International Training Course on

Seismology, Seismic Data Analysis, Hazard Assessment and Risk Mitigation

9 – 27 October, 2023
Podgorica, Montenegro

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Organised and sponsored by

Helmholtz Centre Potsdam
GFZ German Research Centre for Geosciences

co-sponsored by

Federal Foreign Office of Germany (Berlin)

European Plate Observing System (EPOS)
EPOS Thematic Core Service for Seismology
Observatories and Research Facilities for European Seismology *(ORFEUS)*

with the local support of

Institute of Hydrometeorology and Seismology of Montenegro
University of Montenegro - Faculty of Civil Engineering

List of institutions, lecturers and assistants contributing to the International Training Course on "Seismology, Hazard Assessment and Risk Mitigation",
October 9 to October 27, 2023 in Podgorica, Montenegro

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Scientific Programme

International Training Course on

Seismology, Seismic Data Analysis, Hazard Assessment and Risk Mitigation
&
EPOS Seismology Workshop

Podgorica, Montenegro, 9-27 October, 2023

1. Course Opening

Monday, Oct. 9

09:00 - 10:00	*Dr. S. Cesca, J. Mihaljevic* Welcome Training Course 2023 participants at IHMS
10:00 - 11:00	*Transfer to the EPOS/Orfeus venue*
11:00 - 11:30	*Registration*
11:30 - 11:45	*Prof. Torsten Dahm, Dr. S. Cesca* Opening of the Training Course 2023
11:45 - 13:00	*Peter Felten – Ambassador, German Embassy to Montenegro* *Prof. Dr. Marina Rakocevic – Dean, Civil Engineering Faculty, University of Montenegro* *Dusica Brnovic – Director, IHMS* *Jadranka Mihaljevic* 40 years of Montenegrin seismic network
13:00 - 14:00	*Lunch Break*

2. Joint ITC and EPOS Seismology Session

Afternoon 15:00 -17:30 (incl. coffee break):

- Talks by **F. Tilmann** (focus ML applications in seismology) & **T. Meier** (focus AdA)
- Address by EPOS (**L. Freda**)
- Demo of EPOS Data Portal (**J. Michalek**, EPOS Comm.)

Evening:	*Social program - to be defined -*

3. Attendance EPOS/Orfeus meeting

Tuesday, Oct. 10

08:30-18:00	The programme will be distributed by EPOS Seismology

Wednesday, Oct. 11

08:30-18:00	The programme will be distributed by EPOS Seismology

4. Seismology, Earthquake Statistics, Seismogram Analysis, Earthquake Source Parameter, and Wave Propagation

Thursday, Oct. 12 **Introduction to seismology**

08:30 - 10:00	4.1	S. CESCA Aims and fundamentals of seismology
10:30 - 12:00	4.2	S. CESCA, D. STORCHAK Seismic sources and source parameters (ISC services)
13:30 - 15:00	4.3	S. HAINZL Frequency-Magnitude Distribution
15:30 - 17:00	4.4	S. HAINZL Analysis of particular earthquake catalogues

Friday, Oct. 13 **Introduction to seismology**

08:30 - 10:00	4.5	S. HAINZL Aftershocks & Seismicity models
10:30 - 12:00	4.6	S. HAINZL Analysis of aftershock activity
13:30 - 15:00	4.7	S. CESCA On earthquake detection and location
15:30 - 17:00	4.8	S. CESCA Waveform-based detection and location using Lassie
Evening: *18:30 - 21:00*		*Cultural Ice-breaker*

Saturday, Oct. 14	*Excursion 1*	
Sunday, Oct. 15	*Leisure Time*	
Monday, Oct. 16		
08:30 - 10:00	4.9	M. ISKEN Low cost MEMS accelerometer (Quakesaver) installation
10:30 - 12:00	4.10	M. ISKEN Low cost MEMS accelerometer (Quakesaver) usage demo
13:30 - 15:00	4.11	A. STROLLO, P. EVANS Introduction to seismological instruments, deployment, testing, QA, maintenance
15:30 - 17:00	4.12	A. STROLLO, P. EVANS Earthquake location and Magnitude
Tuesday, Oct. 17		**SeisComp - data integration and analysis**
08:30 - 10:00	4.13	P.EVANS, A. STROLLO SeisComP: setup
10:30 - 12:00	4.14	A. STROLLO, P. EVANS SeisComP: integration of the demo station and other real-time examples
13:30 - 15:00	4.15	A. STROLLO, P. EVANS SeisComP: integration of offline dataset
15:30 - 17:00	4.16	A. STROLLO, P. EVANS SeisComP: earthquake analysis, location, magnitude estimation, fault plane solution from first motion polarity reading (part 1)
Wednesday, Oct. 18		**SeisComp – data analysis and FAIR data management**
08:30 - 10:00	4.17	A. STROLLO, P. EVANS SeisComP: earthquake analysis, location, magnitude estimation, fault plane solution from first motion polarity reading (part 2)
10:30 - 12:00	4.18	A. STROLLO, P. EVANS (ORFEUS -EIDA) The ORFEUS-EIDA federation of data and services: enabling FAIR and open seismological data

13:30 - 15:00	4.19	P. EVANS, A. STROLLO (ORFEUS -EIDA) Insights from an EIDA node: daily operations and data management practices
15:30 - 17:00	4.20	P. EVANS, A. STROLLO Accessing EIDA data via standard web services, smart clients and interactive portals
17:30 - 19:00		Scientific Presentations of the Participants (1-6)
Thursday, Oct. 19		**Moment Tensor Analysis**
08:30 - 10:00	4.21	S. CESCA Moment Tensor Inversion - Theory
10:30 - 12:00	4.22	G. PETERSEN, S. HEIMANN Earthquake Data Agencies and Formats
13:30 - 15:00	4.23	G. PETERSEN, S. HEIMANN Data Access, Preparation and Visualization
15:30 – 17:00	4.24	S. HEIMANN, G. PETERSEN Green's Functions
17:30 - 19:00		Scientific Presentations of the Participants (7-12)
Friday, Oct. 20		**Moment Tensor Analysis**
08:30 - 10:00	4.25	S. HEIMANN, G. PETERSEN Synthetic Seismograms
10:30 - 12:00	4.26	S. HEIMANN, G. PETERSEN Moment Tensor Inversion with GROND
13:30 - 15:00	4.27	S. CESCA, S. HEIMANN, G. PETERSEN Moment Tensor Inversion Exercise I
15:30 - 17:00	4.28	S. CESCA, S. HEIMANN, G. PETERSEN Moment Tensor Inversion Exercise II
Saturday, Oct. 21		*Excursion 2*
Sunday, Oct. 22		*Leisure Time*

Monday, Oct. 23		**Geodesy**
8:30 - 10:00	4.29	B. MÄNNEL GNSS – satellites, signals, observations
10:30 - 12:00	4.30	B. MÄNNEL GNSS – positioning, accuracy, applications

5. Engineering Seismology, Seismic Hazard and Risk

Monday, Oct. 23		**Hazard**
13:30 – 15:00	5.1	M. PILZ Ground shaking site effects. Introduction
15:30 – 17:00	5.2	M. PILZ Instrumental Site effect estimation: Direct methods
Tuesday, Oct. 24		
08:30 - 10:00	5.3	M. PILZ, M. OHRNBERGER Ground shaking site effects. Indirect methods: Surface-wave-based methods
10:30 - 12:00	5.4	M. PILZ, M. OHRNBERGER Use of micro tremor recordings and array methods for estimating site effects
13:30 - 15:00	5.5	M. PILZ Exercise: Dispersion curve calculation and inversion
15:30 - 17:00	5.6	M. PILZ Methods to assess site-specific ground motion without measurements
Wednesday, Oct. 25		
08:30 - 10:00	5.7	F. COTTON Introduction into Seismic Hazard and Risk Assessment
10:30 - 12:00	5.8	F. COTTON Principles of probabilistic seismic hazard analysis (PSHA) I
13:30 - 15:00	5.9	D. BINDI Strong Motion data processing I
15:30 - 17:00	5.10	D. BINDI Strong Motion data processing II

17:30 - 19:00		Scientific Presentations of the Participants (13-18)
Thursday, Oct. 26		
08:30 - 10:00	5.11	F. COTTON The basic principles of probability theory
10:30 - 12:00	5.12	F. COTTON Principles of probabilistic seismic hazard analysis II
13:30 - 15:00	5.13	F. COTTON Principles of probabilistic seismic hazard analysis III
15:30 - 17:00	5.14	D. BINDI Ground-Motion models used in PSHA
17:30 - 19:00		Scientific Presentations of the Participants (19-24)
Friday, Oct. 27		
08:30 - 10:00	5.15	F. COTTON Seismic hazard assessment in practice
10:30 - 12:00	5.16	F. COTTON Lessons learned from the 2023 Turkiye earthquake
13:30 - 15:00	5.17	F. COTTON Physical vulnerability of buildings
15:30 - 17:00	5.18	F. COTTON Seismic risk assessment
Saturday, Oct. 28	*Departure of Participants*	