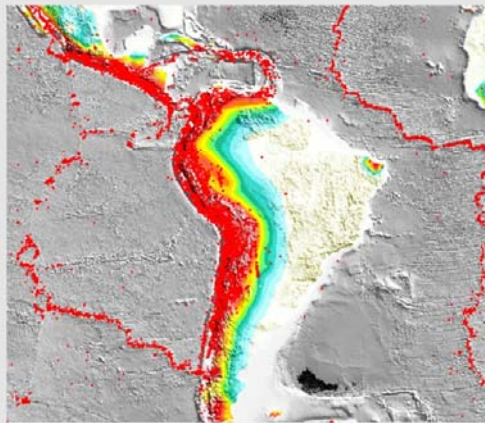


## Scientific Programme

International Training Course on  
**Seismology, Seismic Data Analysis,  
Hazard Assessment and Risk Mitigation**  
Bogota/Colombia, 6 October to 31 October, 2014



### Circular & Programme



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

Bogota, Colombia  
6 October to 31 October 2014

## 1. Opening Day

**Monday, Oct. 6**

**Opening of the Training Course 2014**

08:30 – 9:00

*Representative of the Universidad Nacional, Bogota  
(to be confirmed)*

*Representative of the German Embassy  
(to be confirmed)*

*Representative of the Geological Survey  
(to be confirmed)*

09:00 – 09:30

*Prof. Dr. Carlos A. Vargas*  
Geology and Seismo-Tectonics in South America and  
the Caribbean

09:30 – 10:00

*Dr. Marta Calvache*  
Disaster Risk Management: monitoring and assessment  
of geohazards

10:00 – 10:30

*Break for a welcome drink - Group Photo*

10:30 – 11:00

*Dr. Claus Milkereit*  
The International Training Courses

11:00 – 11:30

*Prof. Dr. Torsten Dahm*  
Human-induced and triggered seismicity: it's role in  
hazard programs

11:30 – 12:00

*Dr. Jaime Eraso*  
Seismic Hazard Program in Colombia

12:00- 13:30

*Lunch Break*

13:30 – 15:00

T. DAHM  
Aims and fundamentals of seismology

15:30 – 16:00

J. HAVSKOV  
Introduction to SEISAN

16:00 – 17:00

J. HAVSKOV  
Installation of SEISAN

**Evening**

19:30 – 21:00

*Dr. C. Milkereit*  
Informal get-together of participants and lecturers

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

### **Tuesday, Oct. 7**

- 08:30 – 10:00  
2.1 T. DAHM  
Seismic sources and source parameters
- 10:30 – 12:00  
2.2 T. DAHM  
Theory of wave propagation: Basics of numerical methods
- 13:30 – 15:00  
2.3 J. HAVSKOV  
**Exercise** on phase picking and localization of teleseismic events based on network records
- 15:30 – 17:00  
2.4 J. HAVSKOV  
**Exercise** on phase picking and localization of teleseismic events based on network records

### **Wednesday, Oct. 8**

- 08:30 – 10:00  
2.5 C. MILKEREIT  
Seismic Sensors and Their Calibration
- 10:30 – 12:00  
2.6 T. DAHM  
Seismic waves in the real Earth, required seismic records and derived Earth models
- 13:30 – 15:00  
2.7 J. HAVSKOV  
**Exercise** on amplitude picking and magnitude determination
- 15:30 – 17:00  
2.8 J. HAVSKOV  
**Exercise** on spectral source parameter determination

### **Thursday, Oct. 9**

- 08:30 – 10:00  
2.9 C. MILKEREIT  
Demonstration of fault plane solution
- 10:30 – 12:00  
2.10 S. HEIMANN, S. CESCA  
Moment Tensor Inversion
- 13:30 – 15:00  
2.11 J. HAVSKOV  
**Exercise** on determination of fault-plane solutions
- 15:30 – 17:00  
2.12 J. HAVSKOV  
**Exercise** on amplitude spectra calculation and moment magnitude determination

### **Friday, Oct. 10**

- 08:30 – 10:00  
2.13 S. HEIMANN, S. CESCA  
Earthquake Data Agencies and Data Access

- 10:30 – 12:00  
2.14 S. HEIMANN, S. CESCA  
Waveform Data for Earthquake Analysis

- 13:30 – 15:00  
2.15 J. HAVSKOV  
**Exercises** on seismogram analysis based on digital data

- 15:30 – 17:00  
2.16 J. HAVSKOV  
**Exercises** on seismogram analysis based on digital data

### **Evening**

19:30 – 21:00 *Cultural presentations*

### **Saturday, Oct. 11**

*Visit of the Universidad Nacional, Geological Survey and National Museum*

### **Sunday, Oct. 12**

*Visit Bogota*

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

### **Monday, Oct. 13**

- 08:30 – 10:00  
3.1 S. CESCA  
Moment Tensor Analysis
- 10:30 – 12:00  
3.2 S. CESCA, S. HEIMANN  
Data Visualization and Preparation
- 13:30 – 15:00  
3.3 S. CESCA, S. HEIMANN  
Data Visualization and Preparation
- 15:30 – 17:00  
3.4 S. CESCA, S. HEIMANN  
Data Visualization and Preparation

### **Tuesday, Oct. 14**

- 08:30 – 10:00  
3.5 S. CESCA, S. HEIMANN  
**Exercise** on Moment Tensor Inversion I
- 10:30 – 12:00  
3.6 S. CESCA, S. HEIMANN  
**Exercise** on Moment Tensor Inversion II
- 13:30 – 15:00  
3.7 A. ZANG  
Stress field of the Earth Crust
- 15:30 – 17:00  
3.8 A. ZANG  
Rock Fracture Criteria

#### 4. Direct and induced effects of strong earthquake ground motion

##### Wednesday, Oct. 15

- 08:30 – 10:00 4.1 S. PAROLAI  
Ground shaking site effects.  
Introduction: Effects of surface topography
- 10:30 – 12:00 4.2 S. PAROLAI  
Effects of soft surface layers
- 13:30 – 15:00 4.3 S. PAROLAI, M. PILZ  
Instrumental Microzonation: Surface waves based  
methods I
- 15:30 – 17:00 4.4 S. PAROLAI, M. PILZ  
Instrumental Microzonation: Surface waves based  
methods II

##### Thursday, Oct. 16

- 08:30 – 10:00 4.5 S. PAROLAI  
Estimation of site effects: Instrumental, numerical,  
empirical
- 10:30 – 12:00 4.6 S. PAROLAI  
Use of microtremor recordings for estimating site effects
- 13:30 – 15:00 4.7 S. PAROLAI, M. PILZ  
Surface wave data acquisition III
- 15:30 – 17:00 4.8 S. PAROLAI, M. PILZ  
Surface wave data acquisition IV

##### Evening

19:30 – 21:00 *Cultural presentations*

##### Friday, Oct. 17

- 08:30 – 10:00 4.9 S. PAROLAI, M. PILZ  
Array Techniques
- 10:30 – 12:00 4.10 S. PAROLAI, M. PILZ  
Array Techniques
- 13:30 Excursion - Travel to Manizales by bus

Saturday, Oct. 18 Excursion

Sunday, Oct. 19 Excursion

#### 5. Strong Motion Data Analysis

##### Monday, Oct. 20

- 08:30 – 10:00 5.1 D. BINDI  
Introduction to Strong Motion Seismology
- 10:30 – 12:00 5.2 D. BINDI  
Strong Motion data processing
- 13:30 – 15:00 5.3 D. BINDI, M. PILZ  
**Exercise** on Strong Motion data processing
- 15:30 – 17:00 5.4 D. BINDI, M. PILZ  
**Exercise** on Strong Motion data processing

##### Tuesday, Oct. 21

- 08:30 – 10:00 5.5 D. BINDI  
Introduction to Ground Motion Prediction Equation  
(GMPE)
- 10:30 – 12:00 5.6 D. BINDI  
Ground Motion Prediction Equation
- 13:30 – 15:00 5.7 D. BINDI  
**Exercise** on Ground Motion Prediction Equation
- 15:30 – 17:00 5.8 D. BINDI  
**Exercise** on Ground Motion Prediction Equation

#### 6. Seismic Hazard Assessment

##### Wednesday, Oct. 22

- 08:30 – 10:00 6.1 F. COTTON  
Introduction to probability theory, **Exercises**
- 10:30 – 12:00 6.2 F. COTTON  
The basic principles of probabilistic seismic hazard  
analysis (PSHA)
- 13:30 – 15:00 6.3 F. COTTON  
**Exercises:** Building hazard curves
- 15:30 – 17:00 6.4 F. COTTON  
Opensource tools and the Global Earthquake Model  
initiative

**Thursday, Oct. 23**

08:30 – 10:00	6.5	F. COTTON Seismicity models for PSHA
10:30 – 12:00	6.6	F. COTTON The Gutenberg-Richter relationship and catalogue completeness, <b>Exercises</b>
13:30 – 15:00	6.7	F. COTTON Ground-motions models for PSHA, <b>Exercises</b>
15:30 – 17:00	6.8	F. COTTON Discussion: How do we take into account uncertainties?

**Friday, Oct. 24**

08:30 – 10:00	6.9	F. COTTON Hazard curves, uniform hazard spectrum and disaggregation
10:30 – 12:00	6.10	F. COTTON Case studies a. Example of a regional seismic hazard map b. Example of a site specific (critical facility) PSHA
13:30 – 15:00	6.11	F. COTTON Discussion: Strengths and weaknesses of PSHA
15:30 – 17:00		Scientific presentations of the participants (1-6)

**Evening**

19:30 – 21:00 *Cultural presentations*

**Saturday, Oct. 25** Leisure Time

**Sunday, Oct. 26** Leisure Time

**7. Seismic Risk Estimation****Monday, Oct. 27**

08:30 – 10:00	7.1	M. PITTORE Introduction to Risk Assessment
10:30 – 12:00	7.2	M. PITTORE, M. WIELAND Risk: Exposure Modeling
13:30 – 15:00	7.3	M. PITTORE, M. WIELAND Risk: Exposure Modeling

15:30 – 17:00

Scientific presentations of the participants (7-12)

**Tuesday, Oct. 28**

08:30 – 10:00	7.4	M. PITTORE, M. WIELAND Estimating Exposure
10:30 – 12:00	7.5	M. PITTORE, M. WIELAND Estimating Vulnerability
13:30 – 15:00	7.6	M. PITTORE, M. WIELAND Estimating Risk
15:30 – 17:00	7.7	M. PITTORE, M. WIELAND Managing Risk: Open Challenges

**8. InSAR Methods****Wednesday, Oct. 29**

08:30 – 10:00	8.1	T. WALTER InSAR Principles and Theory of Radar Interferometry
10:30 – 12:00	8.2	T. WALTER InSAR Practical Considerations
13:30 – 15:00	8.3	T. WALTER Pixel Tracking
15:30 – 17:00	8.4	T. WALTER Installation and Example Processing

**Evening**

19:30 – 21:00 *Cultural presentations*

**Thursday, Oct. 30**

08:30 – 10:00	8.5	T. WALTER <b>Exercise</b> on InSAR Data processing
10:30 – 12:00	8.6	T. WALTER <b>Exercise</b> on InSAR Data processing
13:30 – 15:00		Scientific presentations of the participants (13-18)
15:30 – 17:00		Scientific presentations of the participants (19-24)

**Friday, Oct. 31**

08:30 – 10:00	8.7	T. WALTER, M. CALVACHE Volcano Monitoring
10:30 – 12:00	8.8	T. WALTER, M. CALVACHE Volcano Monitoring
13:30 – 15:00		Scientific presentations of the participants (25-28)
15:30 – 16:00		Final Discussion

**Evening**

19:30 -		<b>Closing of the Training Course 2014</b> Handing out of the course certificates
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**Saturday, Nov. 1**

Departure of Participants

**Sunday, Nov. 2**

Departure of Participants