

## Circular & Programme



## International Training Course on Seismology, Seismic Data Analysis, Hazard Assessment and Risk Mitigation

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Potsdam, Germany  
21 September to 23 October 2009

International Training Course on  
**Seismology, Seismic Data Analysis,  
Hazard Assessment  
and Risk Mitigation**

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September 21 to October 23, 2009  
Potsdam, Germany

Organised and sponsored by

Helmholtz Centre Potsdam  
GFZ German Research Centre for Geosciences

co-sponsored by

*German Foreign Office (Berlin)*  
*UNESCO (Paris)*  
*InWEnt (Berlin)*

## 1. OBJECTIVES AND PROGRAMME OF THE TRAINING COURSE

The disastrous consequences of destructive earthquakes place a heavy burden on many societies and their economies, particularly in developing countries. In order to avoid or at least to mitigate the negative effects of such events a thorough scientific knowledge of their geological and geophysical causes, their structural, kinematics and dynamic characteristics and destructive effects as well as a developed capability to monitor and to analyse them is indispensable. The vulnerability of human societies and related human and economic losses due to earthquakes are steadily growing as a consequence of rapid population growth and urbanization. Accordingly, improved risk assessment and effective disaster mitigation measures are prerequisites to ensure sustainable development in earthquake-prone countries.

The GFZ German Research Centre for Geosciences is running an annual five weeks international training course in the field of seismology and seismic hazard assessment. This training course is part of related programs of the United Nations (OCHA and UNESCO) aimed at promoting training and know-how transfer, especially to nationals from developing countries. In 2009, the GFZ organizes and runs the course in Potsdam, Germany in the time period 21 September to 23 October for the benefit of participants from earthquake-prone developing countries under the main topics:

### **"SEISMOLOGY, SEISMIC DATA ANALYSIS, HAZARD ASSESSMENT AND RISK MITIGATION".**

The training course is co-sponsored by the Foreign Office of the Federal Republic of Germany (AA, Berlin), the United Nations Educational, Scientific and Cultural Organization (UNESCO, Paris), Capacity Building International (InWEnt, Berlin) and the GFZ German Research Centre for Geosciences. It is also supported by the University of Bergen, the BGR Hannover, the Universities of Leipzig, Stuttgart, Karlsruhe, Jena and Munich as well as from institutions in France, Norway, and Italy.

Until 2008, 709 participants from 102 countries, amongst them graduate students, university lecturers as well as senior staff and directors of reputed research institutes, have attended the seismology training courses organized and supported by the Potsdam geoscience research institutes. Since the foundation of the GFZ in 1992 these courses are, as an essentially new feature, held alternately every second year in Potsdam and as regional courses in a hosting country of Africa, Asia or Latin America. In the latter case, the course topics are specifically tailored to the needs and potentials of the respective region and integrate many local lecturers into the international team of instructors. More details on all training courses since 1992, including the circular, programme and application form for the course in 2009 can be found on the GFZ web-page under [http://www.gfz-potsdam.de/portal/-?\\$part=sec21&locale=en](http://www.gfz-potsdam.de/portal/-?$part=sec21&locale=en) .

In line with the steadily growing demand by participants in former courses for mainly practice-oriented training and workshop discussions related to case studies, the current course programme comprises, besides introductory and state-of-the-art review lectures on the various subjects of earthquake seismology and risk assessment, extensive practical exercises, demonstrations, workshop discussions and scientific excursions. The excursions in 2009 focus on visits to geophysical and seismological observatories. Generally, the course programme aims at developing interdisciplinary problem understanding, acquaintance with the theoretical fundamentals and basic features of modern instrumentation, commonly used models and algorithms as well as developing practical skills in data evaluation and analysis.

The detailed scientific programme of the course is annexed to this circular. After each major topic, time is reserved for workshop discussions based on short (15 min.) oral presentations

by the participants. **Data brought along or case studies can also be taken up for discussion.**

The scientific-technical background and work duties of the course participants are usually rather different. None the less, there are generally two main groups of applicants:

- those mainly working in the field of seismic hazard and risk assessment, earthquake zonation and microzonation and/or earthquake engineering and disaster management;
- those responsible for the installation, maintenance, operation of and/or data analysis at seismic stations or network centres.

Throughout the course the completion of exercises by the participants as well as their contributions to workshop sessions and topical discussions are evaluated.

**The successful participation in the course is acknowledged by a certificate at the end of the course.**

## **2. APPLICATION AND ADMISSION**

### **2.1 Conditions for application and admission**

The course is arranged for the benefit of participants from earthquake-prone countries. To make the training effective, the number of participants is limited to about 26. Preference is given to young candidates engaged in seismology, seismic monitoring and zonation, earthquake data analysis, hazard, vulnerability and/or risk assessment. They should have active interest and obligations in these fields. Applicants with background and duties in earthquake engineering and disaster management who want to deepen their understanding of seismological phenomena, methods and data products are also considered, as are researchers or university lecturers in geosciences who may act as conveyers of the knowledge acquired in the course (training of trainers).

**Applicants must have** a scientific degree (B.Sc. or M.Sc.) or diploma in geosciences, physics or engineering from a recognized university. Preferably they should have several years of professional experience in subjects covered by the course. Applicants must also have **a thorough knowledge of English** which is **the only working language of the course**.

It is also **mandatory** for admission to the course that applicants are able and willing to present **a short paper (about 15 minutes) on their research or operational work and/or specify a problem or case study** they wish to discuss with their instructors and fellow participants. In the latter case they should bring along relevant data, documents and/or computer programmes for demonstration and analysis.

Priority is given to applicants who are able to cover the cost for travel from domestic institutional or development-aid project funds for training. **Fellowships** to cover course fees (including full board) as well as **travel grants** are available to selected participants from developing countries in need of support.

**Note:** Fellowship and travel funds are limited and have to be economized in the interest of all applicants in need of support. Tickets bought in the home countries of the applicants at national airline offices are often substantially cheaper than tickets bought in Germany and deposited at the airports of departure. Therefore, applicants are urged to inquire about the cheapest two-way tourist economy fare connection between their national airport and Berlin/Germany and to **state the ticket price in the application form** (in US\$ or EURO

equivalent). This information is taken into account in the selection procedure. In case the ticket option of an applicant is less costly than a ticket arrangement from Germany, he/she is asked to make his/her own travel arrangements locally and will then be refunded after arrival in Potsdam.

**An application is considered only** when:

- **the attached application form is duly filled-in and submitted in time;**
- **the application form is accompanied by two letters of recommendation**
- **Applicants give the title/topic of their presentation in the application form**

Those who intend to present and discuss additionally in a special workshop session data, methods used or case studies from their country should indicate this separately in the registration form and submit an abstract giving details about the subject, method applied, kind of data available as well as of the open questions they want to thresh out.

**Without such specifications and accompanying documents an application will not be considered!**

All participants are also kindly invited to present, at social evening get-togethers (cultural evening), slide, power point or video shows or any other suitable kind of material or personal performances (dances, songs, instruments) which can convey to their fellow participants some impressions about geography, culture, customs, music and daily life in their respective home countries. Such presentations should be limited to 15 min.

In the selection of participant's **preference is given to those applicants**, who (as confirmed in the application forms and accompanying letters):

- are most in need of training in the subjects covered by the course;
- are concerned with the operation of and data analysis at seismic stations or network centres;
- are working with seismic hazard assessment or microzonation;
- are involved in vulnerability and risk assessment, engineering seismology, and/or disaster management and mitigation projects;
- can serve multipliers in spreading the knowledge and skills acquired;
- can make an active contribution to the workshop sessions and discussions;
- had applied already earlier for the course, been found eligible/qualified but could not be accepted due to the limited number of fellowships available for each course;
- can pay their travel.

The application forms and accompanying candidates' files will be carefully screened by the Academic Board and Selection Committee of the course. Members of the board are prominent geoscientists of the GFZ German Research Centre for Geosciences and representatives of the Foreign Office as the main sponsor of the course. Chairman is Prof. Dr. J. Zschau, Director of the Department of Physics of the Earth at the GFZ.

## 2.2 Application formalities

Applications should include the following information:

- (1) Filled-in application form;
- (2) List of scientific publications;
- (3) Two letters of recommendation or reference which give details on the applicants personality, duties and performance in seismic station operation, data analysis or other specified applied or research projects;
- (4) Confirmation of appropriate command of English;
- (5) Title and one page abstract of the proposed topic or case study to be presented or discussed in a special workshop session;
- (6) Title and kind of intended cultural presentation;
- (7) Letter of motivation.

One copy of the application documents should be posted or faxed or sent by email as scanned documents to reach the address below not later than **June 15, 2009**:

**Helmholtz Centre Potsdam  
GFZ German Research Centre  
for Geosciences  
Dr. C. Milkereit  
Telegrafenberg  
D-14473 Potsdam  
GERMANY**

**Phone: (+49 331) 288 1201 or -1289  
Fax: (+49 331) 288 1204 or -1296  
E-mail: course-un@gfz-potsdam.de**

**Candidates will be informed of the decision of the Academic Board by June 20, 2009** and, if accepted, will receive further instructions by the GFZ in a letter of acceptance. Any additional questions may be directed to the address above.

## 2.3 Services provided to selected participants

Fellowships granted to participants entitle them to the following services:

- Accommodation in double rooms, meals and tea-break refreshments within the facilities and arrangements provided by the organizers;
- Tuition, printed course material, scientific and cultural excursions;
- Collection of scientific textbooks and software which participants can take home;
- A small amount of pocket money (8 EURO per day) to cover incidental expenses;
- Local transport in connection with the official programme, field excursions and pick-up arrangements for meeting participants arriving at and departing from the airport.

Travel grants to cover the cost of international air travel might be available for only some of the selected participants. Therefore, every applicant is urged to look into available possibilities to cover travel expenses on his/her own with the support of his/her nominating or sponsoring institution and to make, an explicit statement to this effect in the application form.

## 2.4 Costs borne by participants or nominating agencies

Participants or their nominating governments/agencies are required to bear the following:

- Cost of personal travel, accident, live and medical insurance;

- All expenses in the home country for travelling abroad, including passports, visa, medical examinations, inoculations, domestic travel, etc.;
- Salary and related allowance during the period of participation in the training course;
- Any expenses other than the travel grants for selected participants and the living and accommodation expenses at the seminar place (see 2.3) including subsistence and incidental expenses during travel, any expenses incurred during stop-over en route and any additional costs for travel by other route than the one originally provided with the ticket;
- Any costs for excess luggage.

Neither the GFZ nor any other co-organiser or co-sponsor of the course will assume responsibility for the following expenditures or services:

- Costs incurred by participants with respect to travel insurance, medical bills and hospitals fees in connection with their attendance at the training course;
- Loss of or damage to property while attending the training course;
- Compensation in the event of death or disability of participants in connection their attendance at the training course;
- Any claim towards expenses incurred by participants other than those mentioned in section 2.4. above (e.g. for accommodation in hotels, food and drink orders or private trips of the participants own choice, shopping, excess luggage, etc.);
- Re-routing tickets or making visa arrangements other than those required for entering or leaving Germany on the shortest possible way.

Participants may exchange their own freely convertible currency into Euro to cover themselves the cost for any additional personal needs beyond what is provided under 2.3

<p><b>With their signature under the application form all applicants and their nominating institutions accept these conditions irrevocably.</b></p>
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### **3. GENERAL INFORMATION**

#### **3.1 Location of the course**

The GFZ German Research Centre for Geosciences (GFZ) is situated in a wooded area on the top of a hill (Telegrafenberg) called Science Park "Albert Einstein". Potsdam, the capital of the State of Brandenburg, is surrounded by many lakes and beautiful parks. It lies on the river Havel and has about 120,000 inhabitants. Potsdam is particularly famous for its beautiful 18<sup>th</sup> and 19<sup>th</sup> century palaces and gardens of the Prussian kings, notably Sanssouci, which have been included in the world list of UNESCO of the cultural heritage of mankind.

The opening day of the course takes place at the GFZ, also the lectures are held at the GFZ German Research Centre for Geosciences. Only the evening lectures as well as the special programs will take place in the hotel, where the participants are accommodated. During one week of the course, one group of the participants (Group B) will receive specialized training at the Federal Institute for Geosciences and Natural Resources (BGR) in Hannover in the northern part of Germany.

Hannover is the capital of the federal state of Lower Saxony (Niedersachsen), Germany. With a population of more than 500,000 the city is a major center of northern Germany, known for hosting annual commercial expositions such as the Hannover Fair and the CeBIT. The Hannover fairground, due to numerous extensions especially for the Expo 2000, is the largest in the world. Hannover also has regional importance because of its universities and medical school, its international airport, and its large zoo. The city is also a major crossing point of railway lines and highways, connecting European main lines.

#### **3.2 Excursions**

During the weekends, there will be three full-day excursions in Potsdam, Berlin and surroundings. There will also be a 3-days scientific excursion by bus. For details see the annexed programme.

#### **3.3 Climate and recommended dressing**

September and October are fairly dry in Germany; some rain is to be expected every third day, on the average. In September, the maximum temperature typically is ranging between 14°C and 20°C during day-time and 5°C to 10°C during night time; in October the average maximum temperature reaches 8°C to 15°C and during the nights light frost may occur. It is recommended that the participants bring along a sweater and a rain coat or an umbrella as well as proper shoes for the field excursions and occasional hiking. No formal dressing is required during the course.

#### **3.4 The Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences**

The GFZ is the national research centre for geosciences of Germany and belongs to the Hermann von Helmholtz Association of German Research Centres. It has been jointly established by the Federal Ministry of Education and Research and by the Ministry of Science, Research and Culture of the State of Brandenburg on January 1, 1992. Research is carried out in five departments:

- Geodesy and Remote Sensing;
- Physics of the Earth;
- Geodynamics and Geomaterials;
- Chemistry and Material Cycles;
- Earth Surface Processes.

Besides this, the GFZ:

- provides effective management for major joint geoscientific research projects;
- executes research drilling projects, runs observatories and provides extensive modern facilities, equipment and logistics for both large-scale field projects as well as laboratory measurements;
- performs research with satellites;
- provides, in close cooperation with universities and within the framework of international collaboration, training, expertise and equipment to other countries in need;
- is responsible for the German contribution to the Tsunami Early Warning System in the Indian Ocean region.

Earthquake disaster related topics of the GFZ are:

- development of early warning systems concerning earthquakes;
- microzonation studies;
- multidisciplinary task-force missions to be dispatched into areas which are struck by devastating geological events with the aim to collect first-hand data about damage,
- vulnerability, aftershocks or other post-event activity, local underground effects, seismotectonic conditions, etc.;
- Megacity research;
- assessment of seismic hazard, vulnerability and risk (CEDIM);
- Tsunami research and installation of an Tsunami Early Warning in the Indian Ocean.

Other research projects deal with deep seismic and electromagnetic soundings and with seismology and seismic tomography. The seismology project is mainly concerned with the installation and operation of a global digital broadband system for research (GEOFON), with operational quick determinations of source parameters from strong regional and global earthquakes and with the investigation of deep seismic structures, material properties such as anisotropy and the nature of discontinuities in the Earth's mantle and core.

The training course on "Seismology and Seismic Hazard Assessment" is part of the activities of the Department "Physics of the Earth". Disaster related topics of the Department are research on earthquakes and volcanic eruptions, multidisciplinary taskforce missions to be dispatched into areas which are struck by devastating, geological events with the aim to collect first-hand data about damages, vulnerability, aftershocks or other post events activity, local underground effects, seismotectonic conditions.

The GFZ is situated on the Telegrafenberg (Telegraph Hill) in Potsdam, where world famous scientific institutes for astrophysics, geodesy, geomagnetism and meteorology were founded already between 1876 and 1892. Seismology has a long tradition in Potsdam too. On 17 April 1889, E. von Rebeur-Paschwitz, with a tiltmeter installed at the Telegrafenberg, obtained the world's first record of a teleseismic event, an earthquake near Japan. In 1902 the Potsdam seismic station began to operate and in 1906 the famous San Francisco earthquake was recorded there with a Wiechert seismograph. In 1969, the Geodetic and the Geomagnetic Institutes in Potsdam were united with the Geodynamic Institute in Jena and the Tectonic Institute in Berlin to form the Central Institute for Physics of the Earth (ZIPE) of the Academy of Sciences of the German Democratic Republic. This institute

initiated in 1979 the international UNESCO-sponsored training course on "Seismology and Seismic Hazard Assessment". After the unification of Germany, ZIPE was dissolved in December 1991. Part of its former facilities are now incorporated in the GFZ under a new scientific concept with a wider scope of national and international research activities and international co-operation. Since 1997, most of the GFZ has moved to a new modern building complex on the Telegrafenberg. More information is available from the GFZ home-page <http://www.gfz-potsdam.de/> .

### **3.5 The Federal Institute for Geosciences and Natural Resources (BGR)**

The BGR is the central geoscientific institution of the Federal Government of Germany and a subsidiary agency of the Federal Ministry for Economics. It advises and informs the Federal Ministries on matters related to natural resources and applied geosciences, and on geoscientific aspects of environmental and resources protection. The BGR deals with research and development in the field of applied geosciences and carries out, on the request of the Federal Government, related activities within Germany and abroad, in developing countries in particular. The BGR also represents the Federal Republic of Germany in international, especially intergovernmental, geoscientific bodies and organizations, e.g. those related to the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO).

The BGR is also responsible for the monitoring and cataloguing of the earthquake activity in Germany and the surrounding near-border areas. In this connection it maintains the German Regional Seismic Network (GRSN) of digital broadband stations and operates the Central Seismological Observatory Gräfenberg (SZGRF) in Erlangen, which also functions as the centralized seismological data archive and analysis centre in Germany. More information is available from the BGR home-page <http://www.bgr.bund.de/>

**List of institutions, lecturers and assistants contributing to the International Training Course on "Seismology, Hazard Assessment and Risk Mitigation", September 21 to October 23, 2009 in Potsdam, Germany**

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**GFZ German Research Centre for Geosciences, Germany**

Prof. Dr. P. Bormann	Dr. S. Parolai
C. Bosse	Dr. J. Saul
Dr. G. Grünthal	A. Strollo
Dr. W. Hanka	Dr. M. Sörensen
Dr. S. Hainzl	Prof. Dr. R. Wahlström
Prof. Dr. R. Kind	Dr. T. Walter
Dr. J. Lauterjung	Dr. R. Wang
Dr. C. Milkereit	Dr. B. Weber
Dr. M. Picozzi	Prof. Dr. J. Zschau

**University of Leipzig, Geophysical Observatory Collm, Germany**

Dr. S. Wendt

**University of Stuttgart, Institute of Geophysics, Germany**

Prof. Dr. E. Wielandt

**Black Forest Observatory (BFO) Schiltach, Germany**

Dr. T. Forbrigger

**Federal Institute for Geosciences and Natural Resources, (BGR), Hannover, Germany**

Dr. K. Stammler  
Dr. T. Plenefisch

**Observatoire Grenoble, Laboratoire de Geophysique Interne et Tectonophysique and Laboratoire Central des Ponts-et Chaussees, Paris, France**

Dr. P.-Y. Bard

**University of Bergen, Norway**

Dr. L. Ottemöller

**Istituto Nazionale di Geofisica e Vulcanologia, Italy**

Dr. D. Bindi

**Geophysical Observatory, Ludwig-Maximilians-University Munich, Germany**

Dr. J. Wassermann

**NORSAR, Norway**

Dr. D. Lang

# Preliminary Scientific Programme

## International Training Course on **Seismology, Seismic Data Analysis, Hazard Assessment and Risk Mitigation**

Potsdam, Germany, 21 September to 23 October 2009

### 1. Opening Day

#### Monday, Sept. 21

09.30 - 10.00

*Prof. Dr. R. Hüttl*

Opening of the Training Course 2009  
Presentation of the GeoForschungsZentrum Potsdam

*Mrs. S. Sommer*

Representative German Foreign Office

*Dr. C. Kamlage*

Capacity Building International - InWEnt Berlin

*Break for a welcome drink and snack*

10.30 - 11.00

*Prof. Dr. J. Zschau*

Earthquake Science and its Contribution to Society

11.00 - 11.30

*Dr. J. Lauterjung*

GITEWS – The Tsunami Early Warning Project

11.30 - 12.00

*Dr. M. Picozzi*

Seismic Early Warning in Istanbul

12.00 - 12.30

*A. Strollo*

Cross Border Seismology in Central Asia

12.30 - 13.30

*Lunch Break*

13.30 - 15.00

*Prof. Dr. P. Bormann*

Earthquake Disaster, Scourge of Nature or Man Made  
Disaster?

15.30 - 17.00

Walk through the Science Park "Albert Einstein" and  
introduction into the history of the Telegrafenberg,  
(A. Hübner)  
(History, A31 Cellar – Michelson-Morley Exp., A27 Big  
Refractor, Library)

#### Evening

19.30 - 21.00

*Dr. C. Milkereit*

Informal get-together of participants and lecturers

## 2. Fundamentals of Seismology, Seismometry, Instrumentation, Seismogram Analysis, Earthquake Source Parameter

### **Tuesday, Sept. 22**

- 08.30 - 10.00 P. BORMANN  
2.1 Aims and fundamentals of seismology  
Part I: Seismic sources and source parameters
- 10.30 - 12.00 P. BORMANN  
2.2 Aims and fundamentals of seismology  
Part II: Wave propagation, Earth's models and seismic recordings
- 13.30 - 15.00 P. BORMANN  
2.3 Phase interpretation and methods of event location by using local network data
- 15.30 - 17.00 P. BORMANN  
2.4 Teleseismic phase interpretation and 3-component event location; animation of seismic ray propagation

### **Wednesday, Sept. 23**

- 08.30 - 10.00 P. BORMANN  
2.5 Earthquake magnitudes and energy estimates
- 10.30 - 12.00 P. BORMANN, S. WENDT  
2.6 **Manual exercise** on magnitude determination
- 13.30 - 15.00 P. BORMANN, S. WENDT  
2.7 Introduction to and beginning of **exercise** on determination of fault plane solutions
- 15.30 - 17.00 P. BORMANN, S. WENDT  
2.8 **Exercise** on fault plane solution

### **Thursday, Sept. 24**

- 08.30 - 10.00 P. BORMANN, S. WENDT  
2.9 Site selection, and optimal configuration of seismic networks
- 10.30 - 12.00 S. WENDT  
2.10 Magnitude Calibration Function  
An example from SE-Germany
- 13.30 - 14.20 E. WIELANDT  
2.11 Design of Seismic Sensors I

14.30 - 15.20 E. WIELANDT  
2.12 Design of Seismic Sensors II

15.30 - 17.00 E. WIELANDT  
2.13 Fundamentals of Signal Processing I

**Friday, Sept. 25**

08.30 - 10.00 E. WIELANDT  
2.14 Fundamentals of Signal Processing II, Filter demonstration

10.30 - 12.00 E. WIELANDT  
2.15 Installation and Shielding

13.30 - 17.00 A. STROLLO , E. WIELANDT, C. MILKEREIT  
2.16 **Demonstration** of different digital data acquisition systems together with seismometers for mobile and stationary use (short-period, broadband and strong-motion recordings and display of the collected data) Demonstration of shielding and installation

**Saturday, Sept. 26** *Cultural Walk through Potsdam*

**Sunday, Sept. 27** *Cultural Walk through Berlin*

**Monday, Sept. 28**

08.30 - 09.20 E. WIELANDT, T. FORBRIGER  
2.17 Poles and Zeros, SEED Headers

10.30 - 12.00 E. WIELANDT, T. FORBRIGER  
2.18 Sensor Calibration

13.30 - 15.00 E. WIELANDT, T. FORBRIGER  
2.19 Demo on Sensor Calibration

15.30 - 17.00 E. WIELANDT, T. FORBRIGER  
2.20 Exercise on Sensor Calibration

**Evening**

19.30 - 21.00 P. BORMANN  
History of Seismology

## **Tuesday, Sept. 29**

- 08.30 - 10.00 E. WIELANDT, T. FORBRIGER  
2.21 Coherency testing, orientation
- 10.30 - 12.00 E. WIELANDT, T. FORBRIGER  
2.22 Measuring Noise
- 13.30 - 15.00 P. BORMANN  
2.23 Seismic Wave Propagation and Attenuation
- 15.30 - 17.00 P. BORMANN  
2.24 Introduction to Source Parameter derived from seismic Spectra

## **3. Computer-assisted seismogram analysis and source parameter determination**

### **Wednesday, Sept. 30**

- 08.30 - 10.00 L. OTTEMÖLLER  
3.1 Types of seismic data and formats; overview of seismic processing systems
- 10.30 - 12.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.2 Introduction to SEISAN and exercise on the installation of SEISAN
- 13.30 - 15.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.3 **Exercise** on data base manipulation, on the use of parameter data from internal and external sources and on the presentation of results
- 15.30 - 17.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.4 **Exercise** on phase picking and location of local seismic events based on 3-component and network records

### ***Evening***

19.30 - 21.00 *Cultural Presentation*

### **Thursday, Oct. 1**

- 08.30 - 10.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.5 **Exercise** on phase picking and localization of local seismic events based on network records
- 10.30 - 12.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.6 **Exercise** on phase picking and localization of teleseismic events based on network records

- 13.30 - 15.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.7 **Exercise** on amplitude picking and magnitude determination
- 15.30 - 17.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.8 **Exercise** on amplitude spectra calculation and moment magnitude determination

**Friday, Oct. 2**

- 08.30 - 10.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.9 **Exercise** on determination of fault-plane solutions
- 10.30 - 12.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.10 **Exercise** on spectral source parameter determination
- 13.30 - 15.00 L. OTTEMÖLLER, C. MILKEREIT, S. WENDT  
3.11 **Exercises** on seismogram analysis based on digital data
- 15.30 - 17.00 Scientific Presentations of the Participants (1-6)

**Saturday, Oct. 3** *Excursion to the seismological station Rüdersdorf (RUE) and to the Müggelsee lake area*

**Sunday, Oct. 4** *Leisure time*

**4. Array techniques in Microzonation and Seismological Networks**

**Monday, Oct. 5**

- 08.30 - 10.00 D. BINDI  
4.1 Basics of Fourier Analysis and Data Processing
- 10.30 - 12.00 D. BINDI  
4.2 Source, Path, and Site Convolution
- 13.30 - 15.00 S. PAROLAI, D. BINDI  
4.3 Exercise on Data Analysis
- 15.30 - 17.00 S. PAROLAI, D. BINDI  
4.4 Exercise on Spectral Ratios

**Tuesday, Oct. 6**

- 08.30 - 10.00 S. PAROLAI  
4.5 Surface wave based methods for site investigation I  
Introduction to Seismic Noise
- 10.30 - 12.00 S. PAROLAI  
4.6 Surface wave based methods for site investigation II  
Single Station Noise Measurements
- 13.30 - 15.00 M. PICOZZI, S. PAROLAI, D. BINDI  
4.7 Exercise on Array Data
- 15.30 - 17.00 Scientific Presentations of the Participants  
(7-12)

**Evening**

- 19.30 - 21.00 R. KIND  
Global Seismology

**Wednesday, Oct. 7**

- 08.30 - 10.00 S. PAROLAI  
4.8 Surface wave based methods for site investigation III  
Passive Source Arrays
- 10.30 - 12.00 S. PAROLAI  
4.9 Surface wave based methods for site investigation IV  
Active Source Arrays
- 13.30 - 15.00 M. PICOZZI, S. PAROLAI, D. BINDI, C. MILKEREIT  
4.10 SOSEWIN Installation and Analysis
- 15.30 - 17.00 4.10 - **continuation** –

**Evening**

- 19.30 - 21.00 *Cultural Presentations*

**Thursday, Oct. 8**

- 08.30 - 10.00 J. WASSERMANN  
4.11 Trigger algorithms and parameter selection
- 10.30 - 12.00 J. WASSERMANN  
4.12 Seismological networks and international exchange of  
parameter and waveform data
- 13.30 - 15.00 W. HANKA  
4.13 The GEOFON project – status report and  
instrumentation
- 15.30 - 17.00 W. HANKA  
4.14 SeisComp3 – A new tool for real time seismology

**Friday, Oct. 9**

**Main Excursion**

Departure by bus from Potsdam  
Visit of the **geophysical-seismological observatory Moxa** of the University of Jena, Institute of Geosciences  
Travel to Windischeschenbach  
Visit of the **Deep Crustal Laboratory, KTB site** and exhibition area in Windischeschenbach  
Dinner & Accommodation near Wettzell

**Saturday, Oct. 10**

Travel to Wettzell  
Visit of the **Geodetic Observatory Wettzell**  
Travel to Munich and Fürstenfeldbruck  
Visit of the **Geophysical Observatory Fürstenfeldbruck** of the Ludwig-Maximilians-University Munich  
Dinner & Accommodation near Nördlingen

**Sunday, Oct. 11**

Travel to Hannover  
Visit of the **Federal Institute for Geosciences and Natural Resources (BGR)**, Hannover  
Travel of Group A to Potsdam, Group B stays in Hannover

**During the next four days** the course will split into two groups for **specialized training**

**Group A** continues in *Potsdam* with lectures and exercises on local site effects, microzonation, vulnerability and risk assessment, disaster management

**Group B** stays at the *BGR in Hannover* for lectures and practical work related to the operation of a network centre, seismogram analysis of data from single stations, networks and arrays as well as to national and international data exchange

**GROUP A**

**5. Direct and induced effects of strong earthquake ground motions**

**Monday, Oct. 12**

08.30 - 10.00

P.-Y. BARD

5.1 Ground shaking site effects. Introduction: Effects of surface topography

10.30 - 12.00

P.-Y. BARD

5.2 Effects of soft surface layers

- 13.30 - 15.00 P.-Y. BARD  
5.3 **Manual exercise:** Computation of fundamental frequencies for different sites
- 15.30 - 17.00 P.-Y. BARD  
5.4 **Computer exercise:** Use of the PC-program psvsh1d.f for 1D model calculations of local site effects
- Tuesday, Oct. 13**
- 08.30 - 10.00 P.-Y. BARD  
5.5 **Exercise:** Noise Measurements
- 10.30 - 12.00 P.-Y. BARD  
5.6 **Exercise:** Determination of the fundamentals resonance frequency from noise measurements
- 13.30 - 15.00 P.-Y. BARD  
5.7 Estimation of site effects: Instrumental, numerical, empirical
- 15.30 - 17.00 P.-Y. BARD  
5.8 Use of microtremor recordings for estimating site effects
- Wednesday, Oct. 14**
- 08.30 - 10.00 P.-Y. BARD  
5.9 **Computer exercise:** Use of the program hv-potsdam.f for processing microtremor data
- 10.30 - 12.00  
5.9 - continuation -
- 13.30 - 15.00 P.-Y. BARD  
5.10 Liquefaction: Basic physical phenomena and procedures for assessing the liquifaction potential
- 15.30 - 17.00 P.-Y. BARD  
5.11 **Exercise** on estimation of liquefaction by hand and with simple PC program
- Thursday, Oct. 15**
- 08.30 - 10.00 P.-Y. BARD  
5.12 Slope instabilities: Basic physics and estimation techniques
- 10.30 - 12.00 P.-Y. BARD  
5.13 **Manual exercise** on slope instabilities

- |               |   |
|---------------|---|
| 13.30 - 15.00 | P.-Y. BARD                                  |
|               | 5.14 Noise measurements                     |
| 15.30 - 17.00 | P.-Y. BARD                                  |
|               | 5.15 <b>Exercises</b> on noise measurements |

### Group B

## **6. Operation of network centres and detailed data analysis at single stations, seismic networks and arrays**

### **Monday, Oct. 12**

- |               |   |
|---------------|---|
| 08.30 - 10.00 | K. STAMMLER, T. PLENEFISCH                              |
|               | 6.1 Introduction to the specialized training at the BGR |
| 10.30 - 12.00 | K. STAMMLER, T. PLENEFISCH                              |
|               | 6.2 Technical equipment of the GRF-array and the GRSN   |
| 13.30 - 15.00 | K. STAMMLER, T. PLENEFISCH                              |
|               | 6.3 Technical equipment of the BGR and data exchange    |
| 15.30 - 17.00 | K. STAMMLER, T. PLENEFISCH                              |
|               | 6.4 Software of the BGR (SHM)                           |

### **Tuesday, Oct. 13**

- |               |  |
|---------------|--|
| 08.30 - 10.00 | K. STAMMLER, T. PLENEFISCH   |
|               | 6.5 Seismological routine data processing and communication        |
| 10.30 - 12.00 | K. STAMMLER, T. PLENEFISCH   |
|               | 6.6 Data processing at single stations, networks and arrays        |
| 13.30 - 15.00 | K. STAMMLER, T. PLENEFISCH   |
|               | 6.7 <b>Exercise:</b> First practical steps and data pre-processing |
| 15.30 - 17.00 | K. STAMMLER, T. PLENEFISCH   |
|               | 6.8 <b>Exercise:</b> Data processing at single stations            |

### **Wednesday, Oct. 14**

- |               |  |
|---------------|--|
| 08.30 - 10.00 | K. STAMMLER, T. PLENEFISCH   |
|               | 6.9 Localization using networks and array techniques                   |
| 10.30 - 12.00 | K. STAMMLER, T. PLENEFISCH   |
|               | 6.10 <b>Exercise:</b> Localization using networks and array techniques |

- 13.30 - 15.00 K. STAMMLER, T. PLENEFISCH  
6.11 Identification of depth phases and "later phases"
- 15.30 - 17.00 K. STAMMLER, T. PLENEFISCH  
6.12 **Exercise:** Identification of depth phases and "later phases"

**Thursday, Oct. 15**

- 08.30 - 10.00 K. STAMMLER, T. PLENEFISCH  
6.13 Single station, network and array calibration
- 10.30 - 12.00 K. STAMMLER, T. PLENEFISCH  
6.14 **Exercise:** Magnitude determination
- 13.30 - 14.30 K. STAMMLER, T. PLENEFISCH  
6.15 Final discussion
- ~16 o'clock *Return of Group B to Potsdam by train, expected time of arrival 19:00 o'clock*

**7. Earthquake Hazard Assessment**

**Friday, Oct. 16**

- 08.30 - 10.00 R. WAHLSTRÖM  
7.1 Macroseismic and Strong Motion Parameter
- 10.30 - 12.00 R. WAHLSTRÖM  
7.2 Earthquake statistics and occurrence probability
- 13.30 - 15.00 R. WAHLSTRÖM  
7.3 Methodology of seismic hazard assessment
- 15.30 - 17.00 R. WAHLSTRÖM  
7.4 **Manual exercise** on the validity of the Poisson distribution

***Evening***

- 19.30 - 21.00 *Cultural Presentation*

**Saturday, Oct. 17** Leisure time

**Sunday, Oct. 18** Leisure time

## Monday, Oct. 19

During this day small groups of participants will visit working groups of the GFZ. Participants can choose according to their interest and availability

- Calculation of the complete seismic wavefield in a layered half space (R. Wang)
- Array Methods in Microzonation (S. Parolai, M. Picozzi)
- Strong Motion Data Analysis (D. Bindi)
- Ground Displacement Measured by INSAR (T. Walter)
- Special Exercise Hazard Assessment (R. Wahlström, M. Sörensen)
- Installation, Test, Integration of Broadband Sensors (A. Strollo, B. Weber)
- Time dependent Hazard Assessment (S. Hainzl)
- Microzonation (P.Y. Bard)

## Tuesday, Oct. 20

- |               |  |
|---------------|--|
| 08.30 - 10.00 | R. WAHLSTRÖM, C. BOSSE   |
| 7.5           | <b>Manual and computer exercise</b> on assessing catalog completeness with time  |
| 10.30 - 12.00 | R. WAHLSTRÖM, C. BOSSE   |
| 7.6           | <b>Manual exercise</b> on determination of the parameters of the Gutenberg-Richter relation                                |
| 13.30 - 15.00 | R. WAHLSTRÖM, C. BOSSE   |
| 7.7           | <b>Computer exercise:</b> Assigning catalogue completeness with time and its influence on the Gutenberg-Richter parameters |
| 15.30 - 17.00 | R. WAHLSTRÖM, C. BOSSE   |
| 7.8           | <b>Computer exercise:</b> Influence of fore- and aftershocks on the parameters of the Gutenberg-Richter parameters         |

## Wednesday, Oct. 21

- |                |  |
|----------------|--|
| 08.30 - 10.00  | M. SÖRENSEN, C. BOSSE  |
| 7.9            | Methodology of seismic hazard assessment II                                |
| 10.30 - 12.00  | M. SÖRENSEN, C. BOSSE  |
| 7.10           | <b>Manual Exercise</b> on seismic hazard assessment: A simplified approach |
| 13.30 - 15.00  | M. SÖRENSEN, C. BOSSE  |
| 7.11           | Exercise: Hazard Assessment  |
| 15.30 - 17.00  | Scientific Presentations of Participants III                               |
| <b>Evening</b> |  |
| 19.30 - 21.00  | <i>Cultural Presentation</i>   |

## **8. Risk Assessment**

### **Thursday, Oct. 22**

- 08.30 - 10.00 D. LANG  
8.1 Introduction into seismic risk and loss assessment methods: Empirical (intensity-based) approach versus analytical (spectral displacement) approach, Capacity spectrum methods (ATC-40, FEMA 440), Classification of physical building damage
- 10.30 - 12.00 D. LANG  
8.2 The seismic risk and loss assessment tool SELENA: Theoretical background, Comparison with HAZUS-MH (Part I)
- 13.30 - 15.00 D. LANG  
8.3 The seismic risk and loss assessment tool SELENA: Theoretical background, Comparison with HAZUS-MH (Part II)
- 15.30 - 17.00 Scientific Presentations of Participants IV (19-26)

### **Friday, Oct. 23**

- 08.30 - 10.00 D. LANG  
8.4 Computer exercise: SELENA handling and generation of input and inventory files, Building classification, Site and subsoil classification (international earthquake codes), Provision of seismic demand (scenario events and design spectra), Compilation of a logic tree computation scheme
- 10.30 - 12.00 D. LANG  
8.5 Computer exercise: Risk and loss assessment based on realistic earthquake scenarios for selected cities (Part I)
- 13.30 - 15.00 D. LANG  
8.6 Computer exercise: Risk and loss assessment based on realistic earthquake scenarios for selected cities (Part II)
- 15.30 - 17.00 D. LANG  
8.7 Computer exercise: Risk and loss assessment based on realistic earthquake scenarios for selected cities, Illustration of risk results using the Google Earth-based software tool, RISE (Risk Illustrator for SELENA)

### ***Evening:***

- 19.30 - **Closing of the Training Course**  
Handing out of the course certificates