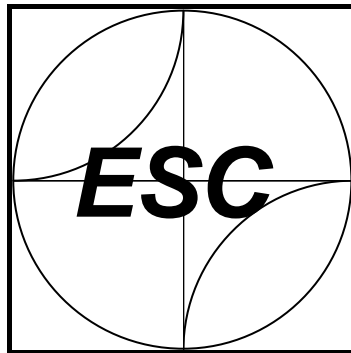


IUGG International Union of Geodesy and Geophysics
IASPEI International Association of Seismology and Physics
 of the Earth's Interior

EUROPEAN SEISMOLOGICAL COMMISSION

Activity Report 1994-1996
and
Proceedings of the XXV General Assembly 1996
Reykjavik, Iceland



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

Edited by

P. Suhadolc
Secretary General

and

Alice B. Walker
Assistant Secretary

1996

Preface

The XXV General Assembly 1996 was held at the Hotel Loftleidir in Reykjavik, Iceland, on invitation of the Meteorological Office of Iceland. The location provided an excellent place to convene 29 symposia and workshops with more than 550 papers for about 450 participants.

The weather was rainy with low clouds for most of the conference time, but that kept the number of participants attending the sessions and workshops high.

The Local Organizing Committee and its chairman Prof. Ragnar Stefansson worked hard to make the meeting a success and we would like to express our most sincere thanks to them. In particular, Bardi Thorkelsson and Helga Bjarnason earn special recognition for their excellent organization.

Also the ladies program was well organized and had some very nice and instructive tours to historic places in and around Reykjavik. An excursion to Thingvellir took place during the meeting and several post-conference excursions within Iceland were organized after the meeting. We would like to thank, in particular, prof. Pall Einarsson for his excellent guidance of the 3-days post-conference tour in the Myvatn area.

Due to the substantial support granted by the LOC a number of scientists mainly from Eastern European countries could be hosted during the meeting. Without this generosity many of them could not have managed to attend. The Bureau of ESC wants to express its deepest gratitude and appreciation.

Not many changes took place this time in the ESC-Bureau. We have a new Vice President, Dr. Avi Shapira. Our Past-President Dr. Ludvik Waniek has passed away shortly before the expiration of his term. We all owe him deep gratitude for everything he has done for the growth and success of ESC.

On the other hand, several Subcommissions have changed their chairpersons and many working groups have been redefined. This will certainly bring new life and fresh ideas to the ESC activities. We are all very much looking forward to some stimulating work in the years ahead and should actively participate in the WG of our interest.

In the past year the ESC Bureau has created, mainly through the efforts of our Assistant Secretary Dr. A B Walker, the ESC Homepage on the Internet. The address is: <http://www.gserg.nmh.ac.uk/esc/>, and I urge everybody to regularly check it in order to read the latest ESC related news and be thus informed on the ongoing ESC activities.

ESC is looking forward to its XXVI General Assembly in the city of Tel Aviv and appreciates very much the interest and efforts of the colleagues in Israel.

Peter Suhadolc
ESC Secretary General

THE XXV ESC GENERAL ASSEMBLY

REYKJAVIK, 9 - 13 SEPTEMBER 1996

Hotel Loftleidir

Meeting of the Bureau Sunday, September 8

Participants: G Sobolev, R Stefansson, P Suhadolc, A B Walker
Excused: J. Drakopoulos

1. Changes in the Bureau

J Drakopoulos (Vice-Pres.) is resigning, having served for two terms.

2. Appointments

Nominating Committee: H Aichele, C Eva, J Bonnin, R Gutdeutsch

Resolutions Committee: I Stimpson, L Vinnik, D Mayer-Rosa.

Joint EMSC-ORFEUS Scientific Advisory Committee: J Havskov.

3. Titular members

7 Titular members (D Solakov, Bulgaria; J Sileny, Czech rep.; P Heikkinen, Finland; C Tabet, Lebanon; R Sleeman, The Netherlands; Y Tyupkin, Russia; J Badal, Spain) are newly appointed for the period 1996-2000. Lebanon is again present at the General Assembly, Dr. C Tabet has been appointed as Titular member.

P Wiejacz will be the proxy of S. Gibowicz for Poland and P Suhadolc will be the proxy of D Solakov for Bulgaria and of D Skoko for Croatia.

Jordan, Monaco and Malta (obs.) 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 presently not an IUGG member but will be invited to participate as an observer. They will be invited to the ESC Council meeting on Thursday but will not have voting rights.

An Application for membership has been received from FYRO Macedonia (V Mihajlov proposed as Titular member). The FYRO Macedonia has satisfied the conditions required to be a member of ESC (members of IUGG) and there are, therefore, no more restrictions for its ESC membership.

It was decided that P Suhadolc should write letters to the National committees requesting them to rotate titular members.

4. Next General Assemblies

Invitations by The Institute for Petroleum Research and Geophysics in Tel-Aviv (Israel) and from the Institute of Geophysics of the University of Lisbon (Portugal) for 1998 were received. The titular members will vote on the 1998 venue at the ESC Council on Thursday.

5. Athens 1994 Proceedings

Published in 1996 by the University of Athens, Faculty of Sciences, Subfaculty of Geosciences, Department of Geophysics and Geothermy (Editors: K Makropoulos, P Suhadolc). The Bureau acknowledges with thanks the big effort in the publication and distribution of the three volumes.

6. Amendment of ESC Bylaws

After extensive discussions on the matter and following several suggestions raised by WG responsables, the ESC Bureau agrees to propose to the Executive Committee the following Bylaws amendments:

1. Inclusion in the ESC Executive of a representative from Observatories and Research Facilities for European Seismology (ORFEUS).

2. A limit on the serving of Subcommission Bureau members.
3. A timetable for sending SC and WG reports to the ESC Bureau.

The last two points refer to changes of the internal rules for Subcommissions.

P Suhadolc volunteered to represent ESC on the ORFEUS board of Directors and A Walker would represent ESC on the EMSC executive council. These changes will be proposed at the Executive meeting.

7. SC

H Berckhemer and U Luosto are resigning from the positions of Subcommission chairpersons. The Bureau acknowledges with thanks their long and fruitful service to the ESC.

Proposals for an improved interaction between SC's and the ESC Bureau have been discussed and some changes to the internal rules for Subcommissions proposed (see point 6).

Meeting of the Executive and Local Organising Committees Sunday, September 8, 1996

Participants: G Sobolev, R Stefansson, P Suhadolc, A B Walker, K B Makropoulos, L Vinnik, A Deschamps, U Luosto, A Ansal, B Thorkelsson, H Bjarnason, S S Jokobsdottir, I Th Bjarnason, B Brandsdottir, J Solnes, R Sigbjornsson, H Palsson

1. The Reykjavik General Assembly

The printed programme of the Reykjavik General Assembly is presented and all facilities are explained by R Stefansson, Chairman of the Local Organising Committee. Many conference papers have been printed by LOC in the book "Seismology in Europe".

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

2. Athens 1994 Proceedings

The three volumes of the Athens Proceedings have been published and distributed in 1996. There are still copies available for interested persons. The Executive Committee acknowledges with thanks the big effort in the publication and distribution. 300 copies are available free of charge with only postage required (about 10 USD). Interested persons should contact K Makropoulos.

3. EAEE and EMSC Representation

For the period 1996-2000, ESC will be represented in EAEE by the SC-F chairperson and in the EMSC by the Assistant Secretary. If the Council will adopt the proposed Bylaw amendment (see point 6) on ORFEUS, ORFEUS will be represented in the ESC Executive and the ESC Secretary General will represent the ESC on the ORFEUS Board of Directors. The appointment of J Havskov as member of the Joint EMSC-ORFEUS Scientific Advisory Committee is approved. A link between the EAEE and ESC home pages was suggested by A Ansal. The establishment of the link is approved.

4. Changes in the Bureau and Subcommissions

J. Drakopoulos (Vice-Pres.) has already served two terms and is not eligible for re-election. U Luosto is resigning and proposes to contact J Mechie from Potsdam for a possible replacement. H Berckhemer is resigning and proposes J Zschau from Potsdam as replacement. The Executive acknowledges with thanks the work being done.

5. SC & WG

A need for a closer co-operation between Working Groups and the dissemination of information to the Bureau about their activities is stressed. Several ideas on Task Groups, discussions, Open forums are brought forward.

Reports of the activities of the WG should be sent to the SC chairperson and the Bureau 6 months before the GA. The SC chairperson then interprets the reports and sends them together with an overview of the WG achievements to the Bureau, 4 months before the GA. The Bureau reviews the reports and asks for external evaluation where appropriate.

It is proposed that the SC Bureau be in charge for a maximum term of 6 years, starting at this General Assembly.

It is proposed (Vinnik, Stefansson, Ansal) that a report is produced within 3 months after the GA on the highlights of each SC session to be printed along with the ESC Administrative proceedings. Ansal offered to publish the short reports also in the EAEE Bulletin.

6. Amendments of the ESC Bylaws

After extensive discussions on the matter the Executive agrees to propose to the ESC Council the following Bylaw amendments:

1. Inclusion in the ESC Executive of a representative from Observatories and Research Facilities for European Seismology (ORFEUS).
2. A maximum term of 6 years for serving in the Subcommissions.
3. Reports of the activities of the WG should be sent to the SC chairperson and the Bureau 6 months before the GA. The SC chairperson then interprets the reports and sends them together with an overview of the WG achievements to the Bureau, 4 months before the GA. The Bureau reviews the reports and asks for external evaluation where appropriate.

The last two points refer to changes of the internal rules for Subcommissions.

Opening Plenary Session Monday, September 9, 1996

Present: About 120 participants.

1. General Activity Report of the ESC President

Ladies and Gentlemen,

Let me present a short review of ESC activities in the years 1994-1996.

The Proceedings of XXIV General Assembly of the European Seismological Commission in the Athens were edited, printed and distributed. This edition contains a number of excellent scientific papers and details the work carried out by European seismologists. Owing to the excellent work of the editors - Kostas Makropoulos and Peter Suhadolc - a valuable report in three volumes has been issued, presenting a detailed insight into ESC administration and new scientific results. We congratulate the whole editorial staff and express our sincere thanks to them.

The ESC Bureau has met twice since the assembly in Athens, in July 1995 during the Boulder IUGG conference and in June 1996 in Iceland to prepare for the Reykjavik General Assembly. Moreover, the Secretary General and Assistant Secretary had two more meetings in this respect with the LOC. A business meeting was held in July 1995 during the Boulder IUGG conference.

The ESC Bureau has in the past two years entered the computer age with its world-wide web home page which was established by Alice Walker - the Assistant Secretary. I would like to thank her, particularly, for this initiative. The home page is designed both as an information pack, covering ESC history, structure, aims and administrative infrastructure and, more importantly, as a platform for information, dissemination and communication between its members. It is intended to provide links to all members who wish to be closely involved with ESC affairs. For this Icelandic Assembly it also provides convenient links to factual information about our forthcoming events. A Walker in collaboration with R Stefansson linked the bulletin board in Iceland to the ESC home page and this allowed delegates up-to-date information about the progress of this Assembly. We need to think about the next step - creating a logical network of the European Seismological Commission.

The ESC - nominated scientists actively participated in the efforts of the European Advisory Evaluation Committee for Earthquake Prediction, chaired by Luis Mendes Victor. Two actions have been undertaken in 1995. The probability of a strong earthquake in Portugal has been estimated, first as a test exercise. Then, the evaluation of the earthquake predictions issued in Greece have been made following a request from the Greek Government.

The ESC-nominated scientists of the Joint EMSC-ORFEUS Scientific Advisory Board have produced a report, which makes substantial recommendations for the improvement of the Seismological Service in Europe. It is now up to the EMSC and ORFEUS to consider these proposals and take forward the recommendations. In this respect we think it would be reasonable to amend the ESC Bylaws in order to have an ORFEUS representative present at ESC Executive meetings.

The ESC General Assembly 1992 in Prague recommended "use of the new European Macroseismic Scale 1992 proposed by ESC - Working group in parallel to the existing scales for a time period of three years". The scale was indeed introduced in different countries and proved to be successful. A resolution will be presented at this Assembly to adopt the new Macroseismic Scale - EMS-92.

An extensive debate was held at the ESC business meeting in Boulder, Colorado, in July 1995 in order to explore the feasibility to have an ESC European Earthquake Catalogue. The long and fruitful discussion at the Boulder ESC business meeting can be summed up as follows:

- It is not possible to have a single European catalogue.
- It is difficult to solve border problems so researchers need more access to basic data.
- It is not possible now to reach the unique quantification of magnitudes and other earthquake parameters.
- It is necessary to have one place to provide access to databases - EMSC may be one from the natural candidates.

Following the suggestion made by Jean Bonnin we plan to have a special discussion on the problem of European system of catalogues and data base after the Workshop on Friday, 13th of September. And we hope to reach workable solution to the problem.

It was our old dream to attract more young seismologists to the ESC. The ESC with financial support from IASPEI sponsored a seminar for young seismologists (up to age 33) in order to expose them to fundamental investigations and new techniques (eg. digital acquisition and processing). This has resulted in a Training Course held for two days before the opening of the present Assembly and hosted by the Icelandic Meteorological Office, with grateful acknowledgements by the ESC.

The Asian Seismological Commission (ASC) has been formally established and the IASPEI regional meeting took place in August 1996 in Tangshan. P Suhadolc attended and represented the ESC. The ASC is a confirmation that the policy of a regional commission pursued by the ESC for decades has proved to be correct. However, no SC's or WG's have been foreseen in the structure of Asian Seismological Commission, but, simply, Task Groups.

European seismologists continued in the activity along the "Global Seismic Hazard Assessment Programme". The President of the ESC and a number of our colleagues took part in organising and holding the Caucasus Regional Meeting of GSHAP in Ashabad.

V. Karnik's death led ESC to suggest to A Spicak, head of the seismology lab at the Geophysical Institute, CAS in Prague, that his archives be carefully indexed and preserved and access to the material be available through an ESC memorial room in Prague which would be given to the scientific community. The ESC has partiallyth ESC affairs. For this Icelandic Assembly it also provides convenient links to factual information about our forthcoming events. A Walker in collaboration with R Stefansson linked the lletin board in Iceland to the ESC home page and this allowed delegates up-to-date information about the progress of this Assembly. We need to think about the next step - creating a logical network of the European Seismological Commission.

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V. Karnik's death led ESC suggest to A. Spicak, head of the seismology lab at the Geophysical Institute, CAS in Prague, that his archives be carefully indexed and preserved and access to the material be available through an ESC memorial room in Prague which would be given to the scientific community. The ESC has partially in Romania. His research contributed to scientific understanding in these fields and aroused international interest: Seismicity of Europe (Prague, 1968; 1971); Catalogue of Balkan earthquakes (UNESCO, 1974; 1993); Atlas of isoseismal maps for Balkan earthquakes (UNESCO, 1974). He published his scientific results in about 100 papers in journals from Romania and abroad.

Dr. Radu devoted all his long and productive scientific activity to the development and promoting of seismological research in Romania. His death was a heavy loss to Romanian seismology.

We shall never forget his outstanding contributions. His memory will always live in our hearts.

(Luminita Ardeleanu and Mircea Radulian)

Nikolai Vissarionovich Shebalin (1927-1996)

One of the outstanding seismologists, Nikolai V. Shebalin, passed away on June 19, 1996, after a long struggle with a severe illness. During his entire scientific career, he worked at the Institute of Physics of the Earth (now the Institute of Seismology) of the Russian Academy of Sciences. He was one of the organizers of the Interdepartmental Geophysical Committee (now the National Geophysical Committee, Russian Federation) and an active participant in international geophysical cooperation. Nikolai V. Shebalin is the author of several fundamental works in seismology and adjacent sciences, the initiator and leader of numerous extensive research programmes that had a large impact on the development of scientific thought and on the improvement of observational systems. Nikolai V. Shebalin was esteemed in international scientific bodies and elected to leading positions (e.g. in 1979 he was elected Vice-President of the IUGG). With his penetrating insight and sustained industry, Nikolai V. Shebalin produced new ideas and acquired results across a broad spectrum of science and culture.

We shall remember his contribution, we owe him great respect and thanks.

(G. Sobolev)

Albert Stein (1929-1996)

On January 26, 1996, the German seismologist Prof. Dr. A. Stein passed away at the age of 67 years. Until his retirement in 1993 he was director at the NLFB in Hannover, Germany and head of the explosion seismology group.

For more than 30 years he was responsible for organizing the programme for deep seismic sounding in Germany and the Alps, the latter, in close cooperation with French and Italian Colleagues. During the post war decades, Albert Stein contributed considerably to the progress of explosion seismology in Germany and Central Europe and his memory as a scientist and a person will continue with the community he served.

(Frank Scherbaum)

3. Call of Titular Members

1994-1996

Country	Titular member	Confirmed or proposed	Proxy
Algeria	M Benhallou	16.06.92	
Austria	W Lenhardt	12.06.92	
Belgium	Th Camelbeeck	14.09.94	
Bulgaria	L Christoskov	13.08.92	P Suhadolc
Croatia	D Skoko	15.09.94	P Suhadolc
Czech republic	L Waniek	24.01.94	J Sileny
Denmark	J Hjelme	04.09.92	E Hjortenberg
Egypt	M Dessokey	01.09.92	
Finland	U Luosto	03.06.92	
France	A Deschamps	09.02.94	
Germany	F Scherbaum	21.08.92	
Greece	J Drakopoulos	12.09.94	K Makropoulos
Hungary	T Zsiros	16.09.94	
Island	R Stefánsson	26.08.92	
Ireland	A W Jacob	25.08.92	
Israel	A Hofstetter	30.06.92	
Italy	C Eva	13.08.92	
Jordan	Z El-Isa	25.08.92	
Lebanon	RPJ Plassard		C Tabet
Luxembourg	J Flick	26.05.92	
Morocco	D Ben Sari	25.06.92	
Monaco	N Bethoux		
Netherlands	Th De Crook	11.06.92	
Norway	S Mykkelveit	25.08.92	
Poland	S Gibowicz	16.09.94	P Wiejacz
Portugal	L A Mendes Victor	15.06.92	
Romania	D Enescu	01.09.92	M Radulian
Russia	S Arefiev	01.09.92	S Tyupkin
Slovakia	P Moczo	22.02.94	
Slovenia	J Lapajne	02.03.94	
Spain	J Mezcuca	03.09.92	J Badal
Sweden	O Kulhanek	03.06.92	
Switzerland	D Mayer-Rosa	21.02.94	
Tunisia	M Allouche	08.09.94	
Turkey	R Yilmaz	28.01.94	
UK	I Stimpson	08.04.94	

4. Activity reports of the Subcommissions

Short activity reports of the Subcommissions are delivered by:

SC-A: "Seismicity" - K. Makropoulos
SC-B: "Data Acquisition and Interpretation" - L. Vinnik
SC-C: "Source Physics" - A. Deschamps
SC-D: "Deep Seismic Sounding" - U. Luosto
SC-E: "Earthquake Prediction" - G. Sobolev
SC-F: "Engineering Seismology" - V. Schenk

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

5. Amendment of ESC Bylaws

The Secretary-General informs that amendments to the ESC Bylaws have been proposed by the Bureau and Executive Committee. The amendments are posted on the bulletin board near the registration area and copies are available for Titular members in the ESC office. The amendments will be discussed at the Council meeting.

6. Announcements

- The Nominating and Resolutions Committees are announced

<i>Nominating Committee</i>	H. Aichele J. Bonnin C. Eva R. Gutdeutsch
<i>Resolutions Committee</i>	L. Vinnik D. Mayer-Rosa I. Stimpson

- 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.

- There are still plenty of copies of the Athens 1994 ESC General Assembly Proceedings available upon request by paying for the postage only (10 USD). Please submit the request at the Registration desk.

7. Opening of the General Assembly

The President declares the 25th General Assembly of the European Seismological Commission open, and wishes much success to all participants.

Opening Ceremony
Monday, September 9, 1996

Reykjavik Brass Quintet

Welcome speeches by:

President LOC, R. Stefansson

Secretary General of the Ministry of Environment of Iceland, Magnus Johannesson

President of IASPEI, C. Froidevaux

President of ESC, G. Sobolev

Ladies and gentlemen,

It is a great privilege for me to express our sincere gratitude for the invitation to hold the XXV General Assembly of the European Seismological Commission here in Iceland. Its juvenile and still scalding soil provides unique possibilities for the study of processes forming the Earth's crust and causing earthquakes and volcanism.

In recent years, the scientists of Iceland have greatly improved the observation network by installing modern instruments and providing means for operative transmission and processing of data. The scientists in other countries will gain much by studying their methods. Impressive results are achieved in the investigation of the observed regularities in local seismicity.

It is gratifying to note that the seismologists of Iceland work in close collaboration with representatives of the adjacent sciences, primarily volcanology, meteorology and hydrology. And now Iceland is a test area for international cooperation in geosciences.

Allow me to make a brief review of some of the acute problems of seismology and of the ESC activities. The technical progress has now produced, on the one hand, the digital seismology and, on the other hand, the new possibilities for geophysical data exchange. The modern communication services of the Internet type and the systems of accessibility and presentation of data of the WWW type provide a close to real time transmission of not only data, but of the results of their processing in the form of charts and plots. It is apparent that seismologists can now expand these possibilities, for instance, by compiling libraries of scientific articles and electronic journals.

Furthermore, the numerous conversations with many researchers have shown their common interest in setting up a system of seismic catalogues available to the seismological community. I mean both the historical and the instrumental catalogues. The discussion of this problem at the ESC Business Meeting during the IUGG General Assembly in Boulder, USA, has indicated that the best way forward is to organize an easily accessible centralized or distributed database for the member countries of the ESC and for a number of other countries. This kind of system would allow countries to correlate results which were obtained by different methods but from the same raw material, to deal with parameters of earthquakes that occur near the borders of different countries, to provide means for researchers to compare data obtained from national seismic networks, and to make corrections in their catalogues.

Moreover, the preparation of strong earthquakes may involve a territory covering hundreds and even thousands of kilometers, and the same distances are involved to evaluate the interaction effects of earthquakes. A combined application of several regional catalogues will reveal with greater clarity the complex character of processes of accumulation and relaxation of energy in the Earth. We plan to have a special discussion on the problem of the European system of catalogues and databases after the Workshop on Friday, the thirteenth of September.

Among other advantages, the elucidation of the problem will enable the young seismologists, inexperienced in the compilation and checking of catalogues, to seek support in the results of acknowledged authorities. I should add that the ESC Bureau and the LOC have given much thought and effort to organize a special "Training course for young scientists" in the frame of this Assembly, which took place yesterday and the day before.

I am glad to take this opportunity to thank the IASPEI administration for financial support of this Course and of its Lecturers, who have generously given their time and knowledge to our young colleagues. It seems symbolic that the first experience of that nature for young scientists was held in this young land. We trust that it will become a tradition.

The development of geosciences and of seismology, among other things, calls for a closer international cooperation. We are now on the verge of the Third Millennium. It is vitally important that we secure and make accessible the vast amount of observation data collected in the 20th (twentieth) century and in the previous centuries. Russia is now approaching the international scientific and governmental bodies with the initiative to conduct the Fourth International Geophysical Year (IGY) on the boundary between the Twentieth and the Twenty First centuries.

During the previous IGY in 1957-59, most of the studies were concentrated in the atmosphere, ionosphere, and magnetosphere of the Earth. We now feel greater demand for correlated research in the solid Earth. I hope the seismologists will duly appreciate this enterprise and will actively contribute to its success.

Ladies and gentlemen, it is a great honour for me to welcome many outstanding participants and guests of the Assembly not only from Europe, but from America, Asia, and Africa. We are glad to greet here the representatives of the Government, of City of Reykjavik, of the Ministries, of the scientific and social institutions, and of the media of Iceland.

I trust that the tremendous work accomplished by the Local Organizing Committee under the guidance of Dr. Ragnar Stefansson, Vice-President of ESC, the active and interested attendance of scientists from many countries, and the wonderful facilities in this hotel will ensure the success of the Assembly.

Meeting of the ESC Council
Thursday, September 12, 1996

Present: Titular Members and Executive Committee

The ESC President welcomes all participants and announces the names of the people he has invited as observers to the meeting:

Secretary-General of the Asian Seismological Commission Prof. Zhu Chuanzhen, the EMSC president Dr. Chris Browitt, the representative of Macedonia (FYRO) that has applied for ESC membership Prof. Vladimir Mihajlov, and the representative of Albania (not an IUGG member) Dr. Betim Muco.

1. Presence of a quorum

P Suhadolc ascertains the presence of the quorum. 30 out of 36 are present.

2. Appointment of the Election Chairman and tellers

C Browitt is proposed as Election Chairman, T Camelbeeck and J Sileny as tellers. The proposal is approved.

3. ESC General Assemblies in 1998

P Suhadolc informs the Council that two invitations have been received by the ESC Bureau for the organisation of the 1998 ESC General Assembly: the first one from The Institute for Petroleum Research and Geophysics in Tel-Aviv (Israel), the second from the Institute of Geophysics of the University of Lisbon (Portugal).

No other candidacies are raised from the floor.

C Browitt asks the representatives from both centres to briefly illustrate their candidacies. A Hofstetter and L Mendes Victor illustrate their candidates.

The voting is done by secret ballot. The outcome is:

Tel Aviv	21 votes
Lisbon	19 votes

The 1998 ESC General Assembly will be, therefore, organised by The Institute for Petroleum Research and Geophysics in Tel-Aviv (Israel). Contact person A Hofstetter.

4. Elections

The Nominating Committee presents the candidates in sequential order.

Results of the elections:

- Bureau:

President: G Sobolev is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands. G. Sobolev is elected (votes: 39 yes, 0 no, 1 abs.)

Vice-Presidents: For the first of the two Vice-presidents R Stefansson is presented. No further candidates are raised from the floor. Election is carried out by show of hands. R Stefansson is reelected (38 yes, 0 no, 2 abs.)

For the second of the two Vice-presidents A Shapira is presented. The candidacy of L Mendes Victor is proposed from the floor. Election is carried out by secret ballot. The outcome is: A Shapira 24 votes, L Mendes Victor 16 votes. A Shapira is elected.

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 (39 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 (39 yes, 0 no, 1 abs.)

- 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. K B Makropoulos is elected.

SC-B: L Vinnik is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands.

L Vinnik is elected.

SC-C: A Deschamps is presented as candidate. No further candidates are raised from the floor. Election is carried out by show of hands.

A Deschamps 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.

J Mechie is elected.

SC-E: G Purcaru is presented as candidate. The candidacy of J Zschau is proposed from the floor. Election is carried out by secret ballot. The outcome is: G Purcaru 14 votes, J Zschau 24 votes, 2 abstentions.

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.

D Slejko is elected.

5. Titular Members

P Suhadolc reports that the ESC Bureau has received one application for membership to the ESC from FYRO Macedonia. According to the ESC Bylaws Article 1 and 2, the membership countries must be located in the ESC area defined in Article 1 and must be members of the IUGG. The applicant fulfills the two requirements. In view of this, the ESC Bureau proposes to accept FYRO Macedonia as an ESC member.

C Browitt asks if there is no objection to a show of hands. No objection is raised. The election is carried out by a show of hands. FYRO Macedonia is accepted unanimously.

The Bureau then proposes the confirmation of Titular Members appointed by their respective countries, including the Titular Member appointed by FYRO Macedonia. P Suhadolc reports that he has not received the official letters of appointment for the Titular members of the Netherlands, Germany, Jordan, Monaco and Norway. The Bureau proposes to the Council that R Sleeman is Titular Member for the Netherlands, F Scherbaum for Germany, Z El-Isa for Jordan, Van Klaveren for Monaco and S Mykkeltveit for Norway. The Council approves the proposal.

The List of Titular Members for the Administrative period 1996-1998 is therefore:

Country	Titular member	Confirmed
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Algeria	M Benhallou	06.08.96
Austria	W Lenhardt	31.07.96
Belgium	Th Camelbeeck	14.09.94
Bulgaria	D Jordanov	13.06.96
Croatia	D Skoko	15.09.94
Czech rep.	J Sileny	02.09.96
Denmark	E Hjortenberg	19.08.96
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
Hungary	T Zsiros	16.09.94
Iceland	R Stefánsson	23.07.96
Ireland	A W Jacob	12.08.96
Israel	A Hofstetter	25.08.96
Italy	C Eva	26.07.96
Jordan	Z El-Isa	12.09.96
Lebanon	C Tabet	07.08.96
Luxembourg	J Flick	31.07.96
Macedonia FYRO V	Mihajlov	04.09.96
Monaco	Van Klaveren	12.09.96*
Morocco	D Ben Sari	16.08.96
Netherlands	R Sleeman	12.09.96
Norway	S Mykkeltveit	12.09.96
Poland	S Gibowicz	30.08.96
Portugal	L Mendes Victor	10.07.96
Romania	D Enescu	18.08.96
Russia	Y Tyupkin	13.08.96
Slovakia	P Moczo	12.08.96
Slovenia	J Lapajne	02.03.94
Spain	J Badal	10.07.96
Sweden	O Kulhanek	15.08.96
Switzerland	D Mayer-Rosa	21.02.94
Tunisia	M Allouche	08.09.94
Turkey	R Yilmaz	28.01.94
UK	I Stimpson	08.04.94

* With a letter dated October 3, 1996 Monaco has subsequently appointed P. Mondielli as its Titular member for the next two administrative periods (1996-2000).

6. Amendments of ESC Bylaws

The ESC Bureau and Executive Committee propose the following amendments to the ESC Bylaws (the deleted parts are strikethrough typed, the added parts are typed in bold).

P Suhadolc presents the first amendment, which has been approved by the ESC Bureau and the ESC Executive Committee.

Article VI. The Executive Committee

The members of the Bureau and the chair-persons of the Subcommissions form the Executive Committee. It meets at least once during the General Assembly and at other times if necessary. It advises the Bureau in the preparation and the co-ordination of the General Assemblies. In addition it intervenes in any important question at the initiative of the President or of at least one third of its members. The International Association of Seismology and Physics of the Earth's Interior (IASPEI), the European-Mediterranean Seismological Centre

(EMSC), ~~and~~ the European Association for Earthquake Engineering (EAEE) **and Observatories and Research Facilities for European Seismology (ORFEUS)** are represented in the Executive Committee. The decisions of the Executive Committee must be confirmed or rejected by the Council.

P Suhadolc asks B Dost to give a short presentation on the work of ORFEUS.

B Dost describes the purpose and objectives of ORFEUS, among which the collection and distribution of broadband digital waveform data and related software. He emphasises the complementary position of ORFEUS with respect to the EMSC activities.

C Browitt asks the Council to vote on the first amendment. The Council approves the amendment unanimously.

P Suhadolc presents the second amendment, which has been approved by the ESC Bureau and the ESC Executive Committee.

Internal Rules for the Subcommissions

I. Membership and Administration

Everybody interested in the objectives of a subcommission is qualified for membership. Each subcommission is administered by a Bureau consisting of a President, a Vice-President and a Secretary.

The subcommission Bureau members are elected for a maximum of 6 years.

C Browitt asks the Council to vote on the second amendment. The Council approves the amendment unanimously.

P Suhadolc presents the third amendment, which has been approved by the ESC Bureau and the ESC Executive Committee.

Internal Rules for the Subcommissions

II. Obligations

The President of a subcommission is responsible for:

1. the delivery of progress reports from its WGs at least 6 months before the ESC General Assembly and the delivery of an evaluation and summary of these progress reports to the ESC Bureau at least 4 months before the ESC General Assembly,

2. the delivery of a review of subcommission activities during the ESC General Assembly within 3 months after its conclusion;

~~3.~~ 3. the delivery of activity reports of the subcommission to the ESC General Assembly,

~~4.~~ 4. the announcement of the results and decisions taken by the subcommission to the ESC Bureau,

~~5.~~ 5. the timely forwarding of resolutions to the Resolutions Committee. The proposed resolutions or recommendations shall concern scientific matters only.

C Browitt asks the Council to vote on the third amendment. The Council approves the amendment unanimously. The Council decides to post the amendments for a limited period on the ESC WWW Homepage.

7. Resolutions

Each resolution is presented, by D Mayer-Rosa, President of the Resolutions Committee. With minor amendments the following resolutions have been adopted.

Parametric European Earthquake Catalogues

Considering that

1. European Parametric Earthquake Catalogues (EPEC) have to be developed rapidly,
2. Most scientists agree that parametric earthquake catalogues can be compiled according to varied perspectives and procedures from a databank of primary data.
3. The main problem is the improvement of primary data and procedures for determining earthquake parameters,
4. The ongoing initiatives will provide a substantial progress in this direction and a methodology for its follow-up,

The ESC recommends

The continuation and possible expansion of ongoing initiatives to the whole European area, with the aim of producing regularly updated EPEC releases under the co-ordination of Subcommission A.

Preservation of all seismological material

Recognising

the importance of historical seismograms, seismological bulletins and catalogues for reliable evaluation of seismicity and seismic hazard in various parts of the world,

the ESC recommends

that all institutes and other organizations which possess seismograms, bulletins, catalogues and other relevant material from the last century and the first half of this century handle these with utmost care and archive them in a way which provides easy access. Means should be found, as a matter of urgency to identify the location and curatorship of existing seismological archives, and that this information should be made available to all interested parties.

Array Seismology

Considering

the importance of array techniques for global seismology and

recognising

the efforts to upgrade existing regional seismic networks to perform as seismic arrays within the Japanese GARNET project

the ESC recommends

to support all efforts for similar initiatives in Europe.

EU Support: Earthquake Prediction

Recognising

the efforts made by the European Union (EU) to improve the scientific research cooperation in the field of earthquake prediction through the European area and noting the new development in this direction

the ESC recommends

the strengthening of the EU support of research programs to foster wider geographic cooperation in order to assure a faster development in earthquake prediction.

Data for Noise-Precursor Discrimination

Recognising

the importance of comparative analysis of data accumulated in the different or similar geological conditions for noise-precursor discrimination and taking into account new technical channels for data exchange and transmission

the ESC recommends

that the members who are involved with ESC activity provide access to the files of their seismological, geochemical and other geophysical observations through INTERNET.

European Macroseismic Scale (EMS-92)

Considering

the successful testing period of three years of the new ‘European Macroseismic Scale’ (EMS-92).

the ESC recommends

the use of the EMS-92 in its improved version in future macroseismic studies in Europe.

ESC Training Course for Young Seismologists

Considering

the very positive response of participants in the first “ESC Training Course for Young Seismologists” in conjunction with the Reykjavik General Assembly of the ESC, the Bureau of the ESC expresses its sincere thanks to the organizers and lecturers of this course and,

the ESC recommends

that such training courses are made an integral part of future ESC General Assemblies.

Thanks

Recognising

the great success of the XXV General Assembly of the ESC (1996),
the participants gathered in Reykjavik

express their appreciation to the Icelandic Meteorological Office, the Ministry for the Environment and the University of Iceland for hosting this meeting, and

express their gratitude to the Local Organizing Committee for their excellent and efficient work in preparing and managing this meeting and for the very enjoyable social programme.

8. Miscellanea

The ESC Council decides to send greeting cards from the XXV ESC General Assembly in Reykjavik to E Petershmitt (Strasbourg), A Galanopoulos (Athens), J Hjelme (Copenhagen), H Berckhemer (Frankfurt), St. Mueller (Zurich) and M Bath (Uppsala), who has celebrated his 80th birthday this year.

Closing Plenary
Friday, September 23, 1994, 16:30-17:30

1. Address by ESC President

The President thanks all participants for the scientific contributions and the Local organising committee, in particular

Ragnar Stefansson

Bardi Thorkelsson

Helga Bjarnasson

for the successful work done during this meeting.

2. The new Bureau 1996-1998

The new ESC Bureau 1996-1998 is introduced:

President:	G Sobolev (Russian Fed.)
Vice President:	R Stefansson (Iceland)
Vice President:	A Shapira (Israel)
Secretary General:	P Suhadolc (Italy)
Assistant Secretary:	A B Walker (UK)

3. Confirmation of the Subcommission Chairpersons

SC-A: "Seismicity"	K Makropoulos
SC-B: "Data Acquisition and Interpretation"	L Vinnik
SC-C: "Source Physics"	A Deschamps
SC-D: "Deep Seismic Sounding"	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 1996-1998.

5. The next General Assembly

The next General Assembly in Tel-Aviv 1998 is announced with thanks to The Institute for Petroleum Research and Geophysics in Tel-Aviv (Israel)

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 Amendments to ESC Bylaws

The amendments to the ESC Bylaws accepted by the ESC-Council are read and adopted by the General Assembly.

8. Adoption of resolutions

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

9. Closing word of the ESC President

The President G. Sobolev thanks, on behalf of the ESC, all participants, the Local Organising Committee and the staff of the Hotel Loftleidir for the excellent conference and invites everybody to attend the XXVI ESC General Assembly in Tel-Aviv.

ESC SUBCOMMISSIONS AND WORKING GROUPS

Activity Reports

SC-A Seismicity of the European Region

Bureau 1994-1996

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

Working Groups 1994-1996

1. European Earthquake Catalogue. Responsible: J Bonnin (France)
2. Instrumental Classification of Earthquakes. Responsible: L Christoskov (Bulgaria)
3. Carpathian Balkan Region. Responsible: VI Marza (Romania)
4. Ibero-Maghrebian Region. Responsible: L Mendez-Victor (Portugal)
5. Historical Earthquake Data. Responsible: R Gutdeutsch (Austria)
6. Central and Eastern Europe. Responsible: Z Schenkova (Czech Rep.)
7. Integrated Research of Aftershock Sequences. Responsible: S Arefiev (Russian Fed.)
8. Volcanism and Earthquakes. Responsible: R Schick (Germany), B Martinelli (Switz.)
9. Seismotectonic Analysis. Responsible: C Eva (Italy)
10. Statistical Models of Earthquake Occurrence. Responsible: G Papadopoulos (Greece)

Activity Report 1994-1996 by K. Makropoulos

During the Athens XXIV General Assembly four scientific sessions and two special symposia were held under the Subcommittee's auspices with one hundred and twenty (120) oral and poster presentations.

During the last two years (1994-1996), most of the working Groups were active by either organising workshops or participating in international conferences like the XXI General Assembly of IUGG in Boulder, Colorado (July 2-14, 1995).

The two years of activity was expressed during the Reykjavik XXV General Assembly (Sep 9-14 1996) through five Scientific Sessions, three Special Symposia and two Workshops with a total of two hundred (200) oral and poster presentations.

Working Groups No. 2, 3, and 7 (see list above), however, did not show any activity for the second consecutive period and therefore, during the Subcommittee's business meeting, held in Reykjavik, with eight out of the eleven Chairpersons present, they were cancelled. However, their subjects will be taken care of by the other Working Groups of our Subcommittee.

A fruitful discussion took place about future activities and the advantages and opportunities for closer co-operation and new initiatives, offered now by the European Union through the INCO-COPERNICUS and similar projects were highlighted. These propositions were finally adopted by the ESC Council.

Bureau 1996-1998

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

Working Groups 1996-1998

1. European Earthquake Catalogue. Responsible : J Bonnin (France)
2. Ibero-Maghrebian Region. Responsible: L Mendez-Vistor (Portugal)
3. Historical Earthquake Data. Responsible: R Gutdeutsch (Austria)
4. Central and Eastern Europe. Responsible: Z Schenkova (Czech Rep.)
5. Volcanism and Earthquakes. Responsible: R Schick (Germany), B Martinelli (Switz.)
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).

SC-B Data Acquisition Theory and Interpretation

Bureau 1994-1996

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

Working Groups 1994-1996

1. Instruments, Data Collection and Processing. Responsible: B Dost (The Netherlands)
2. Standardisation and Interpretation. Responsible: N Kondorskaya (Russian Fed.), R Pearce (U.K.)
3. Microseisms. Responsible: E Hjortenberg (Denmark)
4. Theory of Seismic Wave Propagation. Responsible: I Psencik (Czech rep.) has resigned
5. History of Seismometry. Responsible: G Ferrari (Italy)

Activity Report 1994-1996 by L Vinnik and H Aichele

The ESC Training course for young seismologist was dedicated to the topics of our Subcommittee, in particular, to the processing of digital data. Several members of our Subcommittee took part as lecturers to the Training Course. The Subcommittee strongly supports the continuation of training courses, depending on the financial situation. Moreover, the Subcommittee chairman delivered a keynote lecture at the Reykjavik General Assembly.

The Subcommittee was involved during the past period with different IASPEI initiatives which were followed up on the European level within the Subcommittee itself: the IASPEI working group on geographical regionalisation, and the IASPEI working group for the new Manual of Observatory Practice.

The Subcommittee had also several connections with the other ESC Subcommittees, in particular, Source Process, Earth Deep Structure and Signal Detection. Array techniques and a European interest for cooperation within the Garnet activities have been also a recurrent theme in the Subcommittee activities.

Bureau 1996-1998

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

Working Groups 1996-1998

1. Data Centres and Data Exchange. Responsible: B Feignier (France)
2. Data Processing and Interpretation. Responsible: F Scherbaum (Germany)
3. Microseisms. Responsible: E Hjortenberg (Denmark)
4. 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 Earthquake Source Physics

Bureau 1994-1996

Chairperson: A Deschamps (France)
Vice-Chairperson: C-I Trifu (Romania)
Secretary: E Buforn (Spain)

Working Groups 1994-1996

1. Paleoseismicity. Responsible: D Pantosti (Italy) and M Meghraoui (Algeria)

Activity Report 1994-1996 by C. Trifu and D. Pantosti

The Working Group on Paleoseismicity of the Mediterranean area was started at the XXIV ESC Assembly held in Athens in September 1996. One of our main goals was to create connections between scientists working in active tectonics and paleoseismology around the Mediterranean and stimulate cooperation. This was mainly done by contacting scientists and distributing a list of participants including 35 members plus 5 corresponding members from a total of 14 countries, and co-ordinating our group with other groups working on paleoseismology such as the ILP task group II-3 and INQUA paleoseismology WG.

During these two years the spreading of paleoseismological and active tectonics methodologies was positively pursued by (1) organizing collaborations within different groups mainly to transfer trenching techniques; (2) by helping to organize workshops and courses such as (a) the Summer School on Structural Geology and Neotectonics, with emphasis on Paleoseismology organized by S. Pavlides of the Thessaloniki University in May-June 1995, (b) the workshop, Active Faulting Studies for Seismic Hazard Assessment held in Erice (Sicily), organized by D. Giardini, D. Pantosti and G. Valensise in Sept 1995, and (c) the E.S.F. Research Conference, Large Earthquakes in the Geological Record held in Isthmia (Greece), organized by G. Valensise and R. Collier in May 1996; (3) by publishing a special section of the *Annali di Geofisica* "Active Faulting and Paleoseismicity in the Mediterranean Area" containing contributions presented at the XXIV Assembly.

As part of general SC-C activities a special volume on Seismic Source Parameters: "From Microearthquakes to Large Events" was published in *Tectonophysics*. It was based on one of the symposia organized in Athens by our Subcommittee, and was benefited by the participation and submissions of colleagues from North America and Japan. In addition, the participation of some specialists from outside Europe, to our symposium on Fault Dynamics and Earthquake Nucleation organised during the XXV Assembly in Reykjavik, proved that the Subcommittee's scientific debates are a challenge for world-wide contributions.

In Athens discussions took place about preparing a workshop on moment tensors. This was not done for the Reykjavik meeting, but a workshop or even a symposium is scheduled on this topic at the next ESC General Assembly.

Bureau 1996-1998

Chairperson: A Deschamps (France)
Vice-Chairperson: C-I Trifu (Romania)
Secretary: E Buforn (Spain)

Working Groups 1996-1998

1. Paleoseismicity. Responsible: M Meghraoui (Algeria)

2. Focal parameters determinations. Responsible: C-I Trifu (Romania)

SC-D Deep Seismic Sounding

Bureau 1994-1996

Chairperson: U Luosto (Finland)
Vice-Chairperson: A Guterch (Poland)
Secretary: C-E Lund (Sweden)

Working Groups 1994-1996

1. Synthesis. Responsible: K Osypov (Russia), C Prodehl (Germany)
2. Region N-Europe. Responsible: M Sellevoll (Norway), C-E Lund (Sweden)
3. Region SW-Europe. Responsible: P Giese (Germany), A Him (France)
4. Region E-Europe. Responsible: A A Ostrowsky (Russia)
5. Deep Reflections. Responsible: K Fuchs (Germany)
6. Surface wave and tomographic studies of Lithospheric structure. Responsibilities: T Yanovskaya (Russian Fed.)

Activity Report 1994-1996 by U. Luosto

The detailed activity report of the Deep Seismic Sounding (DSS) subcommission was collected by Dr. C-E Lund, secretary of the subcommission, and delivered in Reykjavik, September 1996. We asked for information about the activity from the responsables of the working groups, and project leaders. The report is not complete, but includes only those projects for which the information was submitted. The whole report contains 140 pages in addition to the cover and contents and therefore the detailed report is only discussed briefly here.

Almost all the projects were international. The projects cover the European area from the Spitsbergen in the North to the Mediterranean Sea in the South, but European scientists have actively participated in the DSS projects also in the other continents or in the ocean and sea areas. The most popular method used in DSS or DSR during the time period under review was marine deep reflection combined with wide angle measurements at land stations or measurements by OBS. In addition, there are many long range land DSS profiles already surveyed or are being planned in Europe, especially as parts of the EUROPROBE studies. The main sources for the signals were airguns but explosive shots and vibroseis were also used for the land profiles.

EUROPROBE/EUROBRIDGE is a long range DSS profile that extends from Baltic Sea across Lithuania and Belarus to Ukraine. The principal organizers of the land profile were geological and geophysical organizations within the countries of the profile. The Baltic Sea part was organized by the University of Hamburg, Germany and Uppsala University, Sweden. Other groups from Finland, Germany, United Kingdom, Poland and Sweden also participated in the land profile. The offshore project was performed in 1994, the land profile in Lithuania in 1995 and in Belarus 1996. The Ukrainian part of the profile is planned to be measured in 1997.

Another big EUROPROBE project, is that of the Trans-European Suture Zone Project. DSS measurements were made in 1993 across, and in 1994, along the Teisseire-Tornquist Zone in Poland. The principal organizer was the Institute of Geophysics, Polish Academy of Sciences, with scientists from Finland, Germany and Sweden participating in the recording and interpretation of the data.

EUROPROBE Seismic Reflection Profiling in the Urals (ESRU) was performed between 1993 and 1996 as a co-operative project between institutions in Sweden (Uppsala Univ.), Russia, U.S., Germany and Switzerland. Among the many interesting results, an important one is the imaging of the main Uralian fault down into the middle crust.

As part of EUROPROBE, the COST-profile project was organized by Uppsala University (Sweden) with help from institutions in Russia, Finland and Denmark. It involved recording airgun shots at eight points on a 200 km line in the Baltic Sea along the Swedish coast.

Under the DECORP2000 project several sub-projects were carried out in Germany and Russia with the GeoForschungsZentrum (GFZ), Potsdam as the principal organizer.

- The main target of the DECORP2000:KTB'94-3D project was the imaging of seismic structures at depths ranging between 7 and 9 km. It was during the German Deep Drilling Project, where most of the drilling problems occurred.

- The DECORP2000:URSEIS'95, 500 km long (integrating explosive and vibroseismic), near vertical and refraction seismic profiling of the Ural and adjacent basins was performed as a collaborative study between Russian, German, Spanish and U.S. institutes and universities. Among the most spectacular results is the imaging of 30-40° dipping tectonic shear zones reaching from the surface to the crust-mantle boundary and of a crustal root of 55 km depths close to the axis of the Uralian orogenic belt.

- The DECORP2000:GRANU'95 was 110-km long vibroseis high-resolution profiling in the Saxsonian Massif and DECORP2000:NGB'96 a lithospheric seismic profiling of the North German intracontinental basin in co-operation with Oil- and Gas companies.

High density vertical and wide-angle seismic reflection and refraction data were recorded along the Pannonian and Hungarian Geotraverses to obtain signals from the lithosphere and asthenosphere in a Hungarian-Canadian-Swiss co-operative project. One of the most surprising results is an anomalous rise of the lithosphere-asthenosphere boundary to 40 km below the Bekes Basin.

The profile FENNIA in Southern Finland is a co-operative project between scientists from the universities of Helsinki, Copenhagen, Leicester, Oulu, Uppsala and Warsaw, and the Geophysical Institute, Polish Acad. Sc., Warsaw. Interpretation of good quality data in a Workshop by the Fennia Working Group is in press.

An interesting revision of DSS data from the 1970's and early 1980's was performed as an international co-operation by Italian, German and French institutions. Reanalysing of the Gargano- Salerno-Palermo Pantelleria profile, revealed the presence of the Adriatic slab, while reanalysing the seismic data of the Northern Apennines, the Ligurian Sea and Corsica did not confirm the presence of the European subduction between Corsica and Tuscany.

With IRRS-CNR, Milano as the main organizer, refraction-wide angle reflection recordings were made in Central Italy. The results support the near vertical reflection CROP project in Central Italy. The model which was obtained shows, e.g. a shallow tuscan moho, from 22 km depths in the tyrrhenian side to 27 km below the foothills of the Apenninic chain. Wide-angle recordings were made on land around the Tyrrhenian Sea using air gun shots by the "Sea Land Group" for the CROP Mare II Project.

Acquisition of 15 regional OBS profiles, total length of 2600 km, in the Lofoten margin was surveyed by Univ. of Bergen, Norway with co-operation of Univ. of Sapporo (Japan). The main purpose is to map deep sedimentary structures, and also the crystalline crust from the continental basins to the oceanic crust.

Study of the seismic structure of the North-Western Spitsbergen area has continued as a project by Polish Institutions. It is based on the travel times of P-waves from nuclear explosions recorded on the GrNfenberg array. An average P-wave velocity model of the Upper Mantle of central Eurasia was constructed in co-operation with Polish and German scientists.

Deep seismic survey by CDP-DSS methods in the area of NW Russia and the Barents Sea was studied within the project POMORJE, with the Geological Institute of Kola Science Centre as the main organizer. The pilot soundings comprise of 200 km of sea profiles and recordings along the 700-km long profile on land.

Center GEON, Russia, performed between 1992-1995 in the Central East-European Platform, five DSS profiles in Russia. The results of analysis show large variations in crustal velocities and thickness (39-50 km).

Interpretation of the geological and geophysical data of the BALTIC SEA PROFILE (1989) was continued at Inst. of Oceanology, R.A.S., Moscow.

As part of the Central Scandinavian Transect, Uppsala University has organized with cooperation from the Univ. of Bergen, Norway, a seismic reflection profile through the central Scandinavian Caledonides. The data showed a highly reflective upper crust in the Caledonian region, well correlated to surface geology. The wide angle profile CABLES, organized by scientists from Uppsala Univ., GEON, Moscow and Univ. of Glasgow with other participants from Finland and Norway is a continuation of the CDP-profiling mentioned above. Good-quality data for the major crustal and upper mantle phases were recorded.

Deep Seismic Studies outside Europe are also described here:

Three projects PISCO 94, CINCA 95 and ANCORP 96 were carried out with the Freie University of Berlin as the main organizer, together with German and South-American institutions in the Precordillera, off- and on-shore Nazca - Central Andes.

The project, KODIAK-SEIS - Sonne Cruise SO 96 was carried out by GEOMAR, Kiel who were the main organizers with co-operation of USGS, Menlo Park, in the Aleutian margin near Kodiak Island. Together with Kiel University, CSIS, Barcelona and American Universities the CONDOR project was performed across the Chilean continental margin. Two refraction lines were shot across Costa Rica with GEOMAR as a main organizer. This revealed some interesting results including imaging, the downgoing slabs.

- KRISP-94 (Kenya Rift International Seismic Project) was organized by geophysical institutes of the universities at Karlsruhe, Germany, Texas and El Paso, USA, Leicester, U.K. and Nairobi, Kenya. Tele- and refraction seismic investigations of the Kenya Rift were performed as a large international co-operative project. Several papers on KRISP-94 are published or are in press.

- EXCO project, University of Hamburg as main organizer, marine seismic soundings were surveyed along lines across the East Pacific Rise. The project was planned to give multi-disciplinary information about "Processes of Convective Exchange between Sea Water and the Oceanic Subbottom".

- ANTARCTIC MARGIN PROJECT, interpretation of OBS refraction and wide angle reflection data obtained during co-operative works between scientists from the Polish Academy of Sciences, Universities of Warsaw and Hokkaido 1990/1991 was continued.

Forty-three recent publications are reported in the complete activity report of the Subcommittee.

Bureau 1996-1998

Chairperson	J Mechie (Germany)
Vice-Chairperson	A Guterch (Poland)
Secretary	C-E Lund (Sweden)

Working Groups 1996-1998

1. Synthesis. Responsible: K Prodehl (Germany), K Osypov (Russian Fed.)
2. Region N-Europe. Responsible: M Sellevoll (Norway), C-E Lund (Sweden)
3. Region SW-Europe. Responsible: P Giese (Germany), A Him (France)
4. Region E-Europe. Responsible: A Ostrovsky (Russian Fed.)
5. Deep Reflections. Responsible: K Fuchs (Germany)
6. Surface wave and tomographic studies of lithospheric structure. Responsible: T Yanovskaya (Russian Fed.)

SC-E Earthquake Prediction Research

Bureau 1994-1996

Chairperson: H Berckhemer (Germany)
Vice-Chairperson: G Sobolev (Russian Fed.)
Secretary: G. Martinelli (Italy)

Working Groups 1994-1996

1. Precursors. Responsible: G Sobolev (Russian Fed.), T Chelidze (Georgia)
2. Field Observations and Techniques. Resp.: J Zschau (Germany), A Prozorov (Russ. Fed.)
3. Algorithms and Models of Earthquake Prediction. Responsible: G Purcaru (Germany)
4. Man-made Earthquakes. Responsible: P Knoll (Germany)

Activity Report 1994-1996 by H.Berckhemer and G. Sobolev

At the XXIV GENERAL ASSEMBLY of the ESC in Athens Subcommittee E organized the following symposia:

- " Earthquake Prediction: Achievements and Problems " ;
- " Nonlinear Dynamics of Seismogenic Fault Systems and Earthquakes " ;
- " Fracture Process of Induced Seismic Events " .

The " European Advisory Evaluation Committee for Earthquake Prediction " of the Council of Europe, which is recruited mainly from members of the SC-E became active in the reporting period. On the initiative of L.A.Mendes Victor, chairman of the Committee, an earthquake prediction evaluation exercise was arranged for a magnitude 6.0 -6.5 earthquake in the region of S.Teotónio-Odemira in SW Portugal. Certain data and arguments were provided to the members of the Committee. Some members submitted a written opinion and eight members met for an evaluation meeting on the invitation of the Council of Europe in Estoril, Portugal on October 30 and 31, 1995. The conclusion was that a $M = 6-6.5$ earthquake can not be excluded in the next few years in that region but the material at the disposal of the Committee does not indicate that the probability of such an event is becoming high.

The first true earthquake prediction evaluation was made by the Committee on the request of the Greek Government. A prediction of a potential earthquake of $M = 4-5$ in the area of Livadia-Amphisa or, with less probability, south of Scopelos Island within a time window ending on December 10 +/- a few days was issued by the VAN Group on November 6, 1995. Four members of the Committee met on Nov. 26 and 27 in Athens and discussed the case with Prof. Varotsos and Dr. Stavrakakis, Deputy Director of the National Observatory of Athens. The Committee concluded that the prediction can easily fall in the statistical earthquake occurrence, and made some recommendations for future procedures and cooperation.

The SEISMOLAP - METHOD which emerged from the Turkish-German Project for Earthquake Prediction Research was continuously improved and refined by J Zschau and applied with positive results also to large earthquakes in the Caucasus Region, and in Japan.

As a result of co-ordinated measurements carried out by the GPS method, the direction and extent of crustal movements were determined in the adjoining areas of Armenia, Georgia, and Russia. The main task of this project is to study the deformation field in the Caucasus region and to reveal the post seismic movements in the aftershock zone of the Rachinsky earthquake.

A joint Working Group of Russian and Chinese scientists (chairmen G Sobolev and Zhan Zhao Cheng) has been established and they have had two meetings (one in Russia and the other in China) to make joint analysis of geophysical dynamic fields before some earthquakes. The statistical significant anomaly was revealed before the Tanshang earthquake as a result of multi-parameter analysis of data. The GEOTIME (version 1.02) computer system and GEO 2.5 computer environment were transferred to the Chinese.

The international seminar on " The Physics of Rock Failure " was held in October, 1995 in the Borok Observatory, Russia (co-ordinator A.Ponomarev).

Post earthquake TASK FORCE activities have been carried out mainly by French and German groups together with local partners after the Kosani earthquake of May 13, 1995 in Greece with a magnitude of 6.6 Ms, the Egion earthquake of June 15, 1995 in Greece, with a magnitude of 6.2 Ms, the Antofagasta earthquake of

July 30,1995, with a magnitude of 7.3 Ms and the Dinar earthquake of October 1,1995, with a magnitude of 6.0 Ms. They, among others and provided important data for earthquake prediction research..

Co-operation in the field of earthquake prediction research on a European scale was further supported by the European Community in the frame of the ENVIRONMENTAL RESEARCH PROGRAMME (Climatology and Natural Hazards). One project is dealing with theoretical research on earthquake prediction and identification of possible locations of future large earthquakes (co-ordinator G Purcaru). New results have been obtained on deterministic time - and magnitude prediction models. Other projects are dealing with electric and magnetic precursors and with the application of space techniques for prediction purposes.

Bureau 1996-1998

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

Working Groups 1996-1998

1. Precursors. Responsible: G Sobolev (Russian Fed.), T Chelidze (Georgia)
2. Field Observations and Techniques. Resp.: J Zschau (Germany), A Prozorov (Russ. Fed.)
3. Algorithms and Models of Earthquake Prediction. Responsible: G Purcaru (Germany)
4. Man-made Earthquakes. Responsible: P Knoll (Germany)

SC-F Engineering Seismology

Bureau 1994-1996

Chairperson: V Schenk (Czech rep.)
Vice-Chairperson: G Zonno (Italy)
Secretary: T de Crook (The Netherlands)

Working Groups 1994-1996

1. Macroseismic Scales. Responsible: G Gruenthal (Germany)
2. Near-Field Seismology. Responsible: V Schenk (Czech rep.)
3. Seismic Risk and Design Criteria. Responsible: P Burton (United Kingdom)
4. Microzonation. Responsible: M Marcellini (Italy)
5. Expert Systems and Seismic Risk Mitigation. Resp.: G Zonno (Italy), M Garcia (Spain)
6. Macroseismology. Responsible: M Stucchi (Italy)

Activity Report 1994-1996 by V. Schenk

The Subcommittee F "Engineering Seismology" consists of six Working Groups :

- i) Macroseismic Scale,
- ii) Near-field Seismology,
- iii) Earthquake Hazard Technology
- iv) Microzonation,
- v) Expert Systems and Seismic Risk Mitigation, and
- vi) Macroseismology.

The main activity of the WG1 "Macroseismic Scale" in the period 1994-1996 has been to test the updated European Macroseismic Scale EMS-92. The scale has been distributed to specialists of many countries who started to test it in different world areas in order to collect experimental data of numerous earthquakes; among them include, strong shocks like Killari (India) 1993, Northridge (USA) 1994, Kobe (Japan) 1995, Dinar (Turkey) 1995, Aegion (Greece) 1995, etc. Another aspect of its application concerned earlier earthquakes, both from this century and even historical ones.

Some members of the WG introduced the new EMS scale during the 11th WCEE (World Conference on Earthquake Engineering) in Acapulco (Mexico) to American experts interested in macroseismics. All comments and remarks to world-wide applications of the EMS-92 have been collected and analyzed by WG-members with respect to the preparation of the final edition of the EMS which is one of the next objectives.

The activity of the WG2 "Near-field Seismology" is concerned with recording and numerical processing (corrections and restoring) of strong ground motion time histories as well as their inclusion into present strong-motion data banks. Dynamic analyses of these records and assessments of the regional attenuation coefficients have been made. Correlations between strong motion parameters and macroseismic intensity have also been provided. It is necessary to point out that most of members of this WG are also active within a research programme of the WG "Strong Motions" as part of EAEE. This close collaboration is important both in fundamental research and in applications in Engineering Seismology.

WG3 "Earthquake Hazard Technology" has concentrated its activities on two main areas:

1. Members of the WG participated in a joint activity between the ESC and the GSHAP project in order to endorse the ILP "Global Seismic Hazard Assessment Project" in the European and Mediterranean areas. Some of the works was concentrated on the "key test areas"; Adriatic Plate and the Crimea-Caucasus-Kopet Dag. Experts from Austria, Germany and Switzerland presented their earthquake hazard calculation. During the Reykjavik General Assembly results from several countries for the GSHAP Programme were presented.
2. Under a new co-operative programme for reducing earthquake losses the WG has started to develop a methodology for different seismogeological conditions. In December 1994, leading specialists gathered for a one week meeting in Eilat (Israel) where they presented and discussed their recent results in this field and planned a future collaboration both within the ESC activity programme and the IASPEI WG "On Earthquake Losses" together with the EAEE Task group 3 "Seismic Risk and Earthquake Scenarios".

During the 24th ESC General Assembly in Athens an agreement on close collaboration between the ESC WG4 on "Microzonation" and the EAEE Task Group 6 "Earthquake Geotechnical Engineering and Microzonation" (chaired by Prof. A Ansal) was adopted. The goal was to strengthen the cooperation among seismologists, geotechnical engineers, designers and specialists for insurance problems and the important points of this joint ESC/EAEE activity are listed below:

- a) review of existing approaches of microzonation and preparation of a microzonation manual.
- b) election of European test sites for microzonation methodology.
- c) closer implementation of microzonation techniques into the EUROCODE-8 programme.

Under WG5 on Expert Systems and Seismic Risk Mitigation the 2nd Workshop in Walferdange devoted to "Application of Artificial Intelligence Techniques in Seismology" was organized. It was recognized that these new techniques have brought an important tool in different applications in Seismology and Engineering Seismology and showed that there had been significant progress on its use in Europe. The presentations covered applications to earthquake hazard and seismic risk, earthquake prediction, inversion problems in seismic signal analysis and networks. This Workshop provided a framework for future WG activities.

The main goals of the WG "Macroseismology" are as follows:

- 1) to develop rigorous procedures for the elaboration of macroseismic data;
- 2) to develop criteria and recommendations for the organisation of a European macroseismic intensity database and to compile such a database with reference to major earthquakes.

In 1995 the workshop on "Historical data for the compilation of earthquake catalogues and data bases" was organized in Poljce (Slovenia), 8-11 November 1995, where members of the WG broadly discussed assessing

the quality of historical earthquake data, including spurious earthquake records. Three objectives were achieved:

- 1) to survey the qualitative unhomogeneity of the macroseismic data points from which the parameters of the European catalogues are derived;
- 2) to define some common criteria for qualifying macroseismic datapoints;
- 3) to agree on a standard procedure for setting out on paper the reasoning by which some earthquake records can come to be recognized as spurious.

The earthquake parameters currently available for Europe are derived from a huge data set formed by some tens of thousands of macroseismic data points. The criteria for assessing the quality of macroseismic data points should be simple and flexible so as to apply to the widest range of cases. In the setting down of classification criteria, special attention must be given to spurious earthquake records, that is, those descriptions of earthquake effects that can be demonstrated to be untrue.

Administrative report on the SC-F Business Session

by Theo de Crook

Chairman: V. Schenk

DECISIONS ON WORKING GROUPS

- 1) **Macroseismic Scales**. Responsible: G. Gruenthal — The work will be finished next year with a publication.
- 2) **Near-field Seismology**. Responsible: V. Schenk. — To join activity of this WG with a similar WG-EAEE, Schenk asked for a resign from the chair and simultaneously he suggested to appoint Prof. N N Ambraseys to the chairs of both WGs. His decision was adopted, new responsible: N N Ambraseys.
- 3) **Seismic Risk and Design Criteria**. Responsible: P Burton — This working group has not been active during the past two administrative periods and is cancelled.
- 4) **Microzonation**. Responsible: A Marcellini — No changes.
- 5) **Expert Systems and Seismic Risk Mitigation**. Responsible: G Zonno and M Garcia — This working group was dissolved towards December 1995.
- 6) **Macroseismology**. Responsible: M Stucchi — after Friday's WG meeting the chair was changed, new responsible: R Musson

NEW WORKING GROUP

After a long discussion a new Working Group "**Earthquake Hazard**" was established. Responsible: D Giardini. The main task of this WG for the first four years is to make a seismic hazard map for the whole of Europe. At the end of the GSHAP-Project in 1997 there will be one map for region 3 (co-ordinator: G.Grünthal), perhaps one map for region 4 west (co-ordinator M. Garcia) and only maps for test areas in region 4 east.

BUREAU ELECTIONS

At the end of the meeting new bureau members were elected.

Bureau 1996-1998

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

Working Groups 1996-1998

1. Macroseismic Scales. Responsible: G Gruenthal (Germany)
2. Strong motion. Responsible: N N Ambraseys (UK)
3. Earthquake Hazard. Responsible: D Giardini (Italy)
4. Microzonation. Responsible: A Marcellini (Italy)
5. Macroseismology. Responsible: R Musson (UK)

**Review of Subcommittee activities during the
XXV General Assembly of the European Seismological Commission,
Reykjavik, September 9-14, 1996**

**Subcommission A (Seismicity)
by K. Makropoulos**

A. Scientific

During the XXV General Assembly held in Reykjavik, Iceland, from 9 to 14 September 1996, Subcommittee A has shown its very high activity through 5 scientific sessions, (SC-A0, A1, A2, A3 and A4), 3 special Symposia (SS-1, SS-2 and SS-3) and two Workshops (WS1- and WS-6), with a total of 200 oral and poster presentations. The papers presented, reflect the wide spectrum of scientific fields which are covered by the term "Seismicity" and also the variety of topics which are dealt with, within Subcommittee A.

In the open session SC-A0, 5 papers were presented covering different aspects, such as: means of presenting seismicity data with the GIS techniques, seismological telemetric networks, seismic zoning and source parameters deduced from historical recordings. They mainly show new ways of collecting and presenting the basic information necessary for reliable seismicity studies.

In session SC-A1 (spatial and temporal variations of Seismicity), 14 oral and 4 poster papers, dealing with the subject of spatial and temporal variations of seismicity, were presented. As new sophisticated instrumentation is becoming available, the accumulation of accurate data, allows for more detailed studies involved in the identification of spatial and temporal changes in seismicity to be performed. Self-similarity and fractal statistics methods are becoming useful tools. The efforts involved in these studies show promising results and were presented for: Vrancea region (Romania), Silesian Coal Basin (Poland), Reykjanes peninsula and South Iceland Lowland, Irpinia (Italy), Horn of Africa and N. Hebrides regions.

Session SC-A2 (Seismotectonics Analysis), with 26 oral and 11 poster presentations, was the second session after the SS-1 (Volcanoes) session, reflecting the continuously increasing interest of Geoscientists in this subject. As it was pointed out by the convenor of the session and chairman of the WG Prof. C. Eva, "In the last years scientists have completely abandoned the concept that seismotectonic analysis is a simple correlation between seismicity distribution and tectonic structures. The seismotectonic analysis has assumed the characteristics of a frontier science, where all rheological, geophysical and geological parameters contribute to a better reconstruction of the stress field responsible for earthquake generation so it has assumed an increasing role to characterise seismogenetic regions and is now the base for many applications".

The presentations confirmed the above statement. Thus, numerous papers were devoted to improve stress evaluation from focal mechanism parameters and evaluation of the capability of a fault, as well as to understand tectonic inversion studies.

In almost all presentations the authors stressed the need for more detailed studies of regional and local characteristics, with dense networks, as a tool for eliminating the inherent ambiguities. The third session (SC-A3) was devoted to the important problem of seismicity induced by man-made activities; 12 oral and 6 poster presentations addressed the problem in different cases, such as shallow water reservoirs, coal mines, salt bodies etc. Results from studying the triggering properties of such cases and the influence of nearby faults on their source mechanism were presented.

In the fourth session (SC-A4, intraplate earthquake activity), 10 oral and 2 posters presented several aspects of intraplate seismicity and the inherent stress field in different parts of the world like Norway, Egypt, Turkey, etc. The work dealing with the characteristics of oceanic intraplate earthquakes has demonstrated the complexity of the stress pattern, as well as the seismic moment of the thrust faulting behaviour.

The volcanic character of Iceland gave the opportunity for volcanologists to show their interest and present their important work. Thus, during the special symposium SS-1 - (Seismicity, Deformation and structure of Volcanoes), 40 oral presentations covering almost all important aspects of the subject (stress-strain, velocity structure, deformation, seismicity, anisotropy, etc.) for numerous volcanoes (Medicine lake - California, Chyulu Hills - Kenya, Vesuvius - Italy, Kamchatka, Hekla - Iceland and others) demonstrated the intensive work which has been carried out in this field.

The special symposium SS-2 (Recent Strong Earthquakes in Europe) was devoted to Strong - Destructive earthquakes during the two-year period between the ESC General Assemblies. Most of the 10 presentations were referring to recent strong earthquakes and their aftershock activities in Pyrgos, Leukas, Kozani and Aegion Greece and to Pyrenean and Colima-Jalisco, Mexico. They covered a wide spectrum of studies, such as spatial and temporal distribution of focal mechanisms, tectonic implications, etc.

The special symposium SS-3 (Seismicity and structure of Ridges) consisted of 17 oral and 5 poster presentations. Problems such as seismicity, crustal structure, deformation, related to ridges were addressed.

Finally the workshops WS-1 and WS-6 (seismic scaling of historical earthquakes and earthquake catalogues, earthquake parameters and macroseismic procedures: history and perspectives) were organised jointly with the WG on Macroseismic scales. There were 25 oral and 12 poster papers, which presented the efforts of the scientists working in this interesting, time-consuming and very important subject of evaluating the seismic parameters from historical records. Due to the short instrumental era and to the long return periods of destructive earthquakes, macroseismic information plays an important role in any attempt for a reliable seismic hazard assessment. During the workshop several presentations addressed the inherent difficulties and problems of assigning intensities and magnitudes to historical earthquakes and stressed the need for careful examination of all available sources, especially to the contemporary ones.

B. Administrative

During the business meeting, SC-A proposed two resolutions:

- a) On the need for preserving all seismological materials and
- b) On Parametric European Earthquake Catalogues

Both were unanimously accepted by the Commission and the General Assembly.

Subcommission B **by L. Vinnik and H. Aichele**

A number of papers relating to various aspects of seismological practice was presented at the open session B0.01, convened by L Vinnik. M Baer and St Rothlisberger and demonstrated that the accuracy of focal depth determinations can be improved by using such exotic phases as ScP. R. Console et al. suggested a new modification of the joint hypocentre determination technique. New algorithms for inversion of seismic data were presented by researchers from Spain (J Badal, L Pujades and others).

At the session SC-B1 (The new manual on seismological observatory practice) convened by P Bormann, 9 papers were presented. Of critical importance was the contribution by E. Bergman who has produced and demonstrated a WWW version of the old manual. J Havskov and H Aichele et al. suggested a restructuring of the preliminary list of contents of the new manual, as elaborated at Boulder in 1995. P. Bormann presented arguments leading to a substantial extension and ramification of the section on seismic noise and site selection in the new manual. The session was followed by a meeting of the newly formed ESC- Manual Task Force within SC-B.

Highlights of the session SC-B2 (Automatic evaluation of earthquake parameters) convened by R Bodvarsson and M Josswig included reports on the principles of the SIL earthquake monitoring system, based on the modern computer and communication technology. SIL stands for South Iceland Lowland, which is the most earthquake prone part of Iceland. The number of detectionís in the network is extremely large. For most of the events, focal parameters and fault plane solutions are determined automatically. The alert system detects changes in stress release. An algorithm for the rapid inversion of long-period waveforms to derive moment tensor for regional earthquakes was presented by D Giardini and B Palombo.

Several projects for installing permanent or semi-permanent seismic observatories on the sea floor were reviewed at the session SC-B3 convened by G. Smriglio, P. Favali and J.-P. Montagner. The session was followed by an open discussion 'Perspectives and future developments of geophysical observatories on sea floor'. Representatives of many scientific institutions contributed to the discussion (ING, IRIS Consortium, Woods Hole, Scripps, IGP, University of Tokyo, University of Lisboa, National Marine Research Center of Athens, Icelandic Meteorological Office, University of Hawaii, University of Uppsala). An oceanic network is a feasible goal for the next 10 years. Several solutions to the problem of supplying electrical power and real-time data transmission are available. Modularity, common components, and standardized formats are necessary, but the state-of-the-art is not yet at the point where clearly superior components can be identified for common use. Strong international cooperation and sharing resources are highly desirable.

A highlight of the session SC-B4 (Microseisms and seismic noise) convened by E Hjortenber, A A Ostrovsky, O G Florenz was the frequency-wavenumber analysis of microseisms with the aid of the GRF array and other arrays in Europe operated by A Friedrich, K Klinge and F Krueger. The analysis revealed several discrete source areas.

Problems of seismic regionalization in Europe were considered at the session SC-B5, convened by J B Young and G Leydecker. Activities at data centers in Europe were reviewed at WS-2 (Convenor: H Aichele). The EUROBALL experiment, the objective of which is the compilation of a complete, high quality, and homogeneous European seismological bulletin, was the principal theme of WS-4 (Convenors: D Faeh, B Feignier, R Crusem). The workshops showed some overlap in the topics for WS2, WS3 and WS6. Therefore, in the future a better separation concerning the topics and a clear indication in the title of the Workshops should be found. In cooperation with the other convenors WS2 (Convenor H Aichele) mainly discussed the task of actual data collection as well as hypocenter determination from submitted station readings for the European area. The uncertain situation of the World Data Center A, concerning its financing and long-term future gave a special emphasis for the necessity of European institutions. As a result, ESC should continue to support the European efforts and in future workshops we should jointly discuss how to integrate actual data center tasks with the work done on historical catalogues and the efforts of people active in detection and verification.

Members of SC-B (F Scherbaum, A Plesinger and L Vinnik) lectured at the ESC training course for young seismologists. The course was evaluated as a success. Chairman of SC-B (L Vinnik) delivered the keynote lecture on 'Broad-band seismic data on the mantle transition zone'.

Subcommission D

by Urmas Luosto

During the XXV General Assembly of the European Seismological Commission in Reykjavik the Subcommission conducted the following Symposia: SC-D0, "Open Session" (Convenors: U Luosto, P Maguire and N I Pavlenkova) and SC-D1, "Deep Structure of Eurasia from the Lower Crust to the Core-Mantle Boundary" (Convenors: L Vinnik and B Jacob).

Abstracts for 16 oral and 3 poster presentations were submitted for the SC-D0 session, although two oral presentations were cancelled. As in several SC-D sessions in the last few years the presentations in the session dealt not only with active seismic studies (ordinary deep seismic refraction and reflection sounding) but also passive experiments (tomographic and surface wave studies).

One of the most interesting presentations in the session was based on the shear wave recordings from local shallow and deep earthquakes. It was the report by G Mele and others: Regional propagation of Uppermost Mantle shear waves from shallow and deep earthquakes in Italy. They have succeeded in mapping the uppermost mantle structure beneath Italy by analyzing several hundred waveforms recorded by the Italian seismic network. These observations led them to map the lateral extent of the subduction zone in southern Italy and to infer the continuity of the descending slab.

Several other interesting papers were presented dealing with the crustal and upper mantle structure and dynamic properties in the seismically active regions of the Mediterranean, Atlantic Ridges, Cordillera and Andean. For example, Peter Giese reported on the work done by a special Andean Seismic Group. A network of seismic refraction profiles including off- and onshore measurements have been carried out between the Pacific coast and the Chaco foreland within the past ten years. From the studies, it turns out that the crust in the forearc is quite differently structured from that in the backarc. In the forearc, the seismic data points to an interaction between the South American plate and the subducted Nazca Plate. In the western forearc, coincident seismic refraction data and earthquake foci, define the downgoing slab.

Crustal structure has also been actively studied in Fennoscandia during the past few years. Hence, six presentations were scheduled to be presented in the session but two of them were cancelled. Details of the deeper lithospheric structure beneath the Fennoscandian Shield will be studied within the EUROPROBE/SVEKALAPKO project in the coming years. It will be very interesting to compare the results of the SVEKALAPKO project with work of Calcagnile and others, who have collected P- and S-wave data from North America and combined those with the surface wave data from the same area to determine the properties of the Lithosphere-Asthenosphere system. These have been compared with similar results from North Europe published some years ago.

In the session SC-D1 Deep Structure of Eurasia from the Lower Crust to the Core-Mantle Boundary, 10 oral and 3 poster presentations were presented. Interesting results on the structure of the upper Mantle down to depths of 600-700 km in the Mediterranean, Urals and Central Eurasia regions was achieved with tomographic methods based on Pn, Sn or surface waves as well as from the traveltimes of nuclear explosions (e.g. Primallo et al.; Martinez et al.; Kosarev et al.; Grad et al.). There has also been some studies dealing with Upper Mantle anisotropy and CMB (core-mantle boundary). Pn anisotropy of about 6 % below the Moho at a depth of 30 - 40 km was determined in the tectonic region of the Variscan Orogeny in southern Germany (Klinge et al.). Travel times of PcP and ScP waves reflected in different points below Europe differ by several seconds from the theoretical ones. There was some discussion as to whether these residuals can be explained by unresolved location errors, lateral heterogeneities along the ray paths or undulations of the depth of CMB (Schweizer).

Traditionally the interest of the SC-D Subcommittee Deep Seismic Sounding has been in the structure of the crust and the upper mantle (Lithosphere). I would like to thank the convenors of the SC-D1 (L Vinnik and B Jacob) for their timely introduction of investigations extending down to the Core-Mantle boundary.

As I am retiring now from the duties of the SC-D chairperson I wish to thank subcommittee secretary Carl-Erik Lund for his valuable work for the subcommittee, and all the convenors and speakers of this and earlier assemblies for their interest in the subcommittee. Further I would like to wish our new chairman James Mechie all the best in his new post.

Subcommittee E

by G.A.Sobolev

Three topics have been discussed mainly during the Open Session and SC-E1 Symposium: a) seismostatistical approaches to earthquake prediction, b) the variations of geophysical, hydrodynamical and geochemical fields before the local earthquakes, c) the theoretical studies of seismic regime structure.

The comprehensive evaluation of the global applicability of the time and magnitude predictable models has been made by C B Papazachos and E Papadimitriou. The results show that these models can be generally used for long-term and intermediate-term prediction if an adequate catalogue is available for the region under consideration.

Several papers have been presented by G Purcaru who developed a nonlinear time-predictable model of earthquakes sequences and used this model to analyse the Adriatic and Vrancea seismicity. The regularity of an earthquakes appearance has been studied in detail with successful application for long-term prediction.

V Marza evaluated the probability for the next strong Vrancea earthquake from an observed recurrence interval using the Savage, 1994 approach. The major event is expected at the beginning of the next century although there is a large uncertainty in the timing of this event.

A new method of intermediate-term prediction has been proposed by G Sobolev and Y Tyupkin. The idea of the method is based on the laboratory and field data that the seismic quiescence and foreshock activation stages follow one another in the source area of future earthquake. The tentative retrospective calculations in several regions produced satisfactory results. The June 21, 1996 earthquake on Kamchatka with a magnitude of 7.0 has been predicted in real time.

An intense radon monitoring program is being carried out in the South Iceland Seismic Zone. The network consists of up to 9 observation points. Radon anomalies have been observed before 30 of the 98 seismic events with magnitudes ranging between 2-5.8 and 35% of them were related to seismicity. The probability of an earthquake occurrence within 1.5 months after a radon anomaly has been observed, is estimated at 38% (S. Jonsson, P. Einarsson).

The two-year radon variations in the spring capture of the Bad Brambach 'Radonquelle' have been discussed by U. Koch and J. Heinicke. They came to the conclusion that most of the local earthquakes generated radon anomalies. The appearance of the anomalies can be explained by the spreading of precursory pressure pulses from the nucleation zone to the earth's surface.

A computer-aided procedure for identification of spike-like anomalies in hydrogeochemical observations has been developed by M. Mucciarelli et al. It has been tentatively applied to the analysis of pH and electroconductivity variations. The revealed anomalies correlated with the occurrence of local small earthquakes near the Etna Volcano.

In the V Smirnov and A Zavalov paper the influence of non-uniformity of space distribution of seismogenic ruptures on evaluation of parameter of their concentration has been presented. The concentration criterion of fracturing is one of the most reasonable physical attributes of destruction. The results of accounts have been compared to empirical data on various seismoactive regions. The dependence of the critical parameter of crack concentration from space size is stipulated not by the mechanism of failure, but by the absence in the account of fractal distribution of ruptures in space.

Yu. Tyupkin presented the theoretical model of the temporal and spatial dynamics of seismic flow obtained by generalization of the standard linear body equation. It describes the seismic cycle having two phases-; the quiet phase and the active one. The results of the calculations show that although the dynamics of the system is chaotic, an intermediate-term prediction of some peculiarities of its behaviour like a seismic quiescence can be made.

A. Soloviev et al. suggested a 3D block model of lithosphere dynamics. The lithosphere is interpreted as a system of heterogeneous deformable elements. The system moves as a consequence of action of outside forces. The numerical experiments show that the model reproduces satisfactorily the Gutenberg-Richter law and a comparison with Western Alps seismicity has been made.

Below is an attempt to briefly formulate the basic notions about the processes of preparation of earthquakes and the means and ways of improving their prediction taking into consideration the papers presented at the XXV General Assembly, their discussions, and the experience of the world scientific community in the sphere of earthquake prognosis. The Earth's crust is composed of blocks of different dimensions and has fractal properties. The blocks have different strengths and experience tectonic stresses of various levels and orientation. Certain regions of the Earth, where the rate of stress accumulation, brought about by the relative movement of plates and endogenic processes, exceeds the rate of their relaxation, concurrently have areas of the crust in a state approaching the endurance limit. Higher seismicity is a reflection of this state. It was established that the highest stresses concentrate at intersections or bends of geological faults dividing the blocks, and the strongest earthquakes are confined to these locations. A system of faults has a fractal structure, hence, a seismoactive area has many foci of future earthquakes of different strength at various stages of its historical development.

The instrumental seismological observations, as a rule, are too brief to delineate the course of development of an individual focus. The information about historical earthquakes derived from ancient chronicles is too inaccurate in fixing the site of the focus and overlooks many seismic events. The method intensively applied in recent years for dating ancient earthquakes by the presence of paleosoils or liquefaction of sands involves excavation of numerous geological faults and does not seem feasible in the near future.

At present, only the location of a few "candidates" to a future strong earthquake can be established with a certain degree of probability by determining the stages of the seismic cycle, the periodicity of earthquakes, the activation of weak seismicity and by using recent crustal movement data and the mapping of faults.

The studies in the laboratory show that in different thermodynamical conditions the destruction of the loaded rock somewhat lags beyond the limit of endurance. There are two necessary and sufficient conditions to prevent a sudden destruction. First, the stresses should grow slowly; second, the components of the medium should have different strengths and should be differently stressed. The Earth provides these

conditions. As a result, weak earthquakes occur (destruction of weak blocks) before stronger earthquakes and, therefore, theoretically provide opportunities for strong earthquake prediction.

At the nonelastic stage of loading, various precursors of macrodestruction occur as a result of fissuring and plastic movements along the contacts between blocks. Let us assume that certain foci have reached the stages of their historical development approaching the endurance limit and, as the stress increases in their areas, the precursors appear. The stresses, however, in the various areas of the Earth's crust, experience fluctuations caused by the cumulative, alternating and heteroperiodical influence of the moon and the sun, the meteorological factors, the earthquakes in adjacent regions and other processes. Obviously, the precursors may repeatedly appear and disappear following the temporal and spatial fluctuations of the state of stress. Thus, the flickering effect of forerunners is manifested and "false" precursors are inevitable. Moreover, precursors are observed in several places simultaneously. Therefore, the establishment of a strict sequence of foci triggering seems impossible.

It is apparent that an earthquake causes redistribution of stresses in the crust, thus enhancing the seismic process in areas with higher stresses and concurrently suspending the seismic process in blocks and fault zones unfavourably oriented towards the new structure of the stress state. Consequently, an earthquake occurs in one of the "candidate foci", the earthquakes in other foci are postponed for an indefinite period, while the precursors observed as a result of the activity of these foci are also unreliable.

The ambiguity of prediction in this situation is obvious even in the case when forerunners appear in the earthquake foci. It has been definitely established, however, that often the site of a strong manifestation of a forerunner does not coincide with the epicenter of the future earthquake but occurs in the so-called "highly sensitive points". Such are, first of all, the zones of tectonic faults intersecting the high-pressure water-bearing horizons. These anomalies were called parametrical because they indicate changes in the physical parameters of weak and plastic rocks in fault zones. These anomalies cover large areas where precursors are manifested (hundreds of kilometers) and obstruct the determination of the site of the real focus. An extensively developed network of prognostic observations, however, in certain cases allows the site of the focus to be fixed.

The location of the earthquake focus reaching the stage of instability is indicated by seismic attenuation and subsequent foreshock activation. To determine the time of the earthquake with greater precision, we should know the lagging time of the possible seismic event in reaching the maximum of endurance limit. A minor increase of local stress in the focus or of stresses in a large region, owing to the external factors indicated above, suddenly accelerates the deformation process and reduces the time before the earthquake. This is proved by experiments in rock mechanics and kinetic conception of durability. The estimations show that an increase in active stresses by a few percent at close to breaking point causes a more rapid tectonic deformation and at the same time shortens the period before the next earthquake. The simultaneous growth of stresses over a large area increases the probability of a high magnitude earthquake occurrence, because the process affects a large block and a long fault in the crust. For example, a dependence was established between the area covered by an atmospheric front and the size of crustal blocks experiencing oscillations caused by atmospheric pressure variations.

The analysis given above emphasizes that the monitoring of stress variations in the Earth's crust caused by cosmic, meteorological and other factors as trigger effects should be an essential element of prognostic work. Modelling in the laboratory demonstrates that the period of time between the onset of instability and the moment of the trigger effect depends on the period and amplitude of that effect. In terrestrial conditions, the range of its changes is still to be defined.

The elaboration of the method for determination of the rheological curve maximum (ultimate strength) in the focus of the pending earthquake was a revolutionary achievement. There are no direct means of measuring stresses and deformations inside the Earth's crust at depths of several tens of kilometers. The study of response of the focus to external influence could be assumed as an indirect method. An impulse of elastic stress from an external source at the linear stage of the rheological curve causes an analogical by form response of deformation. The deformation response grows nonlinearly as it approaches the maximum strength and, which is particularly important, the form of the response signal is distorted owing to the different reaction of the medium to the compression and extension phase. The method opens up prospects in applying the artificial (vibro seis) or natural signals (earth tides) for sounding the earthquake foci to keep control of them reaching the instability stage.

The following strategy of further research in earthquake prediction can be suggested as a result of the above discussion. Location of sites of future earthquakes using the data on historical seismicity and geological structure. Determination of the stages of the seismic cycle by establishment of prognostic features of the type of seismic calm (lull), ring activity, foreshock activation for every one of the foci. Sounding of foci by means of natural and artificial sources to reveal the stages of instability and to range them according to this characteristic. A search for precursors in different geophysical, hydrogeodynamical and geochemical

fields and preparation of maps showing the distribution of forerunners over the area covering all possible foci. Monitoring of stress variations (deformations) and other parameters as the likely triggering phenomena.

All these avenues of investigation should be combined with fundamental research in the physics of the earthquake focus to better understand the nature and regularities of this type of natural catastrophe. This approach does not insure from errors, but will contribute to a more accurate prediction of the locality, time and magnitude of an earthquake.

Subcommission F - "Engineering Seismology"

by Vladimír Schenk

Subcommission SC-F "Engineering Seismology" organized together with SC-A and EAEE TG3 during the 25th ESC General Assembly in Reykjavik Joint Symposium SC-F1 "Seismic Hazard, Risk and Earthquake Impact" and two Workshops SC-F2 "Near-Source Earthquake Effects and Strong Ground Motions" and SC-F3 "Seismic Microzonation". For Symposium SC-F1 39 contributions were accepted, from which 19 were orally presented and 11 displayed as posters. In Workshop SC-F2 nine oral presentations were planned. Workshop SC-F3 involved 17 accepted papers from which 8 oral and 7 poster presentations were supplied. In addition to the above, meetings of the working groups and a SC-F Business meeting were organized.

Contributions presented during the SC-F1 Symposium depict a few domains which have been solved in Europe in 1994-1996. They can be divided into the following areas: (a) methodology of earthquake hazard calculations and influence of input data to the hazard calculations (*Atakan, Bungum et al., Kottnauer et al., Lapajne et al., Lopez Casado et al., Papaioannou et al., Peruzza et al., Salvaneschi et al., Slejko et al., Sólnes & Halldórsson*), (b) seismic zonation and earthquake activity (*Bles et al., Dojcinovski et al.*), (c) regional hazard calculations, mainly connected to the recent GSHAP activity in Europe (*Aoudia et al., Gruenthal et al., Lapajne et al., Rebez et al., Schenk et al., Tosi et al., Ulomov*), (d) particle ground motions and site characteristics (*Ansal et al., Lapajne et al., Vidal et al.*), (e) earthquake vulnerability (*Brivio et al., Erdik, Grimaz et al.*), (f) seismic microzonation (*Hofstetter et al.*) and (g) earthquake engineering (*Laforge et al., Lekkas et al., Potapov & Ivanov*).

Papers prepared for Workshop SC-F2 dealt with (a) an influence of topography (*Moczo et al., Suhadolc et al.*), (b) modelling of strong ground motions (*Bobbio et al., Franceshina et al., Herrero et al., Caserta & Zahradník, Sarao et al.*) and (c) recording of ground motions (*Costa et al., Benito et al.*).

Workshop SC-F3 concentrated on local problems, directly connected to certain localities (towns) and areas (surroundings of the towns, regions of urbanistic interest, etc.). It was obvious from the microzonation problems that many of the contributions solved similar topics to those mentioned above, although on a smaller scale. (a) particle ground motions (*de Crook, Gittermann et al., Hatzidimitriou et al., Horn & Aric, Kociu*), (b) site characteristics (*Ansal, Ansal et al., Delgado et al.*), (c) site microzonations (*F%h et al., Marcellini et al., Paula & Oliveira*), (d) local seismic wave recording (*Mucciarelli et al., Stavrakakis et al., Teves-Costa et al.*), (e) vulnerability (*Cella et al.*), (f) EUROCODE-8 application (*Schenk et al.*) and (g) earthquake damage (*Ansal et al.*)

The WG "Macroseismology", formed as a joint venture with the WG "European Earthquake Catalogues" (SC-A), organised a workshop meeting with the title "Earthquake catalogues, earthquake parameters and macroseismic procedures: History and perspectives". A total of fourteen papers were submitted, some of which were presented as posters. The majority of these related primarily to earthquake catalogues, but the papers "Modelling intensity data to infer rupture characteristics of extended faults: an innovative tool to learn about historical earthquakes" by Mendez et al, and "Intensitude: toward the macroseismic sizing of earthquakes" by Peruzza and Stucchi were of particular interest in suggesting innovative macroseismic methods.

Papers relevant to the WG, and in many cases involving members of the WG, were also presented at the workshop meeting "Seismic scaling of historical earthquakes", which was organised jointly by the WGs "Historical earthquake data" (SC-A) and "Macroseismic Scales" (SC-F). Of particular relevance to the work of the WG were the papers "On the quality of intensity assignments from historical earthquake data" by Musson and "Do European seismologists assess intensity from historical records in a homogeneous way?" by Moroni et al.

ESC Training Course for Young Seismologists

by A B Walker

The ESC, with the financial support of IASPEI, sponsored a training course for Young Seismologists in order to expose them to data acquisition and processing techniques used by many established seismologists throughout Europe and the world. The training course, the first of its kind, took place in the two days before the General Assembly in Reykjavik and included the following subjects: Analogue and digital transfer functions, System calibration and calibration data, The influence of seismic recording systems on wavelet parameters, Fir anti-alias filters: problems and cures, Simulation and restitution filters, Stacking techniques in seismology, Processing broad-band recordings for crust and mantle anisotropy, Data processing for automatic operation of seismic networks and the SIL-network: the need for automatic processing in high seismicity areas. The lecturers, Axel Plessinger, Lev Vinnik, Frank Sherbaum, Reynir Bodvarsson and Steinunn Jakobsdottir each covered their specialist subjects.

Eighteen students attended the course from eleven countries in Europe. Questionnaires were distributed amongst the students inviting them to comment on the overall impression of the course together with each individual lecture. The responses indicated a high rating for the course, overall although the individual lecture questionnaires produced a mixed reaction with regard to the level of difficulty and detail and these constructive comments will be taken into account for future events. Distribution of lecture notes and transparencies was recommended in order to reduce the time spent taking down the information and to allow more time for listening and interaction.

It was clear that the students had a varied level of experience and background knowledge, a situation which is always difficult to cater for. The lecturers are therefore commended for the acknowledged overall success of the course which resulted from their care and attention to content.

It is recommended that, in future, lecturers receive prior information on participant's experience. Distributed lecture notes will serve to consolidate the training received through their availability as a reference set when students have returned to their institutes.

Following receipt of a positive report on the training course, the ESC Bureau thanked the lecturers and organisers on behalf of ESC members and welcomed a proposal to hold a second training course before the next General Assembly in Tel-Aviv (23-28 August 1998). A resolution to this effect was endorsed by the ESC Council at the closing plenary.