



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

June 21 to July 19, 2023
Potsdam, Germany

Scientific Programme

Organised and sponsored by

Helmholtz Centre Potsdam
GFZ German Research Centre for Geosciences

co-sponsored by

Federal Foreign Office of Germany (Berlin)



List of institutions, lecturers and assistants contributing to the International Training Course on "Seismology, Hazard Assessment and Risk Mitigation", June 21 to July 19, 2023 in Potsdam, Germany

GFZ German Research Centre for Geosciences, Germany

Dr. Dino Bindi	bindi@gfz-potsdam.de
Dr. Pinar Büyükkakpınar	pinar.bueyuekakpınar@gfz-potsdam.de
Dr. Simone Cesca	simone.cesca@gfz-potsdam.de
Prof. Dr. Fabrice Cotton	fcotton@gfz-potsdam.de
Prof. Dr. Torsten Dahm	torsten.dahm@gfz-potsdam.de
Dr. Zhiguo Deng	deng@gfz-potsdam.de
Dr. Peter Evans	peter.evans@gfz-potsdam.de
Dr. Sebastian Hainzl	sebastian.hainzl@gfz-potsdam.de
MSc. Laura Hillmann	laura.hillmann@gfz-potsdam.de
MSc. Marius Isken	marius.isken@gfz-potsdam.de
Dr. Daniela Kühn	daniela.kuehn@gfz-potsdam.de
MSc. Karina Loviknes	karinalo@gfz-potsdam.de
Dr. Claus Milkereit	claus.milkereit@gfz-potsdam.de
Prof. Dr. Mahdi Motagh	mahdi.motagh@gfz-potsdam.de
Dr. Cecilia Nievas	cecilia.nievas@gfz-potsdam.de
Dr. Marco Pilz	marco.pilz@gfz-potsdam.de
Dr. Angelo Strollo	angelo.strollo@gfz-potsdam.de
MSc. Elif Türker	etuerker@gfz-potsdam.de
PD Dr. Thomas Walter	twalter@gfz-potsdam.de

University of Potsdam, Germany

Dr. Sebastian Heimann	sebastian.heimann@uni-potsdam.de
Dr. Matthias Ohrnberger	mao@geo.uni-potsdam.de

University of Naples, Italy

Dr. Matteo Picozzi	matteo.picozzi@unina.it
--------------------	--

Leibniz University of Hannover

Dr.-Ing. Mahmud Haghshenas Haghighi	Mahmud@ipi.uni-hannover.de
-------------------------------------	--

Scientific Programme

International Training Course on Seismology, Seismic Data Analysis, Hazard Assessment and Risk Mitigation Potsdam, Germany, 21 June – 19 July, 2023

1. Opening Day

Wednesday, June 21

H, VR 2-3

08:45 - 09:30	<i>Prof. Dr. Susanne Buitter</i> Opening of the Training Course 2023 Presentation of the Helmholtz-Centre Potsdam - GFZ German Research Centre for Geosciences <i>Dr. Alexander Rudloff (GFZ & Secretary General of IUGG)</i> The International Union of Geodesy and Geophysics (IUGG) and its 28th General Assembly in Berlin - July 2023 <i>Prof. Dr. Torsten Dahm</i> The Turkiye-Syria Major Earthquakes from Feb. 6 th , 2023 – Why were they so deadly?
09:30 - 10:00	<i>Break for a welcome drink - Group Photo</i>
10:00 - 10:30	<i>Dr. Angelo Strollo</i> The GEOFON program and the SeisComp3 project
10:30 - 11:00	<i>Dr. Zhiguo Deng</i> Velocity and deformation of intraplate blocks in Central Europe - comparison to seismic mantle anomalies, volcanism and seismicity
11:00 - 11:30	<i>Marius Isken</i> Fibre-optical measurements for seismic and earthquake monitoring
11.30 - 12:00	<i>Dr. Thomas Walter</i> InSAR – Remote Monitoring of Natural Hazards
12:00 - 13:30	<i>Lunch Break</i>

13:30 - 15:00	T. DAHM 1.1 Aims and fundamentals of seismology
15:00 - 15:30	<i>Coffee break</i>
15:30 - 17:00	C. MILKEREIT 1.2 Introduction to Digital Signal Processing and Concepts

Evening

(Canteen)

18:00 - 19:00	Dinner participants + lecturers
19:00 - 21:00	Informal get-together of participants and lecturers

2. Seismology, Instrumentation, Seismogram Analysis, Earthquake Source Parameter, and Wave Propagation

Thursday, June 22

H, VR2-3

08:30 - 10:00	T. DAHM 2.1 Seismic sources and source parameters
10:30 - 12:00	T. DAHM 2.2 Theory of wave propagation: Basics of numerical methods
13:30 - 15:00	S. HAINZL 2.3 Frequency-Magnitude distribution
15:30 - 17:00	S. HAINZL 2.4 Analysis of particular earthquake catalogues

Friday, June 23

08:30 - 10:00	S. HAINZL 2.5 Aftershocks & Seismicity models
10:30 - 12:00	S. HAINZL 2.6 Analysis of aftershock activity
13:30 - 15:00	T. DAHM 2.7 Seismic waves in the real Earth (1) - Required seismic records and derived Earth models
15:30 - 17:00	T. DAHM 2.8 Seismic waves in the real Earth (2) - Tools to support interpretation

Evening:

18:30 - 21:00	<i>Cultural Presentations (1-8)</i>
---------------	-------------------------------------

Saturday, June 24 *Cultural Walk Potsdam*

Sunday, June 25 *Leisure Time*

Monday, June 26

H, VR2-3

08:30 - 10:00 C. MILKEREIT, L. HILLMANN
2.9 Seismic Sensors and their calibration

10:30 - 12:00 A. STROLLO
2.10 Event Location and Magnitudes

13:30 - 15:00 P. EVANS, L. HILLMANN, A. STROLLO
2.11 SeisComP setup

15:30 - 17:00 P. EVANS, L. HILLMANN, A. STROLLO
2.12 SeisComP quick start

Tuesday, June 27

SeisComp – Event analysis

08:30 - 10:00 C. MILKEREIT, A. STROLLO
2.13 Fault Plane Solution from First Motion Polarity Reading

10:30 - 12:00 A. STROLLO, P. EVANS
2.14 Event Location and Fault Plane Solution with SeisComp

13:30 - 15:00 P. EVANS, L. HILLMANN, A. STROLLO
2.15 SeisComp Practical

15:30 - 17:00 P. EVANS, L. HILLMANN, A. STROLLO
2.16 SeisComp Practical

Wednesday, June 28

08:30 - 10:00 A. STROLLO, P. EVANS
2.17 ORFEUS services, data curation and access

10:30 - 12:00 P. EVANS, L. HILLMANN, A. STROLLO
2.18 SeisComP Playback

13:30 - 15:00 P. EVANS, L. HILLMANN, A. STROLLO
2.19 SeisComP Playback

15:30 - 17:00 Scientific Presentations of the Participants (1-8)

Thursday, June 29

08:30 - 10:00 S. CESCA
2.20 Moment Tensor Inversion - Theory

10:30 - 12:00 S. HEIMANN
2.21 Earthquake Data Agencies and Formats

13:30 - 15:00 S. HEIMANN, S. CESCA
2.22 Data Access, Preparation and Visualization

15:30 - 17:00 S. HEIMANN, S. CESCA
2.23 Green's Functions

Friday, June 30

08:30 - 10:00 S. HEIMANN, S. CESCA
2.24 Synthetic Seismograms

10:30 - 12:00 S. CESCA, S. HEIMANN
2.25 Moment Tensor Inversion with RAPIDINV

13:30 - 15:00 S. CESCA, S. HEIMANN, D. KÜHN
2.26 Moment Tensor Inversion Exercise I

15:30 - 17:00 S. CESCA, S. HEIMANN, P. BÜYÜKAKPINAR
2.27 Moment Tensor Inversion Exercise II

Evening:

18:30 - 21:00 *Cultural Presentations (9-16)*

Saturday, July 1 *Excursion Berlin*

Sunday, July 2 *Leisure Time*

3. Engineering Seismology, seismic hazard and risk assessment

Monday, July 3

H, VR 2-3

08:30 - 10:00 F. COTTON
3.1 Introduction into Seismic Hazard and Risk Assessment

10:30 - 12:00 F. COTTON
3.2 Factors controlling strong ground-shaking characteristics

13:30 - 15:00 M. PILZ
3.3 Ground shaking site effects. Introduction

15:30 - 17:00 M. PILZ
3.4 Instrumental Site effect estimation: Direct methods

Tuesday, July 4

- 08:30 - 10:00 M. PILZ, M. OHRNBERGER
3.5 Ground shaking site effects. Indirect methods: Surface-wave-based methods
- 10:30 - 12:00 M. PILZ, M. OHRNBERGER
3.6 Use of micro tremor recordings for estimating site effects
- 13:30 - 15:00 M. PILZ
3.7 Instrumental Site effects: Single station and array passive data acquisition
- 15:30 - 17:00 Scientific Presentations of the Participants (9-16)

Wednesday, July 5

- 08:30 - 10:00 F. COTTON
3.8 Principles of seismic hazard analysis I
- 10:00 - 12:00 M. PILZ
3.9 Methods to assess site-specific ground motion without measurements
- 13:30 - 15:00 K. LOVIKNES
3.10 Non-linear site effects
- 15:30 - 17:00 D. BINDI
3.11 Introduction to strong motion seismology

Thursday, July 6

- 08:30 - 10:00 D. BINDI
3.12 Strong Motion data processing I
- 10:30 - 12:00 D. BINDI
3.13 Strong Motion data processing II

4. Seismic Hazard Assessment and Seismic Risk

- 13:30 - 15:00 D. BINDI
4.1 Strong Motion data processing III
- 15:30 - 17:00 Scientific Presentations of the Participants (17-22)

Friday, July 7

- 08:30 - 10:00 D. BINDI
4.2 Ground motion models in PSHA I
- 10:30 - 12:00 D. BINDI
4.3 Ground motion models in PSHA II
- 13:30 - 15:00 F. COTTON
4.4 Principles of seismic hazard analysis II
- 15:30 - 17:00 F. COTTON
4.5 Principles of seismic hazard analysis III

Evening:

18:30 - 21:00 *Cultural Presentation (17-22)*

Saturday, July 8

Excursion Rüdersdorf

Sunday, July 9

Leisure Time

Monday, July 10

H, VR 2-3

- 08:30 - 10:00 E. TÜRKER
4.6 Seismic hazard assessment in practice. 1) seismic building codes
- 10:30 - 12:00 F. COTTON
4.7 Seismic hazard assessment in practice. 2) site-specific evaluation and uncertainty evaluation
- 13:30 - 15:00 F. COTTON
4.8 Lessons learned from the 2023 Turkiye earthquake (from a seismic hazard perspective).
- 15:30 - 17:00 F. COTTON
4.9 Lessons learned from the 2023 Turkiye earthquake (from a seismic hazard perspective).

Tuesday, July 11

Seismic Risk

- 08:30 - 10:00 C. NIEVAS
4.10 Physical vulnerability of buildings
- 10:30 - 12:00 C. NIEVAS
4.11 Seismic risk assessment
- 13:30 - 15:00 M. PICOZZI
4.12 Seismic Early Warning - Introduction
- 15:30 - 17:00 M. PICOZZI
4.13 Seismic Early Warning - Examples

5. Satellite Methods and Modelling

Wednesday, July 12

H, VR 2-3

08:30 - 10:00	M. MOTAGH
5.1	Introduction to SAR Interferometry (InSAR) and multi-temporal InSAR analysis
10:30 - 12:00	M. MOTAGH
5.2	Introduction to SAR processing using SNAP
13:30 - 15:00	M. MOTAGH, M. HAGIGHIHI
5.3	Practical exercise in SNAP for extracting earthquake deformation field using SAR offset tracking (1)
15:30 - 17:00	M. MOTAGH, M. HAGIGHIHI
5.4	Practical exercise in SNAP for extracting earthquake deformation field using SAR offset tracking (2)

Thursday, July 13

08:30 - 10:00	M. MOTAGH, M. HAGIGHIHI
5.5	Introduction to SAR Interferometry (InSAR) and multi-temporal InSAR analysis
10:30 - 12:00	M. MOTAGH, M. HAGIGHIHI
5.6	SAR Interferometry processing using SNAP
13:30 - 15:00	M. HAGIGHIHI
5.7	Practical exercise in SNAP for extracting earthquake deformation field using SAR Interferometry (1)
15:30 - 17:00	M. HAGIGHIHI
5.8	Practical exercise in SNAP for extracting earthquake deformation field using SAR Interferometry (2)

Evening:

19:00 – 21:00 *Handing out of the course certificates*

6. IUGG/IASPEI/IAVCEI conference (Berlin)

<https://www.iugg2023berlin.org/iaspei/>

Friday, July 14 – Wednesday, July 19, 2023

The International Association of Seismology and Physics of the Earth's Interior (IASPEI) and the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) are two of the eight Associations that comprise the International Union of Geodesy and Geophysics (IUGG).

IASPEI and IAVCEI promote the studies of seismology and volcanology and the Earth's internal structure, properties, and processes which includes efforts to mitigate earthquake and volcanic disasters. Scientists participating in IASPEI and IAVCEI initiate and co-ordinate research and scientific exchanges that demand co-operation among countries.

The IUGG/IASPEI/IAVCEI conferences offer a unique opportunity to the course participants to participate actively at the outstanding conferences. In line with the course program and its topics, the following planned IASPEI sessions are of interest:

- S01 Observational Seismology - Open Session
Convener: Torsten Dahm (Germany)
- S02 International, National, Regional and Local Networks and Earthquake Data Centers
Convener: Dmitry Storchak (UK)
- S03 Seismic Scattering and Absorption, Ambient Noise, and Monitoring Earth's Structure
Convener: Hisashi Nakahara (Japan)
- S04 Advancements in Acquisition, Processing and Interpretation of Seismological Data
Convener: Francesco Grigoli (Italy)
- S05 Advances in Earthquake and Explosion Monitoring Using Distributed Acoustic Sensing
Convener: Ben Dando (Norway)
- S06 Pre-Instrumental Earthquake Data
Convener: Paola Albini (Italy)
- S07 Scientific Drilling and Downhole Monitoring – A Key to Understand Geohazards
Convener: Harold Tobin (USA)
- S08 Anthropogenic Seismicity
Convener: Stanislaw Lasocki (Poland)
- S09 Earthquake Ground Motion and Seismic Hazard
Convener: Fabrice Cotton (Germany)
- S10 Multi-Hazard Risk Assessment
Convener: Katsuichiro Goda (Canada)
- S11 Site Response in Urban Areas
Convener: Stefano Parolai (Italy)
- S12 Recent Devastating Earthquakes Including the Feb. 6, 2023 Turkey Sequence
Convener(s): Kenji Satake (Japan)
- S13 Development, Testing and Application of Earthquake Forecasting Models
Convener: Annemarie Christophersen (New Zealand)

- S14 New Advances in Understanding the Earth's Crust Dynamics in the Light of Solving the Problem of Earthquake Forecasting
Convener: Sergey Pulinet (Russia)
- S15 Boundary Layers in Earth's Mantle: Origin, Structure, and Influence on Convection
Convener: Morvarid Saki (Germany)
- S16 Earthquake Source Mechanics
Convener: Satoshi Ide (Japan)
- S17 Structure and evolution of the lithosphere in the circum-Mediterranean
Convener: Thomas Meier (Germany)
- S18 Integrating Seismic Tomography With Mineral Physics and Potential Fields to Describe the Crust and Upper Mantle Physical State
Convener: Judith Bott (Germany)
- S19 Fabrics and Dynamics of the Lithosphere-Asthenosphere System Imaged by Seismic Anisotropy and Integrated Studies
Convener: Jaroslava Plomerova (Czech Republic)
- S20 Education & Outreach to Ensure Success of Earthquake Early Warning Programmes
Convener: Alison Bird (Canada)
- S21 Seismology Education and Inclusive Environments
Convener: Raju Sarkar (Bhutan)

Thursday, July 20 Departure of Participants