



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

September 10 to October 5, 2018
Accra, Ghana

Organised and sponsored by

Helmholtz Centre Potsdam
GFZ German Research Centre for Geosciences

and

Geological Survey of Ghana
Accra, Ghana

co-sponsored by

Federal Foreign Office (FFO), Berlin, Germany



List of institutions and lecturers contributing to the International Training Course on "Seismology, Hazard Assessment and Risk Mitigation", September 10 to October 5, 2018 in Accra, Ghana

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

Accra, Ghana, 10 September to 5 October, 2018

1. Opening Day

Monday, Sept. 10	Opening of the Training Course 2018
08:30 – 09:00	<i>Representative of the Geological Survey of Ghana (to be confirmed)</i> <i>Representative of the German Embassy (to be confirmed)</i>
09:00 – 09:30	<i>Prof. Kutu (University of Ghana)</i> Geology and Seismo-Tectonics of Ghana
09:30 – 10:00	<i>Prof. Dr. Torsten Dahm</i> Human-induced and triggered seismicity: its role in hazard programs
10:00 – 10:30	<i>Dr. Anthony Osei Tutu</i> Looking at Africa from the Modeling Point of View
10:30 – 11:00	<i>Break for a welcome drink - Group Photo</i>
11:00 – 11:30	<i>Nicholas Opoku (Geological Survey of Ghana)</i> Monitoring and Assessment of Geohazards in Ghana
11:30 – 12:00	<i>Carlien D. Bou-Chedid (Ghana Institute of Engineers)</i> Risk Assessment in Ghana
12:00 – 12:30	<i>Dr. Claus Milkereit</i> The International Training Courses
12:30- 13:30	<i>Lunch Break</i>
13:30 – 15:00	T. DAHM Aims and fundamentals of seismology
15:30 – 17:00	L. OTTEMØLLER Introduction to SEISAN
Evening 19:30 – 21:00	<i>Dr. C. Milkereit</i> Informal get-together of participants and lecturers

2. Fundamentals of Seismology, Instrumentation, Earthquake Source Parameter and computer-assisted Seismogram Analysis

Tuesday, Sept. 11	
08:30 – 10:00	T. DAHM 2.1 Seismic sources and source parameters
10:30 – 12:00	T. DAHM 2.2 Event Location and Magnitudes
13:30 – 15:00	L. OTTEMØLLER 2.3 Exercise on phase picking and localization of local events based on network records
15:30 – 17:00	L. OTTEMØLLER 2.4 Exercise on phase picking and localization of teleseismic events based on network records
Wednesday, Sept. 12	
08:30 – 10:00	T. DAHM 2.5 Theory of wave propagation: Basics of numerical methods
10:30 – 12:00	T. DAHM 2.6 Seismic waves in the real Earth, required seismic records and derived Earth models
13:30 – 15:00	L. OTTEMØLLER 2.7 Exercise on amplitude picking and magnitude determination
15:30 – 17:00	L. OTTEMØLLER 2.8 Exercise on spectral source parameter determination
Thursday, Sept. 13	
08:30 – 10:00	C. MILKEREIT 2.9 Seismic Sensors, their calibration and installation
10:30 – 12:00	C. MILKEREIT 2.10 Demonstration, Exercise on Instrumentation
13:30 – 15:00	L. OTTEMØLLER 2.11 Exercise on Response File
15:30 – 17:00	L. OTTEMØLLER 2.12 Exercise on Magnitudes

Friday, Sept. 14

- 08:30 – 10:00
2.13 C. MILKEREIT
Fault Plane Solution
- 10:30 – 12:00
2.14 C. MILKEREIT
Manual **exercise** on fault-plane solution
- 13:30 – 15:00
2.15 L. OTTEMØLLER
Exercise on determination of fault-plane solutions
- 15:30 – 17:00
Scientific presentations of the participants
(1-6)

Evening

19:30 – 21:00 *Cultural presentations (1-6)*

Saturday, Sept. 15

Excursion I

Sunday, Sept. 16

Excursion II

Monday, Sept. 17

- 08:30 – 10:00
2.16 S. CESCA
Moment Tensor Inversion Theory
- 10:30 – 12:00
2.17 S. HEIMANN
Earthquake Data Agencies and Formats
- 13:30 – 15:00
2.18 S. HEIMANN, S. CESCA
Green's Functions
- 15:30 – 17:00
2.19 S. HEIMANN, S. CESCA
Synthetic Seismograms

Tuesday, Sept. 18

- 08:30 – 10:00
2.20 S. CESCA, S. HEIMANN
Exercise on Moment Tensor Inversion: Case Study
Strike Slip Earthquake
- 10:30 – 12:00
2.21 S. CESCA, S. HEIMANN
Exercise on Moment Tensor Inversion: Case Study
Subduction Earthquake
- 13:30 – 15:00
2.22 S. CESCA, S. HEIMANN
Exercise on Moment Tensor Inversion
- 15:30 – 17:00
2.23 S. CESCA, S. HEIMANN
Moment Tensor Inversion with RAPIDINV

3. Engineering Seismology**Wednesday, Sept. 19**

- 08:30 – 10:00
3.1 M. PILZ
Ground shaking and site effects
Effects of soft surface layers and surface topography
- 10:30 – 12:00
3.2 M. PILZ
Instrumental Microzonation I: Earthquake-based
methods
- 13:30 – 15:00
3.3 D. BINDI
Numerical methods and inversion techniques I
- 15:30 – 17:00
3.4 D. BINDI
Numerical methods and inversion techniques II
- Evening**
19:30 – 21:00
3.5 D. BINDI
Strong Motion

Thursday, Sept. 20

- 08:30 – 10:00
3.6 M. PILZ
Instrumental Microzonation II: Surface waves based
methods I
- 10:30 – 12:00
3.7 M. PILZ
Instrumental Microzonation III: Surface waves based
methods II
- 13:30 – 15:00
3.8 M. PILZ, D. BINDI
Surface wave data acquisition and analysis I
- 15:30 – 17:00
3.9 M. PILZ, D. BINDI
Surface wave data acquisition and analysis II

Evening

19:30 – 21:00 *Cultural presentations (7-12)*

Friday, Sept. 21

- 08:30 – 10:00
3.10 D. BINDI, M. PILZ
Data acquisition and analysis, urban seismology I
- 10:30 – 12:00
3.11 M. PILZ, D. BINDI
Data acquisition and analysis, urban seismology II
- 13:30 – 15:00
Scientific presentations of the participants
(7-12)
- 15:30
Excursion III

Saturday, Sept. 22 *Excursion III*

Sunday, Sept. 23 *Excursion III*

4. Strong Ground Motion and Hazard Assessment

Monday, Sept. 24

- 08:30 – 10:00 4.1 F. COTTON
Introduction into Seismic Hazard Assessment
- 10:30 – 12:00 4.2 F. COTTON
The basic principles of probabilistic seismic hazard analysis (PSHA) : probability distributions
- 13:30 – 15:00 4.3 G. WEATHERILL
Earthquakes catalogues
- 15:30 – 17:00 4.4 G. WEATHERILL
Earthquakes catalogue analysis

Tuesday, Sept. 25

- 08:30 – 10:00 4.5 G. WEATHERILL
Seismicity models for probabilistic seismic hazard analysis
- 10:30 – 12:00 4.6 F. COTTON
The basic principles of probabilistic seismic hazard analysis (PSHA) : hazard curves and PSHA maps
- 13:30 – 15:00 4.7 G. WEATHERILL
Introduction to Openquake
- 15:30 – 17:00 4.8 F. COTTON
Capturing epistemic uncertainties: introduction to logic trees (**exercise**)

Wednesday, Sept. 26

- 08:30 – 10:00 4.9 F. COTTON, G. WEATHERILL
Ground-Motion data
- 10:30 – 12:00 4.10 F. COTTON, G. WEATHERILL
Ground-Motion models
- 13:30 – 15:00 4.11 F. COTTON, G. G. WEATHERILL
Ground-motion model (exercise)
- 15:30 – 17:15 Scientific presentations of the participants (13-19)

Thursday, Sept. 27 'Site Specific Hazard Assessment of Critical Infrastructure'

- 08:30 – 09:30 4.12 F. COTTON
Site specific hazard studies. Expert guidance and uncertainty analysis according to SSHAC level 3 and 4
- 09:30 – 10:30 4.13 F. COTTON
Site specific ground shaking prediction. Methods and lessons learned from SSHAC level 3 and 4
- 11:00 – 12:00 4.14 F. COTTON, D. BINDI
Challenges of PSHA (case studies, discussion)
- 13:30 – 14:15 4.15 N. K. ALLOTEY
International safety requirements for an atomic critical infrastructure
- 14:15 – 15:00 4.16 A. BLAY
Site Investigations for a critical infrastructure
- 15:30 – 16:15 4.17 P. AMPONSAH
Earthquake catalogue information of Ghana for the time period 1615–2003 and its use in Seismic Hazard Models for Ghana
- 16:15 – 17:00 4.18 F. COTTON
Seismic Monitoring of Critical Infrastructure – Seismic Early Warning

5. Geodynamic Modelling

Friday, Sept. 28

- 08:30 – 10:00 5.1 E. RIVALTA
Introduction to Geodynamic Modeling I
- 10:30 – 12:00 5.2 E. RIVALTA
Introduction to Geodynamic Modeling II
- 13:30 – 15:00 5.3 E. RIVALTA
Geodynamic Modeling III
- 15:30 – 17:00 5.4 E. RIVALTA
Geodynamic Modeling IV

Evening

19:30 – 21:00 *Cultural presentations (13-19)*

Saturday, Sept. 29 Leisure Time

Sunday, Sept. 30 Leisure Time

13:30 – 15:00

A. STROLLO, T. ZIEKE
7.3 Seismic station integration into SeisComp3

15:30 – 17:00

A. STROLLO, T. ZIEKE
7.4 Seismic station integration into SeisComp3

6. InSAR and Remote Sensing in Monitoring Geological Changes

Monday, Oct. 1

08:30 – 10:00

T. WALTER
6.1 Examples of Remote sensing of Volcano- and seismo-tectonic processes

10:30 – 12:00

T. WALTER
6.2 Examples of Remote sensing of Volcano- and seismo-tectonic processes

13:30 – 15:00

T. WALTER
6.3 Examples of Remote sensing of Volcano- and seismo-tectonic processes

15:30 – 17:00

T. WALTER
6.4 Examples of Remote sensing of Volcano- and seismo-tectonic processes

Tuesday, Oct. 2

08:30 – 10:00

T. WALTER
6.5 Examples of Remote sensing of Volcano- and seismo-tectonic processes

10:30 – 12:00

T. WALTER
6.6 Examples of Remote sensing of Volcano- and seismo-tectonic processes

13:30 – 15:00

T. WALTER
6.7 **Exercises** on InSAR data analysis

15:30 – 17:00

T. WALTER
6.8 **Exercises** on InSAR data analysis

Evening

19:30 – 21:00

Cultural presentations (20-26)

Thursday, Oct. 4

08:30 – 10:00

A. STROLLO, T. ZIEKE
7.5 Waveform analysis with SeisComp3

10:30 – 12:00

A. STROLLO, T. ZIEKE
7.6 Waveform analysis with SeisComp3

13:30 – 15:00

A. STROLLO, T. ZIEKE
7.7 Waveform analysis with SeisComp3

15:30 – 17:15

Scientific presentations of the participants (20-26)

Friday, Oct. 5

08:30 – 10:00

A. STROLLO, T. ZIEKE
7.8 Waveform analysis with SeisComp3

10:30 – 12:00

A. STROLLO, T. ZIEKE
7.9 Waveform analysis with SeisComp3

13:30 – 15:00

A. STROLLO, T. ZIEKE
7.10 Waveform analysis with SeisComp3

15:30 – 16:00

Final Discussion

Evening

19:30 -

Closing of the Training Course 2018
Handing out of the course certificates

Saturday, Oct. 6

Departure of Participants

7. Waveform Analysis with SeisComp3

Wednesday, Oct. 3

08:30 – 10:00

A. STROLLO
7.1 The GEOFON Project and SeisComp3

10:30 – 12:00

A. STROLLO, T. ZIEKE
7.2 Seismic station integration into SeisComp3