the Lithospheric Structure.
Responsible: T Yanovskaya (Russian Fed.). Subtopic responsables:

- Body wave tomography
- Surface wave tomography T Yanovskaya (Russia)
- Refraction/wide angle reflection M Grad (Poland)
- Receiver function G Bock (Germany)
- Deep reflection

Activity Report (1998 - 2000) by J Mechie and P Maguire

A very extensive report was presented on paper only. Due to the large number of pages and the many figures contained in it, it is not reproduced here. Copies of the are available at reproduction costs from the ESC Secretary-General.

Bureau 2000 – 2002

Chairperson: J Mechie (Germany)
Vice-Chairperson: A Guterch (Poland)
Secretary : P Maguire (UK)

Working Groups 2000 – 2002

1. Surface Wave and Tomographic Studies of the Lithospheric Structure.
Responsible: T Yanovskaya (Russian Fed.). Subtopic responsables:

- Body wave tomography I Sanina (Russia)
- Surface wave tomography T Yanovskaya (Russia)
- Refraction/wide angle reflection M Grad (Poland)

- Receiver function
- Deep reflection

G Bock (Germany)
C Juhlin (Sweden)

SC-E Earthquake Prediction Research

Bureau 1998-2000

Chairperson: J Zschau (Germany)
Vice-Chairperson: G Sobolev (Russian Fed.)
Secretary: G Martinelli (Italy)

Working Groups 1998-2000

1. Field Observations. Responsible: A V Ponomarev (Russian Fed.), M Westerhaus (Germany)
2. Nonlinear Processes in Multiscale Seismicity and Earthquake Prediction. Responsibilities: V. Smirnov (Russian Fed.), C. Godano (Italy)
3. Algorithms and Models of Earthquake Prediction. Responsible: G Purcaru (Germany)
4. Man-made Earthquakes. Responsible: P Knoll (Germany)

Activity Report 1998 – 2000

By J Zschau

During the last two years the working groups were mainly active in

- organizing workshops or participating in international conferences with sessions related to earthquake prediction research, and
- participating actively in large scale national and international projects in the above research field.

Working group 4 ("Man Made Earthquakes") has finished its activities and it will have to be discussed during the next SC-E-meeting in Lisbon (Sept. 2000) whether it will be reactivated, dropped or replaced by a new working group.

(1) *Symposia and Workshops where Sub-commission Members were Involved in the Organisation*

- Open Symposium on "Dynamics of Earthquakes and Models in Earthquake Forecasting
Convenors: G Purcaru among others
- International IDNDR-Conference on Early Warning Systems for the Reduction of National Disasters. Potsdam, Sept. 7-11, 1998
Convenors: J Zschau among others
- Second Int. Conference on Earthquake Hazard and Seismic Risk Reduction. Yerevan, Sept. 15-21, 1998
Convenors: G Sobolev, J Zschau, among others

- Seismic Hazards and Earthquake Prediction. AGU Fall Meeting, San Francisco, Dec. 1998.
Convenors: J Zschau among others
- Seismic Hazard Evaluation and Precursory Phenomena, EGS, Nice, April 1999.
Convenors: J Zschau among others
- Reliability of Predictions in Seismic Hazard. EGS, Nice, April 1999
Convenors: J Zschau among others
- Panel Discussion on Earthquake Prediction. IUGG-Assembly, Birmingham, July 1999.
Convenors: G Sobolev, J Zschau among others
- Space-Time Patterns of Seismicity and Related Fields. IUGG-Assembly, Birmingham, July 1999
Convenors: G Sobolev, J Zschau
- Second Int. Workshop on Magnetic, Electric and Electromagnetic Methods in Seismology and Volcanology, Chania (Greece), Sept. 22-24, 1999.
- Int. Conference "New Ways in Seismology". Borjomi (Georgia), Oct. 26-28, 1999
Convenors: J Zschau among others
- Seismic Hazard Evaluation, Precursory Phenomena and Reliability of Predictions, EGS, Nice, April 2000
Convenors: J Zschau among others
- Integration of Earth Sciences Research on the 1999 Turkish and Greek Earthquakes and Needs for Future Cooperative Research. NATO Advanced Research Seminar, Istanbul, May 14-17, 2000
Convenors: J Zschau among others

The sub-commission SC-E will contribute to the coming ESC meeting in Lisbon (Sept. 2000) with an Open Session and two workshops:

- SC-E Open Session. ESC Lisbon, Sept. 2000
Convenor: J Zschau
- Crustal Transients Related to Large Earthquakes. ESC Lisbon, Sept. 2000
Convenors: R Stefansson, J Zschau among others
- Recent Earthquakes. ESC Lisbon, Sept. 2000
Convenors: J Zschau among others

(2) *Projects where Sub-commission Members were (are) Involved*

- The EU-funded INCO-Copernicus project "Tectonic Early Warning System Through Real Time Radon (Rn) Monitoring; A Geophysical Method for Forecasting Earthquakes" was successfully finished. However, more long-term observations are necessary to link seismic measurements to radon, exhalations and consider the developed data acquisition- broadcasting system as a real alert system.
- GPS Observations in the Northern Caucasus have been carried out in 1998 and 1999. The average rate of relative movements is about 10 mms per year with an accuracy of 2 mms per year.
- High-Sensitive Magnetoelastic Geophones were installed in 1999 in the Northern Caucasus. Test measurements were also conducted at Matsushiro Seismological Observatory (Russia). It seems that these instruments should be used more widely in test areas of seismoactive zones in order to study their capability with respect to earthquake prediction purposes.
- Testing Real Time Earthquake Warning. Medium term forecasts of strong earthquakes on Kamchatka are carried out in real time. This is a cooperation between Russian institutions (UIPE RAS and Geophysical Center RAS) and the USGS. The test is based on the regional catalogue of earthquakes (more than 60 thousand events) and a laboratory catalogue of acoustic emissions (more than 100 thousand events).
- A Cooperative Project between Russia and China has been started for applying nonlinear models to geophysical fields. Possible applications are focussing on earthquake prediction.
- PRENLAB-Project (Earthquake Prediction Research in a Natural Laboratory). This project in Iceland has been continued in 1999 and 2000. Using the shear-wave splitting technology, scientists from University of Edinburgh (S Crampin) and Iceland Meteorological Office (R Stefansson) successfully predicted a M=5 earthquake on Nov. 13, 1998.
- The German-Turkish Project on Earthquake Research. Multiparameter monitoring of the North Anatolian Fault Zone some 150 km east of Istanbul has been continued in 1999 and 2000. Despite the small distances of one several 10 kms between the epicentres of the 1999 Izmit and Düzce earthquakes, no short term precursors have been observed. A medium term period of seismic quiescence in the Izmit epicentral area prior to the earthquake was determined retrospectively. Based on a study of spatial variations of the b-value, carried out 2 years prior to the Izmit earthquake, a site within 10 km to the subsequent epicentre was depicted as the "most likely location for a major earthquake along this section of the North Anatolian Fault Zone".
- Immediate Post Earthquake Task Force Campaigns after the Izmit and Düzce Earthquakes 1999. Upon invitation of the General Directorate of Disaster

Affairs in Ankara, the German Task Force on Earthquakes arrived within 24 hours after the earthquakes in Turkey. Aftershocks were monitored with 19 mobile three component digital seismographic stations extending the local seismic network (SABO net) of the Turkish-German Project on Earthquake Research towards the West. Co-seismic displacement was mapped and post-seismic deformation was monitored with 6 continuously recording GPS receivers. More than 40 mineral and thermal waters have been investigated with respect to temporal changes of physico-chemical properties. About one third of the springs had also been investigated before the earthquakes in the frame of the project READINESS and the German-Turkish Project on Earthquake Research. A network of 10 strong-motion accelerographs had been installed after the earthquakes in order to investigate the local ground response to seismic waves. ERS-orbit manoeuvring that was conducted by the ESA after the Izmit earthquake provided SAR images offering a special opportunity for studying surface deformations. The SAR data are analysed by groups from France, Great Britain, Germany and the US. Postseismic field observations were also carried out by teams from several other European countries as well as from Japan and the US. Among these groups were French geologists (IPGP) who mapped the western segments of the Izmit surface rupture. Based on a calculation of Coulomb stress changes due to the Izmit earthquake as well as the earthquake history in that area, different groups including IPG (Paris) describe a seismic gap of about 150 km length with a slip deficit of 5 m on faults beneath the Marmara Sea immediately South of Istanbul. Various forthcoming earthquake research activities will focus on this area.

- *A Special Study Group (SFB) on Nonlinear Dynamics* has been established among universities in the Berlin/Potsdam area. One of the focus points is the analysis of space-time patterns of seismicity.
- *EU-project SPIN (Spatial Mining for Data of Public Interest)*. The project was established in 1999/2000 and includes an Internet Presentation of software tools for space-time analysis of seismicity to be used in earthquake prediction research. Participants are from Great Britain, Italy, Russia, Germany and the Netherlands.

(3) Other Activities

- *ESC Executive Meeting (21.7.99, Birmingham)*
SC-E was represented by J Zschau
- *ESC Business Meeting (22.7.99, Birmingham)*
SC-E was represented by G Sobolev, R Stefansson and J Zschau
- *Meeting of the European Advisory Evaluation Committee for Earthquake Prediction.*
This Committee of the EUR-OPA Major Hazards Agreement of the Council of Europe met during the IUGG Assembly in July 1999 in Birmingham. One major item discussed was the prediction of an earthquake in Iceland by S

Crampin in the frame of the PRENLAB project. SC-E was represented by G Sobolev, R Stefansson and J Zschau among others.

(4) ***Individual Reports of the Working Groups***

- a) Report AV Ponomarev (WG 1)
- b) Report M Westerhaus (WG 1)
- c) Report V Smirnov (WG 2)
- d) Report G Purcaru (WG 3)

a) A. V. Ponomarev: Report WG 1

Activity Report 1998-2000 of Working Group "Field Observations" of SC-E. According to recommendations of the ESC meeting in Tel Aviv 1998 for SC-E (Earthquake Prediction) to continue observations and laboratory studies in the field of earthquake prediction research the following activity should be noted:

1. The international EU-funded INCO-Copernicus project "Tectonic Early Warning System Through Real Time Radon (Rn) Monitoring; A Geophysical Method for Forecasting Earthquakes" on developing of the prototype system for soil radon monitoring in real time and data transfer via INMARSAT global satellite communication system on a base station is successfully finished. The synchronous field observations of geochemical parameter were carried out on the Northern Caucasus, in Transcaucasia, Greece, Albania and Scotland (UK) throughout the months, as well data processing, by project partners: Athens University (coordinator), United Institute of the Physics of the Earth (Russia), British Geological Survey (UK), National Survey for Seismic Protection (Armenia), Center of Geophysical and Geochemical Exploration (Albania), Institute of Geochemistry (Russia), Scientific Inductional Enterprise "Geotechvims" (Russia) and European Economic Interest Grouping "GeoMentor" (Greece). Signal processing software has been developed on the base original solutions to study the time series structure. It was shown that a physical model of geochemical precursors should be developed in order to construct precursor's image.

On the whole, the Project was effective and its main results make an appreciable contribution both in pan-European geophysical research and in partner's plans for geodynamic monitoring system creation. The possibility of using the offered methodical and technical approaches for monitoring of geologic environment is substantially demonstrated, but more long-term observations are necessary to link seismic measurements to radon exhalations and consider mentioned data acquisition-broadcasting system as real alert system.

2. The repeated GPS observations on Northern Caucasus were carried out in 1998 and 1999. The first epoch of these measurements based on 14 reference marks in the region was realized in 1995. The data analysis demonstrates some complicated differentiated motion of separate benchmarks in respect to fairly

uniform motion of more northern areas of Europe. The segments contrast direction of motions in regions of Maikop-Sochi, Kislovodsk and Stavropol are detected. A number of marks are displaced to the South both Southeast concerning Moscow and Potsdam, others to the North and Northwest. The average rate of relative movements is about 10 mm per year with accuracy to 2 mm per year. It testifies that shear stresses are accumulated and is of interest for refinement of seismic hazard on these zones.

3. High-sensitive magnetoelastic geophones were installed in 1999 on the Northern Caucasus to research underground acoustic noise structure as possible indicators of dynamical processes in the Earth crust, including earthquake preparation. The unique sensors has frequency response proportional to the cube of frequency, contains narrow band pass filters and could be used as element of multidisciplinary geophysical stations. Test measurements were conducted at Matsushiro Seismological Observatory (Japan) and at Obninsk Seismological Observatory (Russia). It seems these devices could be used more widely on the test areas in seismoactive zones to study their availability for earthquake prediction aims.

4. The complex of laboratory and field researches of physical substantiation of new methods of seismic hazard evaluation and prognosis of earthquakes was carried out (UIPE RAS and Geophysical Center RAS, Russia).

It was established as a result of laboratory experiments, that the model of a seismic source passes some main stages during its development: accumulation of small-sized ruptures up to a critical level; association of cracks with formation larger and localisation of this process in a zone of an unstable strain. These stages are accompanied by prognostic effects of clusterization of acoustic emission, quiescence and foreshocks activation.

On a basis of the physical modelling regularities the algorithms were offered and the programs for revealing places of the developing sources, time and magnitude of appropriate earthquakes were compiled. The medium term forecasts in real time of strong earthquakes on Kamchatka are carried out. The information basis of work was the regional catalogue of earthquakes (more than 60 thousands of events) and laboratory catalogue of acoustic emission (more than 100 thousands of events); the latest obtained during joint experiments in USGS. The suggested approach is shown to be effective for using in real time warning systems.

5. Further international symposia and workshops where subcommission members were involved in the organisation are:

- The Second International Conference on Earthquake Hazard and Seismic Risk Reduction, Sept. 15-21, 1998, Yerevan (Intern. Organ. Committee: Zschau, Sobolev among others).

- XXII General Assembly of the International Union of Geodesy and Geophysics (IUGG 99) in Birmingham, UK, 18-30 July 1999. (conv: Sobolev, Zschau among others).

- 2nd International Workshop on Magnetic, Electric and Electromagnetic Methods in Seismology and Volcanology. Chania (Greece). September 22-24, 1999.

- International Conference "New Ways in Seismology", Borjomi (Georgia) 26-28 October 1999r.

b) M. Westerhaus: Report WG 1

Activity Report 1999-2000 of Working Group "Field Observations" of SC-E.

The research activities were strongly dominated by the two catastrophic Turkish earthquakes of Izmit, Aug. 17, (Mw=7.4) and Düzce, Nov. 12, (Mw=7.1). In the frame of the "German Task Force Programme Earthquakes" immediate post earthquake expeditions had been carried out after both earthquakes. Upon invitation of the General Directorate of Disaster Affairs in Ankara, participants of the Task Force arrived within 24 hours after the earthquakes in Turkey. The following activities were carried out in the field:

- Monitoring of aftershocks: 19 mobile stations were installed after the Izmit earthquake extending the permanent local seismic network (SABOnet) towards the West. During the first days after the event about 2000 earthquakes per day were recorded; after two months the daily rate still exceeded 200 events. The temporary "Izmit" net operated until October 21, 1999. Three days after the Düzce earthquake the mobile stations were re-installed to the East, again partially overlapping the SABOnet.
- Ground response and structural damage: a network of 10 strong-motion accelerographs had been installed after the two earthquakes in order to investigate the local ground response to seismic waves. Structural damage was macroseismically investigated for several urban regions by regarding the different building types and grades of damage. Additionally, a microregion in Düzce was studied after both earthquakes in August and November 1999, elaborating the effects of damage progression.
- Post-seismic deformation: 6 GPS receivers were installed along an approx. 100 km long segment of the surface rupture generated by the Izmit earthquake. They monitored aseismic after-slip continuously and were in operation until Oct. 15, 1999. Horizontal, right lateral postseismic movements reached 8 cm within 6 weeks. 5 receivers were placed again after the Düzce earthquake, working in continuous mode until Nov. 29, and in repeated mode (every 5 days) until Dec. 15, 1999.
- Thermal and mineral waters: more than 40 thermal and mineral waters have been investigated with respect to temporal changes of physico-chemical properties. About one third of the springs had been investigated before the earthquakes in the frame of the German-Turkish Project on Earthquake Research and within the READINESS project. The most striking co- and post-seismic change after the Izmit as well the Düzce event is a significant increase in the CO₂ content, observed for almost all springs. Local inhabitants detected a new hot spring two weeks before the Izmit event. Extraordinarily gas bubbling

at a thermal bath was reported two days prior to the Düzce earthquake. These observations are among the few preseismic effects known so far.

Teams from several European countries as well as from Japan and United States also carried out postseismic field observations. Among these groups were French geologists (IPGP) who mapped the western segments of the Izmit surface rupture, and Italian civil engineers.

ERS-orbit maneuvering that was conducted by the ESA after the Izmit earthquake provided SAR images offering a special opportunity to study surface deformations. The SAR data are analysed by groups from France, Great Britain and Germany. Surface deformation pattern derived from SAR interferometry are compared to the results of dislocation models and ground-based data like co- and postseismic water well level variations.

The interdisciplinary observations in the frame of the joint German-Turkish Project on Earthquake Research have been continued in 1999 and 2000. The observational array will be operated another two years. The majority of monitoring stations is installed along a fault segment located several 10 km south of those segments that ruptured during the Izmit and Düzce earthquakes. Despite the small distances between the epicenters and the monitoring stations, no medium- or short term precursors have been observed. This important result indicates that any temporal changes of physical rock properties during the earthquake preparation process are confined to the immediate vicinity of the fault segment that is later on ruptured by the quake. Significant co- and postseismic changes are observed for most observables providing a rich database for a study of postseismic deformation processes. As in many other cases, it was found that microseismic activity is sensitively connected to changes in the state of deformation and/or stress on a regional scale. A period of seismic quiescence in the Izmit epicentral area prior to the earthquake was detected by the SEISMOLAP method. Based on a study of spatial variations of the b-value, carried out 2 years prior to the Izmit earthquake, a site close to the subsequent epicenter was depicted as the "*most likely location for a major earthquake along this section of the North-Anatolian Fault Zone*".

The Izmit earthquake of Aug. 17, 1999, considerably increased the seismic hazard for the Istanbul area. A team of French scientists from IPG, Paris, describes a seismic gap of about 150 km length and a slip deficit of 5 m on faults beneath the Sea of Marmara south of Istanbul. Their findings are based on a calculation of Coulomb stress changes due to the Izmit earthquake as well as the earthquake history in that area. Coming earthquake research programmes will focus on the Istanbul area.

Activities within the frame of the PRENLAB project have been continued in 1999 and 2000. The project focuses on crustal processes in the seismic and rift zones of Iceland. Among other experiments, the build-up of stress is monitored by S-wave splitting, seismicity studies and investigation of fault plane solutions. Earthquakes are located with relative accuracy of 10 m, allowing for mapping of faults by microseismicity. Using the shear-wave splitting technology, scientists from University of Edinburgh (S. Crampin) and Iceland Meteorological Office (R. Stefansson) successfully predicted a M=5 earthquake on Nov. 13, 1998.

Members of the ESC subcommission participated at the AGU 1999 Fall meeting (session S12D, "The August 17, 1999, Izmit, Turkey, Earthquake").

c) V. Smirnov: Report WG 2:

The investigation of the structure of time-patterns of geophysical fields related to seismicity were carried out in the frame of INCO Copernicus Project "Tectonic Early Warning System Through Real Time Radon (Rn) Monitoring; A Geophysical Method for Forecasting Earthquakes" (participants are Albania, Armenia, United Kingdom, Greece and Russia). Methods of the theory of dynamic systems, deterministic chaos and statistical theory of open systems, and fractal analysis of time series were used as a statistical base for analysis of a set of geophysical time series. These techniques allow to consider the degree of stochasticity of the generating process. They enable to separate the processes of high dimensionality generated by a great number of independent factors and processes of low dimensionality generated by the dynamics of the non-linear self-oscillating system.

The properties of the deterministic chaos in variations of geophysical fields are detected and the estimations describing a degree of a determinacy of temporary changes are obtained. These estimations of dimensions indicate that the observed randomness of variations of time series can be explained by changes concerning a small amount of non-linearly interdependent physical factors. It is shown that the studied time series are partitioned on two groups distinguished by fractal dimension. The first group is characterised by values of dimension 1.5-1.9 and includes the fields, which one directly or indirectly reflects deformation processes in the lithosphere. The processes of the second group have the different physical nature (electrical conductivity, the contents of a radon etc.) and are characterised by dimension 2.7-3.5. The large values of dimensions obtained in the latter case, apparently, show to more composite and random system behaviour generating variation of these geophysical fields.

The obtained results suggest a possibility of identifying the studied geophysical fields with processes going on in a dynamical system which is governed by the regularities of non-linear dissipative systems with time-space deterministic chaos. It means that a reliable detection of prognostic anomalies in the geophysical series is hardly possible on the basis of simple linear models. The elaboration of more complicated algorithms invites further development of non-linear physical models of geophysical precursors generation.

The investigations in described direction were started and are continuing now in the frame of scientific collaboration between the China and Russia.

d) G. Purcaru: Report WG 3

SC-E, WG3-Report 1998-September 2000

The WG3 organized the open symposium "Dynamics of earthquakes and models in earthquake forecasting" where 21 oral papers were presented.

The important topics of the presentations concerned:

1. Development/improvement and testing of the prediction algorithms RTL (G. Sobolev, Y. Tyupkin), M8 (V. Kossobokov) and "largest aftershock" (A. Vorobieva). The retrospective analyses show that further work is necessary for the reduction of the false alarms and failures. These were made for very large seismic regions.
2. Models and simulations of seismicity dynamics and possible implications for prediction. The methods of Seismicity Localization (R, Ksr) (A.D. Zavyalov) and of Simultaneous Variation of Observables (SVO) (G. Purcaru) have been applied to the great 1997 Kamchatka event (M 7.9) for which complete data are available. The analyses have shown that localized seismicity was apparently close to the future hypocenter where parameters R and Ksr are generally minimum. Using SVO method clusters on different space-time scales were identified before the main shock. The long-lasting absence of large $M > 6$ events in a cluster associated with the major asperity of the rupture zone can provide useful information for place forecasting. Numerical simulations have been made for rigid blocks and synthetic catalogs shown migration of seismicity and plate-dip-angle dependent seismic activity, consistent with Sunda Arc observations (D. Rundkist, A. Soloviev). Significant departures from power law and SOC have been found in terms of "heterogeneous" sand pile models (G. Purcaru). Numerical experiments were also made for two block models (I. Kuznetsov et al.). The RTL method was also applied for seismicity analysis (Y. Tyupkin, R. Giovanibambista). A Model of fault interactions was discussed (A. Bykovtev) for obtaining exact solutions of the interactions with varying parameters. Introduction of a new continuous hierarchical cascading model of aftershocks (L. Rundquist and colleagues) shown the possibility of exhibiting basic features of seismicity. An information space-time model (A. Ponomarev, V. Gitis), in a computerized approach, for modelling the preparation process using expert approach was found to separate deterministic and stochastic parts in the seismic data.
3. A study of self similarity break in tectonic conditions with observed faulting and implications for hazard has been presented (M. Meghraoui). A statistical analysis magnitude uncertainty for prediction shows that it can produce biased results (S. Lasocki).
4. Some precursory phenomena have also discussed for their usefulness in earthquake prediction (M. Merzer, M. Chesnokov, M. Krasnova, G. Papadopoulos, V. Rudaev, R. Ciz).

Overall the symposium provided a further insight in some difficult aspects of forecasting, and some new results have been presented.

From the critical discussions emerged the conclusion that more work along developing of methods and testing is highly necessary in future.

G. Purcaru was participating at the AGU 1998 and 1999 Fall Meetings.

Bureau 2000 – 2002

Chairperson: J Zschau (Germany)
Vice-Chairperson: G Sobolev (Russian Fed.)
Secretary: G Martinelli (Italy)

Working Groups 2000 – 2002

1. Field and Laboratory Observations. Responsibilities: A V Ponomarev (Russian Fed.) and M Westerhaus (Germany)
2. Non Linear Processes in Multiscale Seismicity and Earthquake Prediction. Responsibilities: V Smirnov (Russian Fed.) and C Godano (Italy)
3. Algorithms and Models of Earthquake Prediction. Responsible: G Purcaru (Germany)
4. Earthquake Triggering. Responsible: G Papadopoulos (Greece)

SC-F Engineering Seismology

Bureau 1998 - 2000

Chairperson: D Slejko (Italy)
Vice Chairperson: M Garcia-Fernandez (Spain)
Secretary: I Cecic (Slovenia)

Working Groups 1998 - 2000

1. Strong Motion. Responsible: NN Ambraseys (UK)
2. Earthquake Hazard. Responsible: D Giardini (Switzerland)
3. Microzonation. Responsible: A Marcellini (Italy)
4. Macroseismology. Responsible: R Musson (UK)

Activity Report 1998 – 2000

by D. Slejko, N. N. Ambraseys, D. Giardini, R. Musson, S. Sellami and P. Smit

The subcommission F "Engineering Seismology" consists of four Working Groups which have been active in various ways in recent years. For most of them the efforts made to disseminate information about their activity, especially by the constitution of proper WWW home pages, should be emphasised. All the WG reports are available at the web page www.ogs.trieste.it/esc/ together with all information about the activity of the subcommission.

A WG on "Strong Motion Studies" joint with the European Association for Earthquake Engineering (EAEE, <http://www.ins.itu.edu.tr/eaee/eaee.htm>) was discussed and initiated at the IASPEI meeting in Thessaloniki late in 1997. The purpose of the group is to retrieve the existing strong-motion data in Europe and to review works relating to the development and research in this field.

Strong-motion instrumentation and recording in Europe and in the Middle East started later than in other parts of the world. With the advent of digital recorders in recent years, this development increased rapidly, particularly because of the need to instrument major engineering works and public buildings and to comply with the requirements of hazard assessment and earthquake resistant design stipulated in EUROCODE-8.

A survey made in 1998 by the Working Group on Strong-Motion Studies (TG2) of EAEE to assess the state of strong-motion recording capabilities in the region, shows that although the total number of stations is difficult to estimate, the number of instruments operating in the free-field was close to 2,500, approaching today 2,800. The number of individual three component recordings made by earthquakes of all magnitudes during the last 30 years exceeds a conservative estimate of 3,000. The number of freely available records does not include all statistics from the former USSR and from a few other European countries, or from the European nuclear and oil industries. The survey also showed that European strong-motion networks and individual stations have been established and are maintained with recurrent government subsidies or short-term grants. They operate as independent state, industrial or university units with little or no coordination between them. Some of these networks are very well run but because of the closed system within which they operate, even within the same country, few cooperative research programmes have developed between them and only a fraction of their output reaches end-users, engineers and earth scientists alike. However, this situation is rapidly changing with more agencies making their data accessible to end-users via the Internet and CD-ROMs. There now exists an appreciable quantity of acceleration time histories recorded in Europe and adjacent area, but this data is far less well known than that from certain other parts of the world such as Japan and the U.S. Only few data centres are providing strong-motion data on the Internet. A number of CD-ROMs with European strong-motion records have been published in recent years. Data from other strong-motion networks in Europe and adjacent area are still not freely available. However a number of network operators provide information on the Internet about strong-motion recordings and/or data of their permanent stations.

The EAEE initiated this programme and aims at three work areas:

- the establishment of a freely available database and bank of free-field strong-motion data (records and parameters),
- the study of source, path and local effects,
- the study of structural response and establishment of an available data base and data bank of structural strong-motion data.

During the past decade Imperial College of Science Technology and Medicine (ICSTM, <http://www.cv.ic.ac.uk/>), London, Ente Nazionale per l'Energia Elettrica (ENEL, <http://www.enel.it/>), Rome, Ente per le Nuove Tecnologie, l'Energia e

l'Ambiente (ENEA, <http://www.enea.it/>), Rome and Institut de Protection et de Sûreté Nucléaire (IPSN, <http://www.ipsn.fr/>), Fontenay aux Roses, the Tripartite Project Group (TPG), attempted to retrieve, process and analyse strong-motion records, chiefly analogue, from the European, Mediterranean and Middle Eastern regions and to identify future needs for strong-motion information. In what follows we describe briefly the method we followed to retrieve and process these data, and the lessons learnt from this exercise. Most of the TPG records come from events before 1995, and are in the period already analyzed by the International Seismological Centre (ISC, <http://www.isc.ac.uk/>) and Harvard (<http://www.seismology.harvard.edu/>). Many of the earthquakes are of moderate magnitude and are reported from a relatively large enough number of stations to ensure reasonable azimuthal coverage. The locations found by ISC are therefore not likely to be in serious formal error and can be used as initial values for refinement. The main uncertainty is in depth of focus, and adjusting this could introduce compensating changes in position, particularly if the reporting stations are concentrated in a limited range of azimuth. Teleseismic locations are known to have larger uncertainties compared with those from local networks and the latter, when derived from special studies have been adopted in our analysis. Like epicentres, focal depths are also based on teleseismic arrival times alone and lack precision. Here again, results from special studies have been incorporated into our analysis to improve the quality of the data. The use of a unified magnitude scale in attenuation studies is an important consideration. Our adoption of M_s rather than M_L stems from the fact that the former is not only the best estimator of the size of a crustal earthquake, but also because seismicity in Europe is generally evaluated in terms of M_s , it is necessary to use the same magnitude scale in attenuation relations. Moreover, we have chosen M_s because in some parts of the study area there are no M_L determinations. Also, importantly, because we have access to a large number of station bulletins we can calculate M_s uniformly for almost all events that have generated strong-motion records from a sufficiently large number of stations using the Prague formula, which was checked for Europe. Equally important in the assessment of reliable source distance, particularly in the near-field, is the exact location of the recording sites. The identified location errors were generally within a few kilometers however we also found station mis-location of up to 90 km. The distance or source-path one assigns to a strong-motion record has a significant influence on the close-in behavior of attenuation curves, particularly for small events for which location errors can be many times the source dimension. These errors accrue owing to errors in source and station location. For most of the larger earthquakes we adopted the closest distance to the projection of the fault rupture. For small magnitude crustal events the source distance is close to the epicentral distance. However, the locations of some of the smaller events are poorly known and for this reason their location was re-evaluated or distances based on S-start times (first S-wave arrival-trigger time) or S-P time were adopted. Local site conditions (soil, topography, instrument location, housing and characteristics) at many European strong-motion stations are poorly known, particularly for the case of old sites which have been moved or abandoned, or for temporary stations. In terms of the soil conditions the majority of sites can only be

described at best in very general terms such as 'soil' or 'rock'. Instrument data is usually more readily available, at least in general terms of the instrument type and the structure in which it is housed. However reliable values of the instrument transducers natural frequencies and damping levels are quite often not available. In this case de-coupling of the instrument response cannot be performed. The majority of the analogue recorded data have been recorded with SMA-1 instruments for which the transducers typically have natural frequencies around 25 Hz and damping of about 60%. Significant distortion of the ground motions only occurs for frequencies above this level, which is generally outside the range of engineering interest. It is not uncommon to have no knowledge of the specific characteristics of the instrument (sensitivity and damping). Furthermore it is even less common to have detailed information regarding the structure, in which the instrument is housed.

The TPG-databank and database contains information for Europe and world-wide regions. Specifically for Europe, the database contains information for 869 separate events, which are believed to be associated with strong-motion recordings. The completeness of data for these 869 events is variable ranging from only the basic event time to a complete set of magnitude values, stress drop, fault type etc. Of the 869 events, 617 are known to have triggered strong-motion instruments. Information for 1,249 triggered record sets from these 617 earthquakes is contained in the data base. As previously, the completeness of information is variable ranging from basic identification of the triggered station through to peak acceleration values, intensity levels, source-site distances, instrument type, basic soil condition, ground or structural record etc.

Uniform surface-wave magnitude determination and distance calculations have been done where possible for 711 record sets of 331 events (duplicates resulting from multiple digitization of records by the same or different agencies are excluded from this dataset).

The 2,293 records in the TPG-databank come from 261 individual strong-motion stations. Of these 261 sites, there are 19 for which there is no knowledge of the local soil conditions. For the other 242 stations, 182 can only be described in general terms. For the remaining 60 stations, shear-wave velocity profiles are available, or can be estimated from SPT N-count and void ratio data. Of the 60 sites, local soil data is available at or very close to the instrument for 47 stations. For the remaining 13 sites, local soil data has been extrapolated from nearby stations or from general profiles, which are considered representative for the area of concern.

Of the 261 stations associated with strong-motion records, 11 are considered to be structural. These 11 stations recorded 50 separate record sets giving 148 individual components. Most interest though at ICSTM and from the TPG has been only with ground level records. Structural records have therefore been excluded from analyses. The resulting available ground-level data set is therefore comprised of 2,145 component records (661 record sets) generated by 321 separate earthquakes and recorded by 250 different ground-level stations.

Visual examination of the 2,145 component records has shown a number to contain irrecoverable errors such as clipping, missing data segments and very poor quality digitization. Consequently, the number of usable records is reduced.

Furthermore, by taking into consideration the availability of seismological parameters (magnitude and distance) for these records, the available strong-motion data set consists of 598 record sets from 287 earthquakes. This though is independent of local soil conditions, thus by also considering this factor the usable data set is further reduced to 590 record sets from 285 events with a basic soil description and 192 record sets from 102 earthquakes if detailed soil conditions are considered.

These data sets do not consider focal depth. The most common data usage is from crustal earthquakes (depth < 30 km). Obviously the yearly totals depend on seismic activity, however it is somewhat surprising to see that the totals for the last decade have remained relatively constant and are indeed lower than the mid to late 1970's and early 1980's. This is surprising because the last decade has seen an expansion in strong-motion instrumentation numbers, both on national network scales but also in the proliferation of small local networks. In addition to this, strong-motion instruments have themselves advanced in technology both in quality and ability, specifically with the deployment of digital instruments, which allow large numbers of time-histories from small events to be recorded. The TPG have actively sort to obtain new records thus the low numbers of data for the last decade probably reflects three factors: 1) poor communication between networks within the same country and within Europe, specifically the lack of notification of data held by agencies; 2) reluctance on the part of agencies to release data; 3) the cost and time requirements to prepare data for release.

Whilst the availability of data via mass media such as CD-ROMs or the Internet is extremely valuable, it must be recognized that use of this data cannot be made indiscriminately. Such large databases and data sets will inevitably contain errors and/or be incomplete. We are fully aware of database errors and completeness. In particular, our most recent research efforts made extensive use of our database and databank and highlighted a number of significant errors similar to those described above. Quite simply, it is not easy, or economical, to produce a reliable data bank in this form. In the case of the errors in our database and databank, their origin resulted from two factors: 1) data operator input errors; 2) errors in data supplied by the contributory organisation.

From the foregoing, it is readily apparent that the indiscriminate use of the data in existing CD-ROMs is likely to generate erroneous and misleading results. The derivation of attenuation laws and site-specific design parameters must rely on good quality databases and reliable associated data banks rather than on statistics of many records of questionable quality.

With very few exceptions the terms of reference of most of the strong-motion networks in Europe include little more than what is needed to keep them going and much of the data they acquire are not freely available to end-users such as young researchers, engineers or earth scientists and as a result relatively little research is generated. This inaccessibility of the available strong-motion records from a wide variety of well-recorded earthquakes has been having a major impact on the research and development of strong-motion studies in Europe and has created a serious imbalance of knowledge. Of course, this is not a problem unique

to Europe and steps have already been taken by a number of European networks to release their strong-motion data on CD-ROMs or on the Internet.

Regarding to the feedback and the comments to the questionnaire we have sent to different European data centres and institutions, the main activity that ESC WG2, jointly with EAEE TG2 might support in the future, would be the establishment and running of an Internet-site to which contributing agencies could deposit free-field strong-motion data from the European area and other information regarding strong-motion networks, research and development in this field for free use by the profession. This initiative will be preceded by making freely available over 1,000 records from the European area in a CD-ROM, prepared with EC support by ICSTM, London, ENEL, Rome (joint with Servizio Sismico Nazionale), ENEA, Rome and IPSN, Fontenay aux Roses. Copies of this CD-ROM will be available in August 2000 upon request. Refer to <http://www.cv.ic.ac.uk/research/seismo/index.html> for further information.

Work for the establishment of an Internet-site for European strong-motion data, also supported by EC, will shortly begin. In this work the participants are ICSTM, London; University of Iceland, Reykjavik; University of Trieste and Institute of Engineering Seismology and Earthquake Engineering, Thessaloniki.

Goal of the WG "Earthquake Hazard" (ESC/WG-SHA) is to produce a uniform seismic-source zoning and seismic hazard assessment for the Euro-Mediterranean region. The ESC/WG-SHA strategy is based on the integration and coordination of national, multi-national and regional programs operating in the Mediterranean. Programs and test-areas for multi-national seismic hazard assessment have been active in different areas of the Mediterranean area: Ibero-Maghreb, central-northern Europe, Pannonian Basin, Adriatic Sea, Middle-East, Caucasus, Greece and Turkey. In coordination with the Global Seismic Hazard Assessment Program (ILP, ICSU, UN/IDNDR) and with the IGCP project 382 SESAME (Seismotectonics and seismic hazard assessment of the Mediterranean) has set up a schedule for the standardization of data bases, assessment methodology and hazard maps, and for the integration of the regional results into a homogeneous source zones and hazard mapping for the whole Mediterranean basin. The GSHAP (1992-1998) is now finished and the volume of regional reports and the global map have now been published (list of publications enclosed), while ESC/WG-SHA and continue until the year 2000 for the Mediterranean area. The work is conducted in three phases:

1. 1996-97: the aim and activities of SESAME, the ESC/WG-SHA and GSHAP coincided; regional mapping of source zones and hazard were conducted in the different test-areas; in 1997 the regional results were presented at the 29th IASPEI Assembly (Thessalonicki, 8/97);

2. 1997-98: the intermediate goal of merging the regional hazard results into a preliminary regional PGA map was reached at the 26th ESC Assembly (Tel Aviv, 8/98), making possible to identify regions requiring further work and to set up a common strategy for Phase III;

3. 1998-2000: construct a homogeneous model of source zones for the whole Mediterranean and compute for the first time a suite of regional hazard maps in spectral parameters.

SHA in the Mediterranean area is coordinated under a number of regional, multi-national and national initiatives. Here we first describe the progress in the different areas, then summarize the work done toward achieving a basic level of unification in the whole Mediterranean. All details on activities in previous years are found in previous ESC/WG-SHA reports.

CENTRAL-NORTHERN EUROPE. Minor changes have been made with respect to the GSHAP implementation in Central-Northern Europe, coordinated by the GFZ Regional Centre in Potsdam and including the territory north of 46°N. The seismic hazard for France has now been completed also south of 46°N and a second hazard zonation is now available for Poland, Czech Republic and Slovakia, coordinated by Prague University.

IBERO-MAGHREB. This project, coordinated by CSIC in Barcelona, includes Spain, Portugal, Morocco, Algeria and Tunisia. The catalogue, homogeneous zoning and SHA map were completed in 1997-98.

ADRIA. This project includes all countries bordering on the Adriatic Sea (Italy, Switzerland, Austria, Slovenia, Croatia, Albania, Greece) coordinated by OGS of Trieste. A final iteration on the source zone model and the seismic hazard was conducted in Pisa (2/98; sponsored by SESAME), and the final model hazard results presented at the 1998 ESC assembly (Tel Aviv, 8/98).

EASTERN MEDITERRANEAN. The IGCP-SESAME and the UNESCO/USGS RELEMR are coordinating their activities toward a unified hazard mapping for the whole area (Turkey, Syria, Lebanon, Cyprus, Israel, Jordan, Egypt, Palestine, Saudi Arabia and Arabian Peninsula). Several planning and review meetings have been held so far in the area. In 1999, regional integration in hazard assessment was the main goal of meetings in Tehran (5/99) and Cyprus (10/99).

CAUCAS. The project includes the Caucasian Republics (Armenia, Ukraine, Georgia, Turkmenistan, Azerbaijan), Russia, Iran and Turkey. The coordinated catalogue, homogeneous zoning and SHA map were completed in 1997.

NORTHERN EURASIA. The JIPE of Moscow is coordinating the seismic hazard mapping for the whole FSU territory. This five-year program, initiated before the FSU break-up and interrupted during the period of more intense political turmoil, has been restarted, leading to the compilation of the seismic catalogue and the SHA, using for the first time a probabilistic approach. Technical workshops are held routinely in Moscow. The whole area has been subdivided in five blocks, and the final catalogue, the model of source zones and lineaments and the hazard maps were released in early 1998.

CIRCUM-PANNONIAN. The EU-QSEZ-CIPAR project includes the countries of the Circum-Pannonian basin: Hungary, Romania, Slovenia, Croatia, Albania in addition to Italy and UK. While the aim of this independent project was to produce a deterministic hazard assessment for the region, a specific source zoning (1997) and probabilistic hazard assessment (1998) were produced by BGS, Edinburgh, for comparison with the deterministic results and for inclusion in SESAME and GSHAP.

GREECE. The official national hazard map of Greece has been contributed to the SESAME Mediterranean map (see below), while a new schedule to produce a national source zone model (not yet existing) and a new hazard map adjusted in

critical border areas has been now established for 1999 by the groups in Thessalonicki and Athens.

TURKEY. The Kandilli Observatory of Istanbul has represented Turkey in the activities of the Caucasus and Eastern Mediterranean projects. Following the evaluation of the preliminary Mediterranean map (see below), a revised zoning and hazard maps are being produced to correct discrepancies in the Aegean and Eastern Anatolia border areas.

During 1997-98 the GFZ of Potsdam lead the efforts to collect and fit together the SHA maps derived in the individual regional projects described above. The preliminary PGA map includes the contributions of Ibero-Maghreb, Adria, Central-Northern Europe, Northern Eurasia, Caucasus, Greece, Turkey and Circum Pannonian and is accompanied by a compilation of the individual source zones. The draft maps were presented and discussed at the 1998 ESC assembly (Tel Aviv, 8/98). The Near-East map was presented separately. In 1999 the first joint maps were produced (see figures) and published. The production of the unified source zone models is the key goal for 2000 (see below).

Two technical workshops were organized in the Eastern Mediterranean, within the regional framework described above. One was supported by SESAME.

1. workshop in Tehran (3rd International conference on seismology and earthquake engineering, May 17-19, 1999); SESAME funding 2,000\$; participants from the whole Near East region.

2. workshop in Cyprus (10/99) for the coordination of regional hazard mapping; participants from Israel, Cyprus, Palestine, Jordan, Egypt, Lebanon, Turkey, US

In addition, ESC/WG-SHA sponsored a working meeting of the coordinators of the different regional test areas in occasion of the IUGG General Assembly in Birmingham (7/99) and the traveling expenses for scientists from the Mediterranean basin (i.e. Libya) to work on the unification of the regional SHA map conducted at SED/ETHZ.

Following the strategy decided in TelAviv (8/98), SESAME and the ESC/WG-SHA are proceeding with the following program:

1. The draft PGA map obtained by the compilation and fit of different regional PGA maps has been refined and smoothed to produce a reference PGA map for the Mediterranean and included in the global GSHAP map, under the leadership of GFZ and SED/ETHZ, was completed in October 1999.

2. The first ESC/WG-SHA product has been the compilation of the source zones obtained in the different regions. We are now preparing the first homogeneous model of seismogenic sources for the whole Mediterranean by joining the existing zones as derived in the individual SESAME regions, design new zones in the border areas between different regions and compute the seismicity parameters from one of the two regional catalogues in the border region (using catalogues as they have been used in the individual areas), design source zones and associated parameters in the areas where these are not available (parts of Near East, Libya). Concerns are uniform criteria to deal with size and dimension of source zones, relation to active tectonic features, characterization of the seismic statistics in the zones, back-ground and diffuse seismicity, across-boundary continuity.

3. The final SESAME goal for September 2000 will be a new generation of regional hazard for the Mediterranean computed in uniform fashion from the regional catalogue, source zones model and attenuation laws. A suite of maps will be produced covering a range of spectral parameters and return periods.

M.J. Jimenez of CSIC, Barcelona, now conducts this work, supported by SED/ETHZ, in cooperation with other European and Mediterranean centers. The planned schedule calls for the first model to be presented at the EGS 2000 Assembly (Nice, April 27, 2000), to be finalized in a technical workshop in Slovenja (Poljce, May 22-24, 2000). The final source models and hazard results will be presented at the ESC 2000 General Assembly (Lisbon, September 13, 2000).

The regional reports are now published in the GSHAP volume, printed in late 1999 by *Annali di Geofisica* and now in distribution. All reports, databases, catalogues, procedures, maps and results are now loaded on the web site <http://seismo.ethz.ch/GSHAP>. The global map was released with a press conference at AGU (Dec. 1999) and reviewed very favourably by ABC, CNN, EOS, Discovery and Science. The map has been printed in 11000 copies by USGS and a second print is under way. The *Annali* volume was printed in 3000 copies.

The WG "Microzonation" is still continuing in the preparation of the book "An Introduction to Microzonation", established after Reykjavik and after consultations with the WG members via E-mail.

The Web site at <http://www.gserg.nmh.ac.uk/hazard/escmac1.htm> of the WG "Macroseismology" continues to be a focus for exchange of ideas throughout the year.

The main meeting this year for the members of the WG was at the IASPEI conference in Birmingham in July 1999. Despite problems with the symposium organiser, a session was finally arranged on the last day of the conference at which several presentations were given on the subject of determination of earthquake parameters from macroseismic observations, followed by an open discussion. The WG was pleased to welcome Bill Bakun from the USGS as invited guest speaker. A social evening was held afterwards.

Some members of the WG also met at the Soil Dynamics and Earthquake Engineering conference in Bergen in August 1999.

The chapter on intensity and intensity scales for the New Manual of Seismological Observatory Practice, which has been a continuing WG project, is at last complete in its final draft after a further round of improvements from WG members. The text is available at <http://www.gserg.nmh.ac.uk/hazard/msopch14.htm>. A similar chapter on macroseismology has been drafted for the IASPEI Centenary Handbook on Seismology and Earthquake Engineering, and is currently under review.

The damaging earthquakes in Turkey and Greece in the latter part of 1999 raised a renewed interest in damage and intensity surveys. The Kocaeli earthquake in particular resulted in a number of groups making preliminary intensity surveys after the earthquake and the effects of this earthquake are likely to be a focus for

discussion for some time. In particular, the question has been raised about the usefulness of an initiative to establish a European rapid-response macroseismic survey team under the aegis of the ESC and especially Subcommission F and the WG Macroseismology. The WG web site has been host to a discussion board on this subject, and the matter will be debated in more detail at the next General Assembly in Lisbon.

Bureau 2000 - 2002

Chairperson: D Slejko (Italy)
Vice Chairperson: M Garcia-Fernandaz (Spain)
Secretary: I Cecic (Slovenia)

Working Groups 2000 - 2002

1. Strong Motion. Responsible: NN Ambraseys (UK)
2. Earthquake Hazard. Responsibilities: M J Jimenez (Spain), Ch Papaioannou (Greece)
3. Microzonation. Responsible: A Marcellini (Italy)
4. Macroseismology. Responsible: R Musson (UK)

Review of Subcommittee activities during the XXVII General Assembly of the European Seismological Commission, Lisbon, September 10-15, 2000

SC-A Seismicity of the European Region by K Makropoulos

During the XXVII General Assembly in Lisbon, Portugal, from September 10 to 15, 2000, the main activities of SC-A working groups during the last two years (1998-2000), were presented through 3 scientific sessions (A0, A1 and A2), 2 workshops (WSA-1 and WSA-2) and 3 special symposia (SS-1, SS-3 and SS-5) with a total of 188 oral and poster presentations. The papers presented reflect the wide spectrum of scientific fields covered by the term "seismicity" and the variety of topics which are dealt with, within SC-A.

In the Open Session SC-A0, 14 posters were presented covering a variety of topics such as: Cyclic Migration of earthquakes, anisotropy of the medium using shear-wave splitting technics, crustal velocity structures review and lessons from the past decade relative efforts. The common feature of these presentations was the importance of gathering complete and accurate data sets including aftershocks and microearthquakes.

In the first Subcommittee's Symposium SSA-1 "Advances in Modern Volcano Seismology" the 16 oral and 1 poster presentations addressed the issue of seismic activity and its relation to volcanic activity, both for short and long term behaviour. Results from experiments using temporal and/or permanent seismic networks equipped broadband sensors allowed detailed studies to be performed such as: tremor spectral characteristics, modeling the seismic wave field, detection of site effect on volcanoes, estimation of microearthquakes, rupture parameters following eruption, etc).

The benefits from the recent deployment of local permanent or temporary broad band seismic stations complied with the continuous monitoring of other geophysical long time series towards a better understanding of seismo-volcanic behavior was the common feature of almost all presentations of this session.

The session SSA-2 (seismicity in Europe) was the largest one with 30 oral and 33 poster presentations reflecting the large on going scientific activity of our members. It covers almost all the wide spectrum of the term "seismicity" at local, regional and multi-national scale.

Thus, papers of on going effort on a) Regional and National seismicity studies for: Poland, Latvia, Switzerland, Finland, Albania, Portugal, Romania, Algeria and Greece, b)Local scale microseismicity and aftershock analysis for cases in Czech R., Greece and Germany, c)Wave-form, source parameters and stress-field analysis for specific earthquakes like: 12/4/98 Slovenia, 9/7/98 Azores, 28/4/99 Vrancea and 12/11/99 Turkey and d)Magnitude-Intensities relationships were presented. The message from these papers was:

As new sophisticated instrumentation and powerful computing facilities become available, the accumulation of accurate data allows for more detailed studies concerning the identification of special and temporal changes and fractal properties of the seismic activity to be examined.

Two workshops of the SC-A: devoted to “New perspectives in historical earthquake investigation” (WSA-1), and “The third-level seismogeographical regionalization in Europe” (WSA-2), with 17 oral, 5 posters and 2 oral presentations respectively, presenting the on going efforts of the scientists working on this very important subject of evaluating the seismic parameters from historical records.

In WSA-1, owing to the fact that the short instrumental era coupled with the long return periods of destructive earthquakes put barriers on reliable seismic hazard assessment, the role of methods and means for extracting and evaluating macroseismic information was once again stressed during the session. The contribution of archaeoseismological investigations for ancient earthquakes was demonstrated to be of increasing importance. The inherent difficulties and problems of assigning intensities and magnitudes to historical earthquakes was property addressed and the need for careful examination of all available sources was stressed.

In the second WSA-2, the problems of seismic regionalization in Europe were presented by G. Leydecker who wxplained the present state of the on going effort.

The three special symposia were devoted to a) Tsunami Hazards, (SS-1), b) Early warning systems and real time damage assessment, (SS-3), and c) Recent Earthquakes, (SS-5), with 10 oral and 3 posters (SS-1), 10 oral and 4 posters (SS-3) and 24 oral, 16 posters (SS-5) respectively.

In the first (SS-1), several methods of modeling tsunamis including finite-element, and hydro-dynamical approach, were presented using data from and to post tsunami-cases like the Sep. 8, 1905 Calabrian, March 17, 1875 Central Adriatic, Aug. 17, 1999 Izmit (Turkey) and the 1755 Lisbon Tsunamis. The evaluation of seismic/tsunamigenic sources certainly constitutes a mean contributor towards risk reduction in coastal areas.

During symposium SS-3, the need for rapid determination and dissemination of the basic parameters of a strong event to the relevant organizations dealing with humanitarian relief and risk mitigation was stressed. Damage assessment methods and damage simulation Scenarios were also presented and discussed.

Finally, symposium SS-5 was, as usual, devoted to cases of recent destructive earthquakes especially to Izmit and Duzce (Turkey) 17 papers, and Athens (Greece), 12 papers. Source parameter estimation, rupture processes, slip distribution, pre and co-seismic stress changes, water response and aftershock activity were among the main research topics presented during this session. In addition, the need for a fast co/post-seismic survey reaction for a proper damage-assessment and aftershock activity evaluation was also emphasized.

Administrative

During the business meeting, the chairpersons briefly summarized the activities of their groups during the past two years. A fruitful discussion about future activities and initiatives took place and opportunities for closer co-operation through several research projects were highlighted.

Finally, the following changes in the Bureau and the WGS were unanimous accepted by the members present:

1. Dr. M. Stucchi to replace Prof. J. Bonnin as vice-chairman of the Subcommision.
2. Dr. P. Burton to replace Dr. P. Papadopoulos as the chairperson of WG "Statistical models of Earthquake occurrence".
3. The working groups:
 - a. European Earthquake Catalogue.
 - b. Ibero-Maghrebian Region, and
 - c. Central and Eastern Europe, were eliminated and
4. The working group-on "Seismotectonic Analysis", was renamed as Working Group on "Seismogenetic Structures".

SC-B Data Acquisition Theory and Interpretation **by A Shapira and I Oprsal**

Administrative

Minutes from the ESC SC-B Subcommission (Data Acquisition, Theory and Interpretation) meeting held in Lisbon on September 13, 2000.

Chairing person: Helmut Aichele

Participants:

Avi Shapira, Klaus Klinge, Helmut Aichele, Peter Suhadolc, Peter Borman, Peter Malischewski, Thomas Blake, Graziano Ferrari, Jiri Zahradnik, Jaromir Jansky, Ivo Oprsal.

Meeting started at 12:00

- Helmut Aichele gave a report on behalf of the chairman Lev Vinnik, with special emphasis on the workshop that took place at the GRF Observatory and has been announced by the ESC.

- Prof Peter Borman's report concerned the New Manual of Seismological Observatory Practice which will contain 13 chapters.

Members of the WG have produced drafts for 8 of these chapter between the ESC meetings in Tel Aviv and Lisbon. Some copies were circulated in Lisbon for comments and feed back. These chapters relate to:

Chapter 3: Seismic source processes and parameters

Chapter 5: Seismic sensors and their calibration

Chapter 6: Seismic recorders

Chapter 7: Site selection, preparation and installation of seismic stations

Chapter 8: Seismic networks

Chapter 9: Seismic arrays

Chapter 10: Data formats and exchange

The WG organized two workshops on the new manual both at Tel Aviv and at the Lisbon meeting of ESC. Both sessions were well attended (about 50 participants) and the oral and poster presentations were given as scheduled in the respective programs. Most of the oral presentations were given with direct link to the manual's web site. Between the Tel Aviv and the Lisbon meeting four more preliminary manual chapters have been put on the web (chapters 3, 5, 6 and 7).

Chapter 12: Intensity and intensity scales

- After a short discussion on an election of new subcommission representatives, the assembly attempted to vote. The results are:

Chairperson: Avi Shapira (Israel), avi@gii.co.il

Vice Chairperson: Klaus Klinge (Germany), klinge@szgrf.bgr.de

Secretary: Ivo Oprsal (Czech Republic), ivo@seismo.ifg.ethz.ch
(current e-mail addresses)

- After closing the official part, a meeting of new representatives and Helmut Aichele was held. The discussion concerned handing over the organization of the workgroup activities, plan of work on recollection of information about the SC-B workgroup and creation of a detailed information web page.

Current info page:

<http://karel.troja.mff.cuni.cz/students/oprsal/geophys/esc/escwinf.html>

SC-C Physics of the Earthquake Sources **by C-I. Trifu**

The results of the studies carried out as part of the activities of the SC-C during the past two years (1998-2000) were presented in three symposia (SSC-1, -2, and -3) organized during the XXVII General Assembly in Lisbon. Contributions were made in 42 oral and poster presentations and were representative of the several directions of research that is covered by SC-C. Additionally, a field trip was organized to the Tagus Valley to study the fault system.

The symposium SSC-1 was dedicated to "New methodologies and results in Paleoseismology". Since the identification and characterisation of paleoseismogenic fault are complex tasks that require preliminary subsurface geology investigation, even in areas with good geomorphic signature, this session focused on the development of innovative field approaches aimed at paleoearthquake recognition. A total of 17 contributions were particularly directed towards the use of modern three-dimensional techniques, landform modelling, high-quality trench investigations, study of earthquake-induced phenomena, and refined dating techniques.

A second symposium organized in Lisbon by the sub-commission was SSC-2, "Large earthquakes and related long-term faulting behaviour". The 11 papers presented in this session discussed the current state of understanding of the physics and long-term seismic behaviour of faults, critical for the evaluation of the earthquake potential of active faults. Contributions included multidisciplinary studies based on the integration of new and traditional approaches, in area of earthquake geology, quantitative geomorphology, and paleoseismology providing new results on the seismogenic processes, the seismic history of faults, and earthquake cycle.

"Moment Tensor Determination" was the topic of the symposium SSC-3. The purpose of this session comprising of 14 papers was to stimulate the objective study and analysis of the methodologies employed and of the results derived through moment tensor inversion. Contributions covered a wide area of applications requiring the evaluation of earthquake source mechanism and characterization of failure components, from regional and local earthquakes to induced seismicity. Discussions outlined that more work is required on the comparison and the validation of the results obtained by various techniques before attempting to conclude on a standardized methodology.

As part of the SC-C activities during the General Assembly in Lisbon, a field trip was organized in the Tagus Valley primarily with the help of Joao Fonseca from the Technical University of Lisbon. Some 20 geologists and seismologists participated in the trip. The main goal was to visit the active fault that limits the northern side of the Tagus Valley. This included visiting the trenches and discussions on the paleoseismic investigation along this active fault.

Administrative

During the business meeting, the activities of the two working groups during the past two years were summarized. An ample, open discussion about future activities and initiatives emphasized the importance of (1) attracting the colleagues whose research preoccupations and results in areas covered by SC-C are known and appreciated, but who tend to remain rather remote from the ESC framework, (2) integration of young researchers into our activities and encourage them to champion various tasks, and (3) participate in other important meetings such as the EUG, EGS, as well as SSA and AGU. The Working Group on Paleoseismicity outlined the need to organize task forces ready to launch paleoseismic analyses in regions affected by a large earthquake (e.g., Izmit-Duzce in Turkey). The Working Group on Moment Tensor Determination concluded that a dedicated web page is required in order to facilitate the interaction of those interested in sharing data, software and results.

The members present at the meeting re-elected the Bureau members: C-I. Trifu (President) and A. Deschamps (Vice-President), and M. Meghraoui (Secretary) was elected as secretary. K. Atakan was elected as chairperson of the Working Group on Paleoseismicity, and G. Bock was elected as the chairperson of the Working Group on Moment Tensor Determination.

SC-D Crust and Upper Mantle Structure **by J Mechie**

Administrative

The meeting took place on September 12th between 12⁰⁰ and 12⁴⁰. Eight people attended. The agenda for the meeting was as follows.

- 1) New chairperson and vice-chairperson at the next meeting in 2002.
- 2) Activity report
- 3) Working group
- 4) Report on Commission on Controlled Source Seismology (CCSS) meeting in Dublin, 1999
- 5) Resolutions

Discussion on individual topics

1) J. Mechie (chairperson) and A. Guterch (vice-chairperson) will complete their term of office by the time of the next meeting in 2002. J. Mechie made a request for suggestions for successors for both positions.

2) The activity report of the sub-commission is about 120 pages long. The cost of reproducing the report 100 times was DM 1700. In the future, in order to cut costs, save paper and space and also to be more modern it was suggested that the report be distributed mainly in the form of CD-ROM and/or the internet, with only a few paper copies being produced. A decision should be taken by the time the request letter for contributions for the next report is circulated in late 2001 or early 2002.

3) The activity report of the Working Group "Tomography and other seismic methods" is included in the activity report of the sub-commission. A separate meeting to discuss the activity within the working group was held on 13th September 2000. Minutes of this meeting prepared by T. Yanovskaya (Chairperson) are reported below.

4) Brian Jacob gave a short report on the Commission on Controlled Source Seismology (CCSS) workshop, held in Dublin in October 1999. Many European seismologists also participating in the activities of ESC sub-commission D attended the Workshop. A summary of the workshop will be included in the next activity report of ESC sub-commission D.

5) There were no resolutions.

Working Group 1: Tomography and other seismic methods

The meeting took place between 1800-1900 in the room A3. Fourteen people attended the meeting.

The agenda was adopted.

Chairperson of the WG1 Tatiana Yanovskaya informed about the activity the Working Group in the period 1998-2000 and the tasks of the WG.

The structure of the Working Group was discussed, and the persons responsible for selected directions of research were confirmed.

The future activity of the Working Group was discussed. The discussion is summarized as follows:

- A home page of the WG is to be organized, and all information about WG activity should be placed to the Web-site
- Responsible persons come into contact with the researchers working in the relevant field, and place the information on different teams to the Web-site. The teams are requested to place new results also to the Web site (papers, short communications, lists of publications). This activity would improve exchange of information between the teams working in the same field.
- Responsible persons submit the activity reports to the Chairperson by the end of September 2001. The WG activity report, should be submitted by the end of March 2002.

SC-E Earthquake Prediction Research

By J Zschau

Five sessions were organised during the conference, one Open Session, one Special Session and three Subcommission Symposia with a total of 91 oral and poster presentations:

SC-E-Open-Session (Convenor J. Zschau)

Five posters covering various aspects of earthquake prediction research

SS-5-Recent Earthquakes (Convenors J. Zschau, A.A. Barka)

The session provided a forum for an interdisciplinary discussion of recent large earthquakes, combining various seismological aspects with geotectonics, hydrogeology, modern geodesy from space and new possibilities of modelling stress fields evolving from plate motion as well as from the occurrence of large earthquakes.

21 oral presentations and 16 posters were given. More than half of the contributions were dealing with the two catastrophic earthquakes of 1999 in Turkey (Kocaeli and Düzce) and the catastrophic event near Athens in the same year. Data from at least nine other recent large earthquakes were presented and discussed as well.

SSE-1 Crustal Transients Related to Large Earthquakes (Convenors St. Yakobsdottir, R. Stefansson, J. Zschau)

The session was focussing on transient signals and precursors related to earthquakes. It presented examples from the Corinth Rift Laboratory Project, the Prenlab project in Iceland, the Umbria region in Central Italy as well as from the Caucasus area. Two contributions were dealing with the phenomena of stress migration and earthquake triggering, respectively, another one with using modern

remote sensing techniques for observing thermal anomalies associated with seismic activity. Altogether eight contributions were made in form of oral presentations.

SSE-2 Physics of Earthquakes: Experimental and Numerical Modelling
(Convenors G.A. Sobolev, A. Zang)

About hundred scientists participated in this symposium. Altogether 27 presentations were made, 23 in oral form and 4 as posters. Highlights were related to

- the combination of fracture precursor studies at different scale,
- the physics of the earthquake source,
- the kinetic process in earthquake preparation,
- acoustic emission and seismicity clustering,
- mechano-electric phenomena in rocks, and
- the role of water.

SSE-3 Models and Algorithms in Earthquake Forecasting: Theory and Application
(Convenor G. Purcaru)

The session concentrated on various aspects of quantitatively assessing the space-time-complexity of the earthquake preparation phase and the following rupture process. 14 contributions were made in form of oral presentations. They were followed by an open discussion on the question whether an individual earthquake may principally be forecasted or not.

The subcommission held its administrative meeting on Tuesday, Sept. 12, 2000. It was decided to skip working group 4 on "Man Made Earthquakes" because it had not been active in the recent past. It was acknowledged, however, that the subject is still an important research field and, thus, should not be totally skipped, but should be taken into account in working group 1. There was agreement that the possibility of reactivating working group 4 should be considered again in two years. As a new initiative, it was decided to establish a new working group 4 "Earthquake Triggering" with G. Papadopoulos being the responsible chairperson.

In the general discussion G. Sobolov and A. V. Ponomarev pointed out that more attention should be paid in the future to rock burst and laboratory fracture experiments as well as to their comparison with earthquake field studies. F. Freund suggested to strengthen the sector of non-traditional research topics such as ionospheric transients and related phenomena. According to G. Purcaru the non-availability of seismic catalogues is still a problem, which has not been solved. It needs continuing efforts. G. Martinelli proposed the establishment of a permanent SC-E web site. The proposal was approved, and he will inquire to set up the web site linked to the ESC web site. Finally, J. Zschau proposed to check the possibility of organizing a special issue on "Recent Earthquakes". It was pointed out, however, that a number of similar activities are already underway, and one should carefully check whether an additional activity of this kind would really make sense.

The responsible working group chairpersons gave an outlook on the major activities they have planned for the future:

WG1: "Field Observations" (A.V. Ponomarev, M. Westerhaus)

The major goals remain

- to develop a physical understanding of the earthquake preparation process based on multiparameter observations in the field and in the laboratory, and
- to search for more reliable methods, algorithms and precursors for real earthquake prediction.

WG2: "Nonlinear Processes in Multiscale Seismicity and Earthquake Prediction" (V. Smirnov, C. Godano)
not represented in the meeting

WG 3: "Algorithms and Models of Earthquake Prediction" (G. Purcaru)

The major goals will be

- to develop and improve the actual methods and algorithms for long- to intermediate- or even short term prediction,
- to test these methods against real cases,
- to improve the quantitative assessment of various space time features of seismicity,
- to develop deterministic and probabilistic algorithms, and
- to develop simulation models for a better understanding of the reoccurrence of large earthquakes.

WG 4: "Earthquake Triggering" (G. Papadopoulos)

This new working group will deal with

- the establishment of earthquake triggering case studies and their verification,
- understanding the physics of earthquake triggering, and
- modelling the process of earthquake triggering.

SC-F Engineering Seismology

by D Slejko, I Cecic, M Garcia-Fernandez, A Marcellini, R Musson and Ch Papaioannou

During the 27th General Assembly of the European Seismological Commission, held in Lisbon, Portugal, from September 10 to 15, 2000, the Subcommssion F "Engineering Seismology" has presented the activity done by its Working groups through 4 scientific thematic sessions and one open session. The thematic scientific sessions covered the following themes: SSF-1 "Advances in seismic hazard", SSF-2 "Site effects and experimental data", SSF-3 "Regional and local variations in intensity attenuation", SSF-4 "Strong ground motion analysis and prediction". The thematic sessions consisted of oral and poster presentations while the open session collected only posters. In total 128 oral papers and posters were scheduled for presentation but a notable number of them was cancelled. In addition, a special meeting on "A task force for severe earthquakes in Europe" was held.

The session SSF-1 "Advances in seismic hazard", organised by M. Garcia-Fernandez and J. Lapajne, consisted of 14 oral presentations from the original 16 abstracts received. Two papers were cancelled in advance because authors were

unable to attend the meeting. The poster session consisted of 6 posters from the original 11 abstracts received. Only two authors cancelled in advance their presentation. Different approaches to seismic hazard assessment were presented, including probabilistic, deterministic and logic-tree methods, zonified and zone-less source models, time-independent and time-dependent occurrences; and applied at different scales, from local (e.g., city earthquake scenarios) to broad regional (e.g., the Mediterranean region).

The session SSF-2 "Site effects and experimental data", organised by A. Marcellini and A. Ansal accepted 41 abstracts. The majority of authors asked for oral presentation, but because of the limited time available it was decided to address several papers to the poster session. This decision was taken in order to allow both authors and the audience to participate to a fruitful oral session, that means sufficient time for a clear presentation and time for the discussion. In such a way, 26 posters and 15 oral presentations were accepted, among which 11 posters and 4 oral presentations were withdrawn, often without previous notification. The session was satisfactory both for the quality of papers (with a few exceptions) and for some interesting discussions. The oral session was organized on the basis of a full-day presentation and discussion. Time for discussion was allocated after each presentation. The order of presentation was fixed by the chairpersons on the basis of the two topics: microzonation and site effects. In particular the majority of papers were devoted to site effects, considering both linear and non-linear soil behaviour, tackling the problem from a theoretical point of view or with experimental data. Site effects results obtained using accelerometric and weak-motion velocimetric recordings were shown. Particularly significant was the discussion concerning the modern experimental techniques for site effects detection using weak motion data (thanks to some very good presentations and to some even better posters).

During the session SSF-3 "Regional and local variations in intensity attenuation", organized by R. Musson and C. Papaioannou, seven oral papers were presented and seven posters. There was a large audience for the oral session. A report on the meeting has been placed on the WG's web site at

<http://www.gsrq.nmh.ac.uk/hazard/esc2000.htm>

and this includes online pdf versions of some of the papers.

C. Papaioannou, M. Erdik, P. Smit and C.S. Oliveira organized the Session SSF-4 "Strong ground motion analysis and prediction". Goals of this session were to provide information on (a) the strong motion data recorded in the near field during the strong earthquakes of 1999 in Turkey, Taiwan and Greece, (b) attenuation of strong ground motion parameters, and (c) methods for the synthetic ground motion. The program of the session consisted of 21 oral and 10 poster presentations. The organizers received the full text of 6 papers, which were included in the Book of Abstracts, and Papers". The organizers offered to the authors of the posters the possibility to give a short oral presentation of their work during the last part of the oral presentations. For various reasons 6 oral and 3 poster presentations were cancelled. The papers of the first part of the session dealt with the strong motion data recorded and analyzed during the last strong earthquake sequences in Turkey, Taiwan and Greece. A paper on the dissemination

of European strong motion data was also presented in this part. The second part included papers on the attenuation of strong ground motion. Four papers (out of six) were presented in the third part of the session involving in the modeling and estimation of the strong ground motion in the near field. Finally, during the last part of the session four general papers on strong motion seismology were presented and the session was closed with the short oral introduction of the posters.

Only 6 posters out of the 15 in program were displayed in the SC Open Session, organised by D. Slejko, I. Cecic and M. Garcia-Fernandez. They related to different aspects of risk analysis and assessment, with the majority of them focusing on seismic hazard aspects.

D. Slejko, R. Musson, and I. Cecic organized the meeting M1 "A task force for severe earthquakes in Europe". The meeting was held on Monday September 11 at 18:00 in the Meeting Room 1 of the Lisbon University. There were 42 participants from 15 countries. On the agenda there was the matter of the proposed ESC task force for severe earthquakes in Europe, that would immediately after the strong earthquake collect macroseismic data (more on <http://www.gserg.nmh.ac.uk/~phoh/escmac1.htm#rapid>). I. Cecic presented the proposed goals of such group as well as its financial evaluation. There should have been six presentation of existing national practice, that were cancelled due to the lack of time and the intensive discussion that developed. The proposed name of the group seemed to have provoked the major part of comments. It was changed into "Field investigation team of the ESC" (FITESC). The main outcome of the meeting was the opinion that such force is needed and would be welcome in most Euro-Mediterranean countries. A resolution on this topic was proposed to the ESC Council and accepted as ESC recommendation (<http://www.gserg.nmh.ac.uk/esc/resolutions2000.html>). After the meeting, the Bureau of the SC-F has formed a Preliminary Committee, whose members are D. Mayer-Rosa, R. Musson and I. Cecic. They are to explore the possibilities of realisation of this idea, and to prepare more detailed material.

Administrative

The business meeting of Subcommittee F had the following agenda:

1) Working Groups Activity Reports, 2) Resolutions, 3) Bureau elections.

1. Working Group Activity Reports

- WG-1 Strong Motion

Chairperson: N.N. Ambraseys (confirmed 2000-2002).

Reporter: P. Smit.

Main activity: Collection of strong-motion data from European-Mediterranean countries.

Product: Data publication on CD-ROM (about 1000 records, most of them analogue).

Next activity: Creation of a Internet Web site for European-Mediterranean strong-motion data (public domain data). Funds available from the Council of Europe under the Environment & Climate Research Programme 2000-2002.

- WG-2 Seismic Hazard Assessment

Chairperson: D. Giardini

Reporter: D. Giardini

Main activity: Unified hazard computation of a ESC-region seismic hazard map. A preliminary unified map of the Mediterranean Basin has been produced under the IGCP-382 SESAME project. The publication of a unified seismic hazard map for the ESC-region, joining SESAME results with Central-Northern Europe from GFZ-Potsdam (G. Grünthal) is scheduled for February 2001. An editorial committee (3-4 people) is being created. Data and results will be available from a Web page. D. Giardini thanks all the contributors and the fruitful cooperation. Especially he thanks M.J. Jiménez for the huge amount of work done for the project that allowed to achieve the obtained results. D. Giardini suggests M.J. Jiménez and Ch. Papaioannou to co-chair the WG for the period 2000-2002, if they are available. Both agree.

- WG-3 Microzonation

Chairperson: A. Marcellini (confirmed 2000-2002).

Reporter: A. Marcellini.

The WG was unable to reach the proposed goal to complete a microzonation manual, mainly because they did not receive enough contributions. The possibility of closing the WG was not accepted. It was suggested to keep it alive with less ambitious goals. A Proposal to establish a WG Web page to collect available information on microzonation, and prepare guidelines for microzonation studies was presented. It could work like a discussion forum. A. Ansal agrees with the proposal as representative of the EAEE in the WG. D. Slejko suggests to have a progress Workshop before next ESC, i.e., in one year.

- WG-4 Macroseismology

Chairperson: R. Musson (confirmed 2000-2002).

Reporter: R. Musson.

The WG did not have any workshops or other meetings; however, there is a web page, maintained by R. Musson that was a focus of activity. The WG held its biannual business meeting during the General Assembly, on Monday September 11 at 19:30. The meeting had to be very short due to the fact that it ran immediately after the FITESC discussion, which was also WG business. R. Musson was confirmed as chairman of the WG for the next two years.

2. Resolutions

Establishment of a ESC task force team for macroseismic data collection after main earthquakes in the ESC-region and made them available in a Web site. Propose ESC to endorse the initiative. D. Slejko and I. Cecic reported shortly on the outcome of the meeting M1 "A Task Force for Severe Earthquakes in Europe", that was held on Monday 11 September. After the meeting, the Bureau of the SC-F has formed a Preliminary Committee, whose members are D. Mayer-Rosa, R. Musson and I. Cecic. They are to explore the possibilities of realisation of this idea, and to prepare more detailed material. The text for the ESC resolution, as accepted by ESC, can be found on <http://www.gserg.nmh.ac.uk/esc/resolutions2000.html>.

3. Bureau elections

The members of the SC-F Bureau were elected in 1996. They are:

Chairperson: Dario Slejko (Italy), dslejko@ogs.trieste.it

Vice Chairperson: Mariano Garcia Fernandez (Spain), mgarcia@ija.csic.es

Secretary: Ina Cecic (Slovenia), ina.cecic@gov.si

All members of the Bureau were confirmed for the next mandate. It is, however, their third and the last mandate (see <http://www.gserg.nmh.ac.uk/esc/ammend96.html>), so on the next ESC General Assembly the new Bureau would be elected.

ESC Training Course for Young Seismologists **by A B Walker**

The ESC, with the financial support of IASPEI, has sponsored three training courses for Young Seismologists in order to expose them to data acquisition, processing techniques and empirical evaluation of site effects under the tutorship of many established seismologists throughout Europe and the world. The recent training course in Lisbon, following the now established format, took place in the two days before the General Assembly and focused on earthquake locations and their uncertainties. The lecturers, Jens Havskov, Avi Shapira, Brian Baptie and Luis Matias, tackled the theme location of earthquakes and interpretation of their uncertainties.

Eleven students from four countries attended the course. Questionnaires were distributed amongst the students inviting them to comment on the overall impression of the course together with level struck by each individual lecturer. The responses indicated a high rating for the course, overall, and the individual lecture questionnaires commended the lecturers in both their delivery and level of teaching. Lecture notes were distributed to the students together with CD's containing the test data used in the course for students to use on their return.

The primary objective of the Young Seismologist Training Course was to provide a thorough grounding in both the theory and practice of commonly used methods for locating earthquakes. Beginning with an introduction to the basic non-linear problem, the lecturer team developed the theoretical aspects of setting up and solving systems of equations used in classical methods of earthquake location. Following from this they discussed in detail the determination of the formal errors from least squares inversion assuming a Gaussian distribution of arrivals and the pitfalls of using RMS as an error estimate. Additional methods of earthquake location including grid searching, the simplex technique, joint hypocentral determination and the use of single stations and arrays were also described. The basic aspects of ray theory were then developed, leading to the calculation of travel-times for both plane layered and spherical earth models and a discussion of expected arrivals at local, regional and teleseismic distances. They presented examples of data from a local seismic network in the Azores. The practical elements of the course encompassed the use of computer programs commonly used for locating earthquakes. Participants were instructed in the picking of phases, locating and examining the parameters that influence the errors and in using the standard software package, SEISAN. Facilities for the course were well organised by the Lisbon team from the Institute of Meteorology and the Institute of Geophysics; particularly in relation to the provision of sufficient hands-on computing capacity.

It was clear that the students had a varied level of experience and background knowledge, a situation which is always difficult to cater for; many of the students had not previously located an earthquake. An early assessment of their previous experience was made by Jens Havskov, which helped all lecturers to adjust to the wide spectrum of capability present. It is recommended that, in

future, lecturers receive prior information on participants' experience, in order to facilitate, further, their response to students needs. Additionally, to make this a two-way process, lecture notes should be distributed prior to the training course to allow students to review material, if possible, before attending. These notes will also serve as a reference set when students have returned to their institutes.

Following receipt of a positive report on the training course, the ESC Bureau commended the lecturers and organisers on behalf of ESC members and endorsed a proposal to hold a fourth training course before the next General Assembly in Genoa, 2-8 September, 2002.