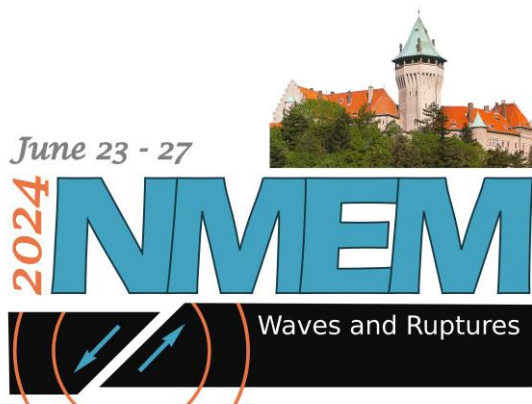


*Workshop*  
**Numerical Modeling of Earthquake Motions:  
Waves and Ruptures**



## **Program of the Workshop**

Smolenice Castle near Bratislava, Slovakia  
June 23 - June 27, 2024

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## Sunday, June 23, 2024

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**from 15:00 Arrival to the Castle and Registration**

**19:00 - 20:00 Dinner**

**Monday, June 24, 2024**

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**07:20 - 08:20 Breakfast**

**08:40 - 08:55 Welcoming and Opening Speeches**

Peter Moczo, Eric Dunham

**08:55 - 09:10 Earthquakes in Slovakia**

Eva Rutšeková et al.

**09:10 - 10:30 Session 1**

Convenor: **Ralph Archuleta**

09:10 - 09:30 **Marschall, Douilly, Kame**

Effects of Bimaterial Interface on Rupture Along Strike-Slip Branch Faults

09:30 - 09:50 **Dunham, Ozawa, Yang**

Fault-Valve Instability: A Mechanism for Slow Slip Events

09:50 - 10:10 **Premus, Ampuero**

Multi-Stage Dynamic Earthquake Source Inversion of the 2023 Mw 7.8 Kahramanmaras, Turkey Earthquake

10:10 - 10:30 **Schliwa, Gabriel, Premus, Gallovič**

The Linked Complexity of Coseismic and Postseismic Faulting Revealed by Seismo-Geodetic Dynamic Inversion of the 2004 Parkfield Earthquake

**10:30 - 11:00 Coffee Break**

### 11:00 - 12:20 **Session 2**

Convenor: Jean-Paul Ampuero

11:00 - 11:20 **Ariyoshi**

Physical Interpretation of Slow Earthquake Migration Process  
Based on a Friction Law

11:20 - 11:40 **Stiernström, Almquist, Dunham**

Adjoint-Based Inversion for Stress and Frictional Parameters in  
Earthquake Modeling

11:40 - 12:00 **Weng**

Viscoelastic Ruptures Unbounded by Classical Speed Limits

12:00 - 12:20 **Huang, Ide, Kato, Yoshida, Jiang, Zhai**

Fault Material Heterogeneity Controls Deep Interplate  
Earthquakes in Kanto, Japan

### 12:30 - 13:30 **Lunch**

### 14:00 - 16:10 **Session 3**

Convenor: P. Martin Mai

14:00 - 14:20 **Vavryčuk**

Interpretation of Non-DC Components of Moment Tensors:  
A Review

14:20 - 14:40 **Lj, Fukuyama**

Nanoscale Dynamic Friction and Wear Mechanism of Alpha-  
Quartz Asperities

14:40 - 15:00 **Passelègue, Latour, Paglialunga, Noel**

What Happens When Two Ruptures Collide?

## Monday, June 24, 2024

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### 15:00 - 15:10 10-minute Break

15:10 - 15:30 **Ciardo, Viesca, Garagash**

Conditions for Slow-to-Fast Slip in a Single-Asperity Strike-Slip Fault

15:30 - 15:50 **Wong, Gabriel, Fan**

Combined Effects of Fast-Velocity Weakening Friction and Stress Heterogeneity Control Megathrust Earthquake Re-Activation, High-Frequency Radiation, and Arrest in 3D Dynamic Rupture Simulations of the 2011 Tohoku-Oki Earthquake

15:50 - 16:10 **Paglialunga, Passelègue, Violay**

Impact of Stress Heterogeneity on Rupture Nucleation and Seismic Cycle Complexity in a Long Laboratory Fault

### 16:10 - 16:30 Coffee Break

### 16:30 - 18:00 Poster Session

### 18:30 - 19:15 Concert

### 19:15 - 22:30 Workshop Dinner

**07:20 - 08:20 Breakfast**

**08:30 - 10:40 Session 4**

Convenor: Alice-Agnes Gabriel

08:30 - 08:50 **Wang Z., Gong, Liang, Wang J.**

RuptureNet2D, a Deep Neural Network-Based Surrogate for Dynamic Earthquake Rupture Simulation in two Dimensions

08:50 - 09:10 **Sopaci, Ampuero, Passelègue**

Triggering of Very Shallow Earthquakes by Surface Mass Removal Processes - A Case Study of the 2019 Mw4.9 Le Teil, France Earthquake

09:10 - 09:30 **Xie, Ampuero, Van Den Ende, Trabattoni, Baillet, Rivet**

Enhanced Seismic Rupture Imaging Using Ocean Bottom DAS Data

**09:30 - 09:40 10-minute Break**

09:40 - 10:00 **Chochard, Svetlizky, Albertini, Viesca, Rubinstein, Spaepen, Yuan, Denolle, Song, Zhao, Weitz**

Propagation of Extended Fractures by Local Nucleation and Rapid Transverse Expansion of Crack-Front Distortion

10:00 - 10:20 **Castro-Perdomo, Johnson**

Slip Deficit Rate Inversions in the Western U.S. Incorporating Viscoelastic Earthquake Cycle Effects

10:20 - 10:40 **Ji, Archuleta, Peyton**

Apparent Stress of Ridgecrest Earthquakes  $4.0 \leq M_w \leq 5.4$ : A Time Domain Analysis

**10:40 - 11:10 Coffee Break**

**Tuesday, June 25, 2025**

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**11:10 - 12:30 Session 5**

Convenor: Eric Dunham

11:10 - 11:30 **Ando**

Key Observational Constraints on Dynamic Rupture Simulations:  
Fault Geometry and Regional Stress Tensor Field

11:30 - 11:50 **Lozos, Warren-Smith, Townend**

Dynamic Rupture Simulations on the Alpine Fault, New Zealand:  
Investigating the Role of Fault Geometry on Rupture Size and  
Behavior Over Multiple Earthquake Cycles

11:50 - 12:10 **Mosconi, Tinti, Casarotti, Gabriel, Dal Zilio, Rinaldi, Cocco**

Modeling the 3D Dynamic Rupture of Microearthquakes  
Induced by Fluid Injection

12:10 - 12:30 **Gabriel, Garagash, Palgunadi, Mai**

Fault-Size Dependent Fracture Energy and Rupture Dynamics of  
Cascading Earthquakes in Multiscale Fracture Networks

**12:30 - 13:45 Lunch**

**14:00 - 19:00 Free Afternoon**

Guided tour to the historic city of Trnava  
Guided tour to the cave Driny  
Guided tour to the Červený Kameň Castle  
Traditional soccer match  
Hiking

**19:00 - 20:00 Dinner**

**20:00 - 22:00 Evening Poster Session**

with wine and beer

### 07:20 - 08:20 **Breakfast**

### 08:30 - 10:40 **Session 6**

Convenor: Pierre-Yves Bard

#### 08:30 - 08:50 **Holden, Townend, Chamberlain, Warren-Smith, Juarez-Garfias, Pita-Sllim, Van Wijk, Denolle**

Inferred Source Models for Alpine Fault Earthquake Scenarios and Influence on Seismic Hazard

#### 08:50 - 09:10 **Sanchez-Sesma, Weaver**

Linking Ambient Seismic Noise Horizontal-to-Vertical Spectral Ratio with Damage Induced by Sub-Basin Local Resonances in Strong Ground Motion

#### 09:10 - 09:30 **Kaneko, Kearse, Nozuka, Goto**

Unraveling the Physical Mechanism of Large and Long-Period, Near-Fault Ground Velocities in Surface-Breaking Earthquakes

### 09:30 - 09:40 **10-minute Break**

#### 09:40 - 10:00 **Shaw**

Deterministic Physics-Based Earthquake Sequence Simulators Match Empirical Ground Motion Models and Enable Extrapolation to Data Poor Regimes: Application to Multifault Multimechanism Ruptures

#### 10:00 - 10:20 **Si**

Simulation of Strong Ground Motion Recorded During the 2024 Noto Peninsula Earthquake Based on an Empirical Green's Function Method

#### 10:20 - 10:40 **Sajan K C, Nweke, Stewart, Graves**

Reconciling Bias in Moderate Magnitude Earthquake Ground Motions Predicted by Numerical Simulations

### 10:40 - 11:00 **Coffee Break**



**11:00 - 12:30 Poster Session**

**12:30 - 13:30 Lunch**

**14:00 - 16:10 Session 7**

Convenor: Jozef Kristek

14:00 - 14:20 **Gallovič, Valentová Krišková**

Dynamic Rupture Inverse Modeling Across Broad Spatial and Temporal Scales

14:20 - 14:40 **Madden, van Dinther, Gabriel, Ulrich, Van Zelst**

Effective Stress and Fault Strength Variations with Depth: Insights from Seismo-Thermo-Mechanical Subduction Models and Dynamic Rupture Models

14:40 - 15:00 **Tsuda, Miyakoshi, Iwata, Matsui, Higashi**

Investigation of the Influence of Fault Strength on Fault Behavior for the Shallow Part of the Fault by the Dynamic Rupture Simulation

**15:00 - 15:10 10-minute Break**

15:10 - 15:30 **Garagash, Gális, Ampuero, Kammer**

Rupture Dynamics on Faults with Continuing Slip Weakening: Does the Tail Wag the Dog?

15:30 - 15:50 **Yun, Fialko, Gabriel**

Rate-and-State Simulations of the Delayed Dynamic Triggering of the 2019 Mw 7.1 Ridgecrest Mainshock by Nearby Foreshocks

15:50 - 16:10 **Niu, Gabriel, Ben-Zion, Lyakhovsky, Igel**

Nonlinear Coseismic Off-Fault Damage in 3D Dynamic Rupture Simulations: Delayed Triggering, High-Frequency Radiation, and Seismic Wave Speed Reduction

**16:10 - 16:40 Coffee Break**

## Wednesday, June 26, 2024

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### 16:40 - 18:00 **Session 8**

Convenor: Francisco Sánchez-Sesma

16:40 - 17:00 **Zhang, Zang, Jiang, Sun, Chen**

Finite-Difference Numerical Simulation of Seismic Waves  
Propagation in Models with Complex Boundary Geometries

17:00 - 17:20 **Moczo, Kristek, Valovčan, Gális, Kristeková**

The Finite-Difference Modelling: Where Is It and What's Next?

17:20 - 17:40 **Sun, Pitarka, Kawase**

Asperity Locations of the 2016 Kumamoto Earthquake Using  
Dynamic Rupture Modeling with a 3D Basin Structure

17:40 - 18:00 **Bard, Nakano, Ito, Sun, Wang, Kawase**

Temporal Changes of Site Response in the Central Tokyo Area:  
A Possible Site-City Interaction Case?

### 18:00 - 18:10 **Concluding Speech**

Peter Moczo, Alice-Agnes Gabriel

### 19:00 - 22:00 **Garden Party**

## Thursday, June 27, 2024

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### 07:20 - 08:20 **Breakfast**

### before 09:00 **Check-out and Departure**

### Poster Area A

**A01 Zhai, Huang, Liang**

Simulations of Earthquake Cycles in Co-Evolving Fault Damage Zones Controlled by Damage Rheology

**A02 Hronek, Gallovič**

Inverse Physics-Based Modeling of the 2016 Mw 6.1 Tottori Earthquake

**A03 Arzu, Twardzik, Fryer, Ampuero, Xie, Passelègue**

Static And Quasi-Static Inversion of Fault Slip During Laboratory Earthquakes

**A04 Zielke, Mai**

Hierarchical Matrices (H-Matrices) in Earthquake Cycle Simulations - Application to PSHA

**A05 Venisse, DiToro, Marchandon, Fondriest, Faccenda, Gabriel**

Fault Damage Zones in Carbonates: Formation, Distribution and Role in the Seismic Cycle (Italian Central Apennines)

**A06 Hewitt, Newgard, Foster, McCartney**

Soil Reinforcement of Transportation Infrastructure: Customized 3D-Printed Geogrid for Centrifuge Shake Table Testing

**A07 Valentová K., Gallovič**

Broadband Dynamic Source Modeling Constrained by Apparent Source Spectra, with Application to Central Italy

**A08 El Khoury, Hok, Gélis, Jomard, Lyon-Caen, Lancieri**

Near-Fault and Site Effect Physics-Based Ground Motion Modelling for Better Understanding of Historical Earthquakes: The Case of Mugello Basin

**A09 Vyas, J.C., Galis, Mai, Meier**

Scaling Rupture Characteristics Across Earthquake Sizes: Insights from 3D Dynamic and Kinematic Simulations

**A10 Kutschera, Gabriel, Ulrich**

Kinematically Constrained, Linked and Fully Coupled Dynamic Rupture and Tsunami Modeling of the 2020, Mw 7.0 Samos Earthquake

## List of Posters

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- A11 Oryan, Gabriel, May**  
The Role of Off-Fault Permanent Deformation on Earthquake Cycles
- A12 Yao, Yang**  
Unzip Earthquake Propagation from Near-Fault Rupture Phases of the 2023 Kahramanmaraş, Türkiye Mw 7.8 Earthquake
- A13 Gregor, Chaljub, Wathelet, Hollender, Perron**  
3D Simulation of Seismic Noise in a Sedimentary Basin with a Blind Fault Structure: Application to the Sensitivity of Surface H/V and Noise Array Measurements
- A14 Gupta, Shapiro, Ampuero, Farge, Jaupart**  
Fault Slip Dynamics in Subduction Zones: Insights into Fast Fluid Pressure Transients
- A15 Kano, Kaneko, Shearer**  
Seismic Source Spectral Properties of Dynamic Rupture with a Self-Similar, Self-Healing Slip Pulse
- A16 Vavryčuk, Hrubcová**  
Significance of Non-DC Components of Moment Tensors for Understanding Tectonic Processes Related to the Reykjanes Seismic and Volcanic Activity, Iceland
- A17 Berrios-Rivera, Ozawa, Dunham**  
Models of Injection-Induced Seismic Slip with Permeability Enhancement and Rate-and-State Friction

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### Poster Area B

- B01 Preca Trapani, Marchandon, Gabriel, Ulrich, Yen, Cotton**  
Do Physics-Based Dynamic Rupture Models Capture Ground-Motion Variability? Insights from the 2023 Turkey Earthquake Sequence
- B02 Locchi, Mosconi, Supino, Casarotti, Tinti**  
Studying the Viability of Kinematic Rupture Models and Source Time Functions with Dynamic Constraints
- B03 Burgess**  
Characterization and Analysis of a Potential Hidden Geothermal Resource in the Jersey Summit Area, North-Central, Nevada
- B04 Abril, Gabriel, Mai, Halldorsson, Jonsson**  
Ground-Motion Simulations for Finite-Fault Earthquake Scenarios on the Húsavík-Flatey Fault, North Iceland
- B05 Jiang, Rinaldi, Dal Zilio**  
Fault Valving and Permeability Evolution in Slow and Fast Fault Slip Dynamics
- B06 Gao, Dai**  
Stick-Slip Induced Collective Response in Sheared Granular Fault
- B07 Kheirdast, Almakari, Bhat, Gupta**  
Dynamics of Slow and Fast Earthquakes and the Effect of Damage Around the Fault by Analyzing Energy Variation
- B08 Su, Hok, Gélis, Causse, Cornou**  
Near-Fault Ground Motion Prediction, Site Effects and Wave Propagation at Regional Scale for a Shallow Earthquake in Southeast France
- B09 Tinti, Mosconi, Gabriel, Dal Zilio, Rinaldi, Meier, Casarotti, Supino, Mesimeri, Villiger, Cocco**  
Microearthquakes Induced by Fluid Injection:  
3D Dynamic Rupture Models and Radiated Waveforms
- B10 Yao, Yang**  
Surface Rupture Behaviors Controlled by Earthquake Source Dynamics

## List of Posters

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- B11 Birkel, Vidale**  
Comparison of Observed and Simulated Ground Motions in the Los Angeles Basin
- B12 Romanet, Scuderi, Chaillat, Ampuero, Cappa**  
Fluid-Triggered Seismicity in a Discrete Fault Network within a Low Permeability Formation
- B13 Ye, Dal Zilio, Giardini**  
Exploring the Interplay of Fault Slip, Poroelasticity, and Permeability Barriers in Seismic Swarms
- B14 Vyas, P.K., Galis**  
Exploring the Influence of Fault-Surface Topography on Earthquake Rupture Dynamics: A Study of Rupture Parameter Correlations
- B15 Zhao, Weng**  
Multiscale Fault Zone Deformation Controlled by Rupture Dynamics During the 2021 Mw7.4 Maduo Earthquake
- B16 Miyamoto, Asano, Iwata**  
Development of Dynamic Source Inversion to Understand Mechanism of Strong Motion Generation

# Schematic Map of the Central Part of the Castle

