



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

October 19 to November 13, 2020
 San Luis and San Juan, Argentina

Organised and sponsored by

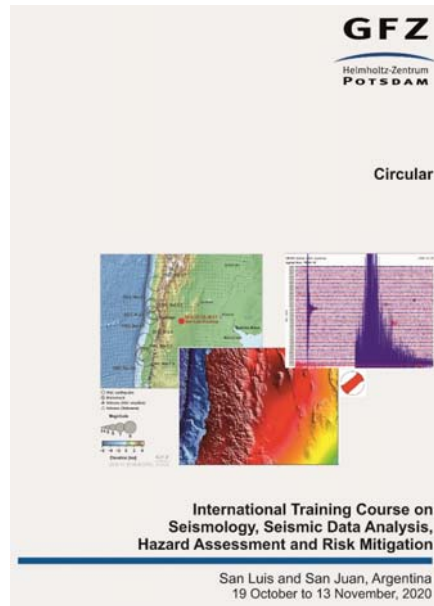
Helmholtz Centre Potsdam
 GFZ German Research Centre for Geosciences

and

Universidad Nacional San Luis and
 Universidad Nacional San Juan, Argentina

co-sponsored by

Federal Foreign Office (FFO), Berlin, Germany



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 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 scientists and engineers from developing countries. The courses are a contribution to the Sendai Framework for Disaster Risk Reduction 2015-2030.

In 2020, the GFZ organizes and runs a regional course in Argentina in cooperation with the Universidad Nacional San Luis and the Universidad Nacional San Juan in the time period 19 October to 13 November for the benefit of participants from earthquake-prone countries in Latin-America under the main topics:

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

The training course 2020 is co-sponsored by the Federal Foreign Office (FFO) of Germany (Berlin). It is also supported by the United Nations Educational, Scientific and Cultural

Organization (UNESCO, Paris), by the University of Bergen, the University Nacional San Luis, and the Universidad Nacional San Juan.

Until 2019, more than 1200 participants from 119 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 GFZ Potsdam. Since the foundation of the GFZ in 1992 these courses are 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 2020 can be found on the GFZ web-page under <http://www.gfz-potsdam.de/en/centre/education-and-training/seismology/>.

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 hazard and risk assessment, extensive practical exercises, demonstrations, workshop discussions and scientific excursions. The excursion in 2020 focuses on visits to geological sites and 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.

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.

Several changes were introduced since 2019, mainly following suggestions of former course participants as well as adapting to modern possibilities in running such a course:

- The training course is planned as a 4-week course. The training is dedicated to fundamental lessons and exercises on Seismology, Microzonation, Strong Ground Motion, and Seismic Hazard Assessment and Risk Estimation. Additional topics are the use of InSAR and geodynamic modelling.
- Some sessions of the training course are dedicated to scientific-technical presentations by the course participants. He/she has to report about his/her work and research. The scientific-technical presentations are planned as talks to the other course participants and interested colleagues.
- In case a course participant wants to use his own data (seismic data, instrumental microzonation, earthquake catalogue, etc.) during the time of the Training Course a copy of the data should be sent to the GFZ for checking and quality control.

Starting in 2019, there is an important extension for further qualification available. Former course participants can apply for additional support from the International Training Course. In case you have an idea for a project, or an interest in gaining further qualifications, you can submit a short application (1 page).

This proposed project should build upon the background you gained as a course participant. We can provide (for a short period of time) a limited number of instruments, as well as software tools for data analysis. The aim should be to produce a common publication for

submission to an international journal. Any acquired data will have to be made publically available in an electronic form. You will need a partner (lecturer) from the training course. The time for the project should be "short" – we cannot support a full Master or PhD project (note, there are other funding possibilities offered by DAAD or the Humboldt Foundation). However, we can support your visit to the GFZ or another institution with a travel grant and even a short-term scholarship. A board of lecturers will select the projects to be supported.

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 2020 is arranged for the benefit of participants from earthquake-prone countries from Latin-America. 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. Only a limited number of **Travel grants** are available to selected participants from developing countries in need of support.

An application is considered only when:

- **the application form is duly filled-in and submitted in time;**
- **the application is accompanied by two letters of recommendation by supervisors or heads of nominating institutes/organisation. These letters should refer to the personality, academic qualification, obligations and performance as well as to future job requirements of the candidate;**
- **the applicants also explicitly confirm to have appropriate command of the English, if possible by adding copies of respective language certificates;**
- **the application is accompanied by a letter of motivation (1/2 - 1 page);**
- **the applicants give the title/topic of their scientific presentation in the application form (with abstract);**

- **The applicants confirm, that an international travel and health insurance will be concluded.**

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

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 discuss about.

All participants have to present, at social evening get-togethers (cultural evening), slide, power point or video shows (self-made) 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 10-15 min.

In the selection of participants, **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 in the field of seismic hazard assessment or microzonation;
- are involved in vulnerability and risk assessment, engineering seismology, and/or disaster management and mitigation projects;
- can serve as 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 to Argentina.

The application with 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 Federal Foreign Office (FFO) as the main sponsor of the course. Chairman is Prof. Dr. T. Dahm, head of section 2.1 "Physics of Earthquakes and Volcanoes" 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.

The deadline for the submission of the application documents is **June 12, 2020**.

Candidates will be informed of the decision of the Academic Board by July 24, 2020 and, if accepted, will receive further instructions by the GFZ in a letter of acceptance and a Letter of Invitation from the hosting University Nacional San Luis. 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 single rooms, meals and tea-break refreshments within the facilities and arrangements provided by the organizers; (Only during the excursion we may ask the participants to stay for one or two nights in double rooms);
- 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 (5 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, laundry, telephone, internet, excess luggage, etc.);
- Re-routing tickets or making visa arrangements other than those required for entering or leaving Argentina on the shortest possible way.

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

By attending the International Training Course on Seismology, you grant the GFZ German Research Centre for Geosciences the right to use your name, photograph and biography in GFZ news, or promotional material, whether in print, electronic or other media, including the GFZ website.

By submitting the application documents all applicants and their nominating institutions accept these conditions irrevocably.

For more information please contact:

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3. GENERAL INFORMATION

3.1 Location of the course (Wikipedia <https://en.wikipedia.org/wiki/Argentina>)

Argentina is located mostly in the southern half of South America. Sharing the bulk of the Southern Cone with Chile to the west, the country is also bordered by Bolivia and Paraguay to the north, Brazil to the northeast, Uruguay and the South Atlantic Ocean to the east, and the Drake Passage to the south. Argentina is the eighth-largest country in the world, the fourth largest in the Americas, the second largest in South America after Brazil, and the largest Spanish-speaking nation. The sovereign state is subdivided into twenty-three provinces and one autonomous city Buenos Aires, which is the federal capital of the nation.

The course 2020 will be in the San Juan and San Luis provinces which belong to the Cuyo region in Argentina. San Luis is located near the geographical center of the country (on the 32° South parallel). Neighbouring provinces are La Rioja, Córdoba, La Pampa, Mendoza and San Juan. The province has low sierras in the north along the Dry Pampas, and another such system on the west with the Guayaguas, Cantanal, Quijadas and Alto Pencoso Sierras, typical of the Cuyo region.

The economic profile of the province changed due to industrial promotion policies implemented since late 1982. Until then, the primary sector (agriculture) was the productive base. Industrial establishments installed after that year, exhibit great diversification and are mainly in two urban centers: the capital and Villa Mercedes. Tourism is another of the activities promoted by the San Luis government since the return of democracy in 1983. Currently the province has the largest network of highways in the country, which connects most of the resorts with the provincial capital.

San Juan Province is located in the western part of Argentina. Neighbouring provinces are La Rioja, San Luis and Mendoza. It borders with Chile to the west. The province is covering a mountainous region with scarce vegetation, fertile oases and turbulent rivers. Throughout the entire province there are an important number of paleontological sites.

Similar to other regions in Argentina, agriculture is one of the most important economic activities, highlighting wine production and olive oil. Additionally, a variety of fruits and vegetables are produced in the fertile valleys irrigated by artificial channels in the western part, close to the Andes mountain range. This is the second province in volume of wine production at the national level and in South America, and possesses outstanding varietal wines. It is also an important center of mining and oil production.

The province is part of the continental semi-desert Cuyo region. The arid plains start on the east, with a few low hills in the middle and swiftly turn into 6,000-meter-high mountain peaks towards the west. Both areas are subject to the dry hot Zonda (a kind of Föhn wind).

3.2 Excursions

During weekends, excursions will be organized.

3.3 Climate and recommended dressing

The center of Argentina, which includes the Pampas to the east and the Cuyo region to the west has hot summers with frequent tornadoes and thunderstorms, and cool, dry winters. The course will be in Oct.-Nov 2020 which is the spring time, so the temperatures will increase but sometimes rain has to be expected. 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. 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. The grand challenges and the complexity of system Earth require a close multidisciplinary interaction and integration across scientific competence fields to secure advances in understanding and solutions. For these reasons, and to achieve our scientific mission, we coordinate our research via five Research Units (RU) that foster the required long-term research collaborations and that transcend the organizational / management units. These five RUs are:

- Global Processes – Integrated monitoring and modelling: How are linked processes controlling the global dynamics of the Earth and change in the Earth System?
- Plate Boundary Systems – Understanding the dynamics that affect the human habitat: How do the dynamic processes of the solid Earth's most dynamic systems function and how do they control related hazards and resource formation?
- Earth Surface and Climate Interactions – Probing records to constrain mechanisms and sensitivities: How does climate change today and in the past affect the Earth surface and how do surface processes, in turn, influence the atmosphere and climate?
- Natural Hazards – Understanding risks and safeguarding the human habitat: How can we better predict and understand natural hazards, their dynamics, and their consequences?
- Georesources and Geoenergy – Raw materials and contributions to the energy transition: How can georesources and the geological subsurface be used in a sustainable way.

Understanding the causes and consequences of Natural Hazards is one of the grand challenges of the Helmholtz Research Field "Earth & Environment". We study natural hazards and associated risks and contributes to mitigation solutions with a broad interdisciplinary team from GFZ and cooperating partner institutions. We investigate fundamental processes leading to single and cascading hazards, model their observed and expected consequences, develop methods to quantify and forecast hazard and risk and develop early warning systems. We use our broad monitoring networks and observatories to validate our models. We place a strong emphasis on outreach activities and delivering products and services relevant to society.

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 Geophysics Department. Disaster related topics of the Department are research on earthquakes and volcanic eruptions, 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 damages, vulnerability, aftershocks or other post events activity, local underground effects, seismotectonic conditions.

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.

More information is available from the GFZ websites <http://www.gfz-potsdam.de/> and the website <https://www.helmholtz.de/en/> of the Helmholtz Association of German Research Centres.

3.5 National University of San Luis and National University of San Juan

Both universities, the Universidad Nacional de San Juan (UNSJ) and the Universidad Nacional de San Luis (UNSL) have an extensive collaboration history that goes back to their common origins. Both universities were part of the regional Universidad de Cuyo, but were separated by provinces in the early 1970s, although the interaction and collaboration continued to be successful. Two years ago, in 2017, as part of this collaborative efforts, a permanent broadband station was installed in the UNSL, with facilities from the UNSJ, transmitting data in real time to both institutions. In addition, there are several ongoing seismological projects with researchers from both institutions.

Concerning the province of San Luis, geological evidences indicate that there are at least three fault systems which are responsible for the ongoing uplift of the Sierra de Comechingones and the Sierra Grande. El Molino fault (Costa, 2009) crosses the Merlo city in San Luis and has an estimated potential to generate earthquakes with magnitude ($M > 7.2$ - Costa et al., 2001). The seismicity of San Luis accounts two big earthquakes: one of magnitude $M \sim 6$ (May 22, 1936) occurred in San Francisco del Monte de Oro and others in Sampacho, (one occurred on June 10, 1934, of Magnitude 5.5 and the other on June 11, 1934 of Magnitude 6.0). These sites in the San Luis province have a lot to offer and are worth seeing from the geological and seismological point of view and are located near the capital city and could be also part of a short field trip. The classrooms for the course are located in the Facultad de Ciencias Físico Matemáticas y Naturales, in the San Luis city, very near to the Sierra de San Luis.

<http://www.unsl.edu.ar/>

https://en.wikipedia.org/wiki/National_University_of_San_Luis

In the San Juan province, the lectures will be hosted in the “Instituto Geofísico-Sismológico Volponi (IGSV)” and in the ZOOM University Complex, we combine this part of the course with a field trip to visit the La Laja Fault which was the responsible for the catastrophic 1944 San Juan earthquake. One of pioneering contributions to seismic hazard was the first seismic regionalization of Argentina published by the Institute founder, Ing. Fernando Séptimo Volponi. The IGSV institute started to record the seismicity with the station ZON that was later incorporated to the FDSN Global Network. The IGSV, in collaboration with other institutions (INPRES, La Plata University, Chile University, between others) has been as well involved in the deployment of many temporary networks in different regions in Argentina. These experiments are intended to improve the seismological research and are the basic source of many doctoral thesis. In particular, many efforts have been done to study the most destructive earthquake of Argentina that affected San Juan province in 1944 and caused many casualties. Other important earthquakes that occurred in the Cuyo region in 1861, 1894, 1929, 1952 and the last one 1977, are as well, aim of many studies involving researchers from both universities. Nowadays, the IGSV has 3 local and temporal seismological networks (2 in Neuquen Province and the other in Mendoza Province) registering the low and moderate magnitude seismicity. Additionally, a more regional network (with time real transmission) is growing up, in which San Luis University are involved too.

<http://www.unsj.edu.ar/>

https://en.wikipedia.org/wiki/National_University_of_San_Juan