



Schweizerischer Erdbebedienst
Service Sismologique Suisse
Servizio Sismico Svizzero
Swiss Seismological Service

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Programme

5 - 8 March 2019
DAVOS

SCHATZALP
*3rd Induced Seismicity
Workshop*

www.seismo.ethz.ch/schatzalp

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5619 Davos - Schatzalp-Bobsleighbahn - Viersitzer Bob in einer Kurve



5615 Davos - Grosse Schneewalze

www.swissinfo.ch/ger/winter-postkarten-in-photocrom_ die-bunte-welt-der-belle-epoque/41942788

„The Magic Mountain“ by Thomas Mann

„And so what had to happen happened, and Hans Castorp experienced what he would never have dreamed possible only a short while before. Winter was upon them, the local winter, with which Joachim was already familiar, because it had been raging at full force when he had arrived the previous year. Hans Castorp, however, had been somewhat afraid of its onslaught, although he knew he was definitely well equipped for it.

His cousin tried to calm him. [...]

Snow began to accumulate in earnest and present difficulties. Both the path to the bench beside the water trough and the driveway to the valley were kept shoveled clear, but were so narrow that there was no room for someone to move aside. When people met, one party had to step into the snowbank, sinking in up to the knee. All day a horse led by a man at its halter pulled a heavy stone snow-roller through the streets of the resort below; and what looked like an old-fashioned postal carriage on runners, with a plow mounted up front to push great masses of white to each side, commuted between the resort and Davos-Dorf, as the settlement to the north was known. [...]

At all seven tables in the dining hall, the onset of winter, the "season" in these regions, was the major topic of conversation. A great many tourists and athletes, it was said, had already arrived, filling the hotels in Dorf and Platz. The snow accumulation was estimated at two feet, its consistency perfect for skiing. Across the way people were hard at work on the bobsled run — from the top of the northwest slope of Schatzalp to the valley below — and it was expected to be open within a few days; that was, if a warm foehn wind did not spoil everything.

People were looking forward to the activities that healthy guests would soon be pursuing again in the valley below — organized races and contests, which they all planned to attend, even if it meant breaking the rules and playing hooky from rest cure. There was a new sport, Hans Castorp learned, an invention from the north called skijoring, a race in which contestants on skis were pulled by horses. [...]"

Excerpt from „The magic mountain“ by Thomas Mann; published by Alfred A. Knopf; translated by John E. Woods. New York, London, Toronto: Everyman's Library, 1995.

Welcome to the 3rd Schatzalp Workshop on Induced Seismicity!

We are delighted that again so many of you decided to come all the way to Davos for 2 ½ days of posters, presentations, discussions and networking. The program is packed with exciting science covering the numerous facets of induced seismicity. We scheduled enough time to view the poster and of course, we count on the enchantment of this 'magic mountain' to create a memorable workshop for all of us.

This is our third workshop here in Davos and despite much progress, induced seismicity remains a major challenge for science, industry, regulators and societies. Recent events, such as the 2017 Pohang earthquake, sometimes make us wonder if we are today any closer to understanding, let alone controlling, anthropogenic earthquakes than we were during the first workshop in 2015.

To us organizers, the workshops have always been deeply rewarding and inspiring, and we like to thank all of you for your contributions that are the essence of the meeting. Welcome again, enjoy the Schatzalp, and let us know your feedback on the workshop!

With best wishes,

Stefan Wiemer, Toni Kraft, and Barbara Naegeli

Tuesday's Programme, 5 March 2019

from 16:00 **Registration at Schatzalp Lobby**

from 18:00 **Ice-breaker** (aperitif and Swiss music)

from 20:00 **Self-paid Dinner at Panorama Restaurant**
(menu for CHF 27.50)

Wednesday's Programme, 6 March 2019

from 07:30 **Registration and Installation of Posters Part A**

08:00 **Toni Kraft (Swiss Seismological Service) and
Gunter Siddiqi (Swiss Federal Office of Energy)**
Welcome address

Session 1 Case Studies I: World Tour

08:10 **Keynote: William L. Ellsworth (Stanford University)**
Induced Seismicity in the Permian Basin, USA

08:30 **Solicited: Brian Baptie (British Geological Survey)**
Seismicity Induced by Hydraulic Fracturing operations at Preston
New Road, Lancashire, 2018

08:45 **Solicited: Vala Hjorleifsdottir (Reykjavik Energy)**
Induced earthquakes in the Hellisheiði geothermal field, Iceland

09:00 **Solicited: Antony Butcher (University of Bristol)**
Induced Seismicity at Thoresby Colliery, UK

09:15 **Solicited: Kwang-Hee Kim (Pusan National University)**
The 15 November 2017 Pohang Earthquake

09:30 **Discussion**

09:50–10:20 **Coffee Break**

Session 2 Social Aspects of Induced Seismicity

- 10:20 **Keynote: Manuel Sintubin (Katholieke Universiteit Leuven)**
The Societal Role of Scientists in Induced Seismicity – Lessons Learned from Groningen (The Netherlands)
- 10:40 **Keynote: Caspar Hirschi (University of St. Gallen)**
The Limits of Expert Knowledge as a Political Problem
- 11:00 **Keynote: Jen Schneider (Boise State University)**
All Shook Up: Rethorics of Induced Seismicity
- 11:20 **Keynote: Evelina Trutnevyte (University of Geneva)**
Where do energy and environmental benefits from EGS outweigh induced seismicity risk?
- 11:40 **Discussion**

12:00–13:30 **Lunch Break**

Session 3 Natural or Induced, and Beyond

- 13:30 **Solicited: Peter Meier (Geo-Energie Suisse AG)**
Understanding the Pohang EGS reservoir and the need for advanced traffic light systems
- 13:45 **Keynote: Gunter Siddiqi (Swiss Federal Office of Energy)**
Non-seismic Reverberations of the M5.4 Pohang Earthquake in Switzerland
- 14:05 **Keynote: Torsten Dahm (German Research Centre For Geosciences)**
Earthquakes close to anthropogenic activities – statistical discrimination without statistics?
- 14:25 **Solicited: Julian Bommer (Imperial College London)**
Towards a More Robust and Transparent Simplified Scheme for the Discrimination of Induced from Natural Seismicity
- 14:40 **Keynote: Norman Sieroka (ETH Zurich)**
Human-induced or Natural? – Some Philosophical Considerations and Concepts
- 15:00 **Discussion**

15:20–15:50 **Coffee Break**

Session 4 Induced Seismicity in the Dutch Gas Fields

15:50 **Solicited: Bernard Dost (Royal Netherlands Meteorological Institute)**

New developments in monitoring seismicity in the Groningen gas field

16:05 **Keynote: Stephen Bourne (Shell Global Solutions International B.V.)**

Physics-based, operational forecasting of production-induced seismicity within the Groningen gas field

16:25 **Keynote: Jan-Dirk Jansen (Delft University of Technology)**

Insights from a closed-form solution for injection- and production-induced stresses in vertical displaced faults

16:45 **Solicited: Sander Osinga (TNO)**

A Framework for Training and Testing Induced Seismicity Forecasting Models: the Groningen Case Study

17:00 **Discussion**

17:20–19:00 **Wine and Cheese, Posters Part A**

19:00 **Break**

19:30–20:30 **Snow Hike with Torches**

20:30–22:30 **Outdoor Dinner (Fondue) at Schatzalp Snow Beach**

Thursday's Programme, 7 March 2019

from 07:30 **Installation of Posters Part B**

Session 5 **Physics of Induced Earthquakes I**

- 08:00 **Keynote: Chris Marone (Pennsylvania State University)**
Laboratory Earthquakes Precursors and Prediction
- 08:20 **Solicited: Marco Scuderi (Sapienza University of Rome)**
Fluid-injection and the mechanics of frictional stability of shale-bearing faults
- 08:35 **Keynote: Art Mc Garr (United States Geological Survey)**
Seismic and Aseismic Response to Fluid Injection
- 08:55 **Keynote: Jean Schmittbuhl (Strasbourg University/CNRS)**
Induced seismic and aseismic slip in EGS reservoir: Case studies from Alsace, France
- 09:15 **Keynote: Alexandre Schubnel (Ecole Normale Supérieure de Paris)**
Energy budget during laboratory earthquakes
- 09:35 **Discussion**

09:55–10:25 **Coffee Break**

Session 6 **Physics of Induced Earthquakes II**

- 10:25 **Solicited: Lisa Johann (Freie Universität Berlin)**
Seismicity in Central Oklahoma shows features of reservoir-induced seismicity
- 10:40 **Keynote: Thomas Goebel (University of California at Santa Cruz)**
Examining the distance decay and effects of active mitigation on injection induced seismicity
- 11:00 **Keynote: Jean-Paul Ampuero (Université Côte d'Azur)**
Connecting physics-based models of natural and induced seismicity
- 11:20 **Solicited: François Passelegue (EPFL Lausanne)**
On the nature of induced seismicity: Control from pore pressure distribution

11:35 **Solicited: Peter van den Bogert (Shell)**
An analytical approach to fault rupturing in depleting gas reservoirs

11:50 **Discussion**

12:10–13:40 **Lunch Break**

Session 7 Modelling Induced Seismicity

13:40 **Solicited: Antonio Pio Rinaldi (Swiss Seismological Service)**
Hydroshearing and permeability enhancement: Revisiting a fracture zone stimulation at Fenton Hill

13:55 **Solicited: Alice-Agnes Gabriel (Ludwig-Maximilians-Universität)**
Multi-physics earthquake simulations on complex fault networks across scales

14:10 **Solicited: Dominik Zbinden (Swiss Seismological Service)**
Induced seismicity during the St. Gallen deep geothermal project, Switzerland: insights from numerical modeling

14:25 **Solicited: Robert Vörös (Q-con GmbH)**
Inferring in situ Reservoir Pressure From Induced Earthquakes

14:40 **Discussion**

15:00–15:30 **Coffee Break**

Session 8 Deep Underground Laboratories

- 15:30 **Keynote: Jens Birkholzer (Lawrence Berkeley National Laboratory)**
Induced Seismicity and CCS at Scale: Understanding Caprock Integrity Impacts Based on Mesoscale Experiments
- 15:50 **Solicited: Kristine Pankow (University of Utah)**
Seismic Monitoring at the Utah Frontier Observatory for Research in Geothermal Energy
- 16:05 **Solicited: Georg Dresen (German Research Centre For Geosciences)**
STIMTEC – a mine-back experiment in the Reiche Zeche underground laboratory
- 16:20 **Keynote: Frédéric Cappa (Université Côte d’Azur)**
Injection-Induced Seismicity and Aseismic Fault Slip in Laboratory and In-Situ Experiments and Hydromechanical Models
- 16:40 **Keynote: Domenico Giardini (ETH Zurich)**
From rock-deformation laboratory to the deep underground laboratory of Bedretto: covering geothermal applications and earthquake physics at multiple scales
- 17:00 **Discussion**

17:20–19:20 **Wine and Cheese, Posters Part B**

19:20 **Break**

20:00–22:30 **Conference Dinner**

Friday's Programme, 8 March 2019

from 07:30 **Hotel Check-out**

Session 9 Advances in Monitoring Induced Seismicity

- 08:30 **Solicited: Joseph Doetsch (Swiss Seismological Service)**
The Grimsel in-situ stimulation project – on the seismo-hydro-mechanical response during hydraulic stimulation tests
- 08:45 **Solicited: Bettina Goertz-Allmann (NORSAR)**
Understanding reservoir processes in injection operations from advanced microseismic analysis
- 09:00 **Solicited: Marcus Herrmann (Swiss Seismological Service)**
Statistical and Phenomenological Analysis of a High-resolution Catalog of Induced Seismicity in Basel
- 09:15 **Solicited: Francesco Grigoli (Swiss Seismological Service)**
Monitoring induced seismicity with a single seismic station by combining coda wave interferometry with distance geometry solvers
- 09:30 **Solicited: Corinna Roy (University of Leeds)**
Quantification of location errors for mining induced seismicity in New Ollerton, UK, using 3D Monte Carlo body wave tomography
- 09:45 **Discussion**

10:05–10:35 **Coffee Break**

Session 10 Case studies II: panta rhei

- 10:35 **Solicited: Sigurjon Jonsson (King Abdullah University of Science and Technology)**
What Triggers Seasonal Earthquakes in South Iceland?
- 10:50 **Solicited: Grzegorz Kwiatek (German Research Centre for Geosciences)**
Controlling induced seismicity during hydraulic stimulation of a 6 km deep Enhanced Geothermal System in Finland
- 11:05 **Solicited: Andrew Barbour (United States Geological Survey)**
Slow Deformation and Rapid Seismicity-Rate Changes Triggered by Geothermal Fluid Redistribution

- 11:20 **Solicited: Enrique Chon (University of Colorado)**
Repeating Earthquakes and Shear Wave Anisotropy Measurements from an Induced Seismicity Case Study, Wattenberg Disposal Zone
- 11:35 **Solicited: Zhuo Yang (Harvard University)**
Fault reactivation by fluid injection considering permeability evolution in damage zones: a case study of Guy-Greenbrier sequence
- 11:50 **Keynote: Stefan Wiemer (Swiss Seismological Service)**
Testing advanced traffic light systems for the management of induced seismicity
- 12:10 **Discussion**
- 12:30 **Stefan Wiemer (Swiss Seismological Service)**
Farewell address

12:40–14:00 **Lunch Break and End of Workshop**

List of Posters

Posters Part A Wednesday, 17:20–19:00 (Wine and cheese)

Posters Part B Thursday, 17:20–19:20 (Wine and cheese)

Posters Part A

Session 1 Case Studies I: World Tour

ID: 3441 **Thorbjörg Ágústsdóttir (Iceland GeoSurvey)**
Board: P1-17 Seismicity rate and earthquake source mechanisms in the Hengill and Hverahlíð geothermal fields, SW-Iceland, October 2016-2018

ID: 2914 **Chris Bromley (GNS Science)**
Board: P1-01 Benefits of Non-Damaging, Publicly-Acceptable, Geothermal Induced Micro-Seismicity in New Zealand

ID: 3046 **Paul Friberg (Instrumental Software Technologies)**
Board: P1-02 Seismicity Induced by Hydraulic Fracturing in Ohio in 2016: Case study of the Conotton sequence in Harrison County

ID: 3319 **Laura Gulia (Swiss Seismological Service)**
Board: P1-03 Reinvestigating the earthquake size distribution of induced seismicity at the Groningen gas field

ID: 3442 **Stephen Hicks (Imperial College London)**
Board: P1-16 The 2018 Newdigate, Surrey, UK earthquake sequence: induced by nearby oilfield activities, or not?

ID: 3045 **Gregor Hillers (University of Helsinki)**
Board: P1-04 Data features from a network around the 2018 EGS stimulation in Espoo/Helsinki, Finland

ID: 2890 **Guoyan Jiang (The Chinese University of Hong Kong)**
Board: P1-05 Ground Expansion and Seismic Hazard Induced by the Hutubi Natural Gas Repository, Xinjiang, China

ID: 2905 **Andrew Jupe (altcom Limited)**
Board: P1-06 Seismic monitoring at the United Downs Deep Geothermal Project (UDDGP), Cornwall, United Kingdom

ID: 3440 **Anne Obermann (Swiss Seismological Service)**
Board: P1-07 COSEISMIQ Project: Control Seismicity and Mangle Induced Earthquakes

ID: 3068 **Marc Schaming (Strasbourg University/CNRS)**
Board: P1-08 Studying induced seismicity within the EPOS Thematic Core Service on Anthropogenic Hazards (TCS-AH)

ID: 3017 **Rob Skoumal (United States Geological Survey)**
Board: P1-09 Characterizing seismogenic faults and discerning hydraulic fracturing induced earthquakes in Oklahoma

Session 2 Social Aspects of Induced Seismicity

ID: 2953 **Evelina Trutnevyte (University of Geneva)**
Board: P1-10 Views of the informed citizen panel to EGS and other electricity generation alternatives in Switzerland

Session 3 Natural or Induced, and Beyond

ID: 3269 **Andrés Alcolea (Geo-Energie Suisse AG)**
Board: P1-15 Hydromechanical modelling of the hydraulic stimulation PX2-1 in Pohang (South Korea)

ID: 3394 **Celso Alvizuri (University of Lausanne)**
Board: P1-12 Seismic moment tensor analysis for the 2016 Gyeongju and 2017 Pohang earthquakes

ID: 3069 **Falko Bethmann (Geo-Energie Suisse AG)**
Board: P1-13 Seismicity analysis with spatial or temporal relation to the deep geothermal project in Pohang

ID: 3287 **Simone Cesca (German Research Centre for Geosciences)**
Board: P1-14 The November 15, 2017, Pohang earthquake: A potential anthropogenic event of Mw 5.5 in South Korea

ID: 3050 **Jin-Han Ree (Korea University)**
Board: P1-11 Reactivation of Unfavorably-oriented Faults for the 2017 Pohang Earthquake Sequence: Driven by Fluid Overpressure?

Session 8 Deep Underground Laboratories

- ID: 3305 **Marian Hertrich (SCCER-SoE)**
Board: P2-06 Design of the seismic monitoring network for the stimulation experiments in the Bedretto Deep Underground Rock Laboratory
- ID: 3066 **Xiaodong Ma (Swiss Seismological Service)**
Board: P2-04 In situ stress characterization in the Bedretto Underground Laboratory: implications for induced slip of existing fractures
- ID: 3115 **Anne Obermann (Swiss Seismological Service)**
Board: P2-05 CS-D experiment: CO₂ injection and mobility within a fault zone in tight caprock at Mont Terri
- ID: 3100 **Katrin Plenkers (Gesellschaft für Materialprüfung und Geophysik)**
Board: P2-02 Seismic Response to Hydraulic Fracturing in Anisotropic Rock
- ID: 2984 **Linus Villiger (Swiss Seismological Service)**
Board: P2-01 On the variability of seismic response during multiple decameter-scale hydraulic stimulations in crystalline rock

Session 9 Advances in Monitoring Induced Seismicity

- ID: 2995 **Amandine Amemoutou (German Research Centre for Geosciences)**
Board: P2-14 Moment tensors of waste-water disposal induced seismicity in southern Kansas
- ID: 3054 **Nepomuk Boitz (Free University Berlin)**
Board: P2-15 The influence of seismic anisotropy on microseismic moment tensors and their radiation patterns
- ID: 3276 **Felix Borleanu (National Institute for Earth Physics, Romania)**
Board: P2-16 Microseismic monitoring and source discrimination at Izvorul Muntelui dam, northeast Romania
- ID: 3074 **Tobias Diehl (Swiss Seismological Service)**
Board: P2-13 Towards Real-Time Double-Difference Hypocenter Relocation as Component for Advanced Traffic Light Systems

- ID: 3073 **Laure Duboeuf (NORSAR)**
Board: P2-11 Automatic picking for induced seismicity in Iceland using an EAT (Empirically Aggregated Template) methodology
- ID: 3063 **Sepideh Karimi (nanometrics inc)**
Board: P2-09 Practical Implementation and Evaluation of a Real-time Forecasting-based Induced Seismicity Management System
- ID: 2987 **Jannes Kinscher (INERIS)**
Board: P2-07 Automatic full wave-form based monitoring at the deep Garpenberg metal mine
- ID: 3155 **Andy Nowacki (University of Leeds)**
Board: P2-10 Automatic detection and location of induced and natural earthquakes using Multichannel Coherency Migration
- ID: 2973 **Hanneke Paulssen (Utrecht University)**
Board: P2-08 P wave travel time changes in the Groningen reservoir
- ID: 2931 **Natascha Vollmer (K-UTEC AG Salt Technologies)**
Board: P2-12 The seismic monitoring system in the Velenje mine, Slovenia

Posters Part B

Session 4 Induced Seismicity in the Dutch Gas Fields

- ID: 3061 **Loes Buijze (TNO)**
Board: P2-15 Elastic vs inelastic reservoir compaction: Effect on the stress path, fault reactivation, and induced seismic rupture
- ID: 3037 **Annemarie Muntendam-Bos (SodM/Delft University of Technology)**
Board: P2-14 Clustering Characteristics of Gas-Extraction Induced Seismicity

Session 5 Physics of Induced Earthquakes I

- ID: 2997 **Michelle Almakari (Mines ParisTech)**
Board: P1-01 Shear induced fluid flow and permeability enhancement during fluid injection lab experiment
- ID: 2980 **Stephan Bentz (German Research Centre for Geosciences)**
Board: P1-04 Analysis of microseismicity framing Mw > 2.5 earthquakes at The Geysers geothermal field, California
- ID: 3022 **Nathalie Casas (Institut national des sciences appliquées de Lyon)**
Board: P1-07 Slip in granular fault gouges: factors influencing the slip regime.
- ID: 3391 **Adam Klinger (University of Bristol)**
Board: P1-09 Stress drop parameters of fracking-induced microseismicity.
- ID: 3164 **Brice Tanguy Alphonse Lecampion (EPFL Lausanne)**
Board: P1-08 A-seismic fracture growth driven by fluid injection and remote nucleation of dynamic rupture in a weaker part of the fault
- ID: 3020 **Jose Angel Lopez-Comino (King Abdullah University of Science and Technology)**
Board: P1-03 Rupture complexity of an injection induced event: the 2016 Mw 5.1 Fairview, Oklahoma earthquake
- ID: 2991 **Yusuke Mukuhira (Tohoku University)**
Board: P1-06 Dependency of the induced seismicity b-value on the stress state of existing fractures
- ID: 3393 **Verena Simon (Swiss Seismological Service)**
Board: P1-10 High-resolution analysis of seismicity patterns in microearthquake sequences using waveform similarity methods

ID: 3029 **Sergey Turuntaev (Institute of Geosphere Dynamics of Russian Academy of Sciences)**
Board: P1-02 Laboratory study of hydrofracturing and related seismicity

ID: 3251 **Clay Wood (Pennsylvania State University)**
Board: P1-05 The Effect of Roughness on the Elasticity and Permeability of Fractured Media

Session 6 **Physics of Induced Earthquakes II**

ID: 3010 **Jens-Erik Lund Snee (Stanford University)**
Board: P1-14 A second-generation stress map of the intraplate USA, and its utilization for managing the hazard of injection-induced seismicity

ID: 3162 **Corentin Noël (EPFL Lausanne)**
Board: P1-13 Fault reactivation during pore pressure oscillations

ID: 3439 **Luca Urpi (Swiss Seismological Service)**
Board: P2-01 Can a deep geological repository in a clay formation maintain its integrity and still reactivate a nearby fault?

ID: 3354 **Marcel Schulz (Karlsruhe Institute of Technology)**
Board: P1-16 Analysis of injection data for pore pressure and minimum horizontal stress magnitude estimates in the Arbuckle Formation

ID: 3052 **Victor Vilarrasa (Spanish National Research Council)**
Board: P1-12 Inhomogeneous fault stability due to fluid injection

ID: 3055 **Brecht Wassing (TNO)**
Board: P1-11 Modelling of long-term temperature effects on fault reactivation and induced seismicity potential in conventional geothermal doublets in The Netherlands

ID: 3044 **Ju Hyi Yim (Seoul National University)**
Board: P1-15 Coulomb Stress Changes by Fault Slip and Pore Pressure Push due to Fluid Injection

Session 7 Modelling Induced Seismicity

- ID: 3320 **Sebastian Anger (Ludwig-Maximilians-Universität München)**
Board: P2-10 Dynamic earthquake rupture modeling in fracture networks of geo-reservoirs accounting for the effects of thermal pressurization
- ID: 3407 **Amir Ashrafi Habibabadi (ETH Zurich)**
Board: P2-13 Numerical Simulation of Fracture Failure and Propagation due to Fluid Injection, in the Context of Embedded Discrete Fractures
- ID: 2969 **Giuseppe De Natale (Istituto Nazionale di Geofisica e Vulcanologia)**
Board: P2-02 Seismogenic potential of withdrawal-reinjection cycles: numerical modelling and implication on induced seismicity
- ID: 2968 **Benjamin Edwards (University of Liverpool)**
Board: P2-08 A Hybrid Empirical Green's Function Technique for Predicting Ground Motion from Induced Seismicity: Application to the Basel Enhanced Geothermal System
- ID: 3351 **Dimitrios Karvounis (Swiss Seismological Service)**
Board: P2-06 Testing Injection Scenarios with a 3D Discrete Fracture Hybrid Model
- ID: 2955 **Maria Kozłowska (Institute of Geophysics Polish Academy of Sciences)**
Board: P2-07 How to model aftershocks in induced seismicity? Insight into seismicity of Kiruna Mine, Sweden
- ID: 3028 **Maarten Pluymaekers (TNO)**
Board: P2-03 Depletion-induced seismicity at the Groningen gas field: Coulomb rate-and-state models for structurally complex reservoirs
- ID: 3034 **Gudrun Richter (German Research Centre for Geosciences)**
Board: P2-04 Stress-based, statistical modeling of the induced seismicity at Groningen Gas Field

ID: 3166 **Vasily Riga (The Federal State Unitary Enterprise
"All-Russia Research Institute of Automatics named after
N.L. Dukhov")**
Board: P2-12 Numerical Analysis Of Friction Laws. Application To Induced Seis-
micity

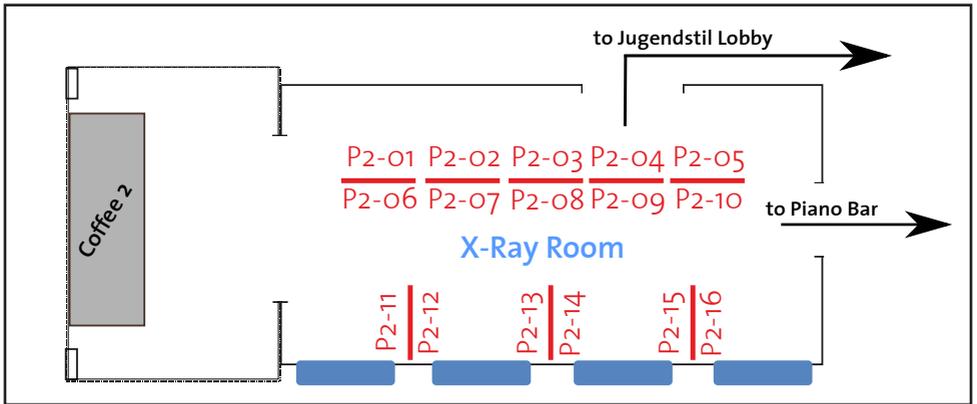
ID: 3060 **Vanille Ariane Ritz (Swiss Seismological Service)**
Board: P2-05 Injection strategies for EGS: balancing seismic risk and stimula-
tion efficiency

ID: 3064 **Justin Rubinstein (United States Geological
Survey)**
Board: P2-09 Forecasts of Induced Seismicity and its Hazard from a Hydrome-
chanical Earthquake Nucleation Model

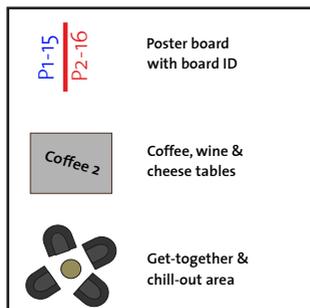
Session 10 Case studies II: panta rhei

No posters

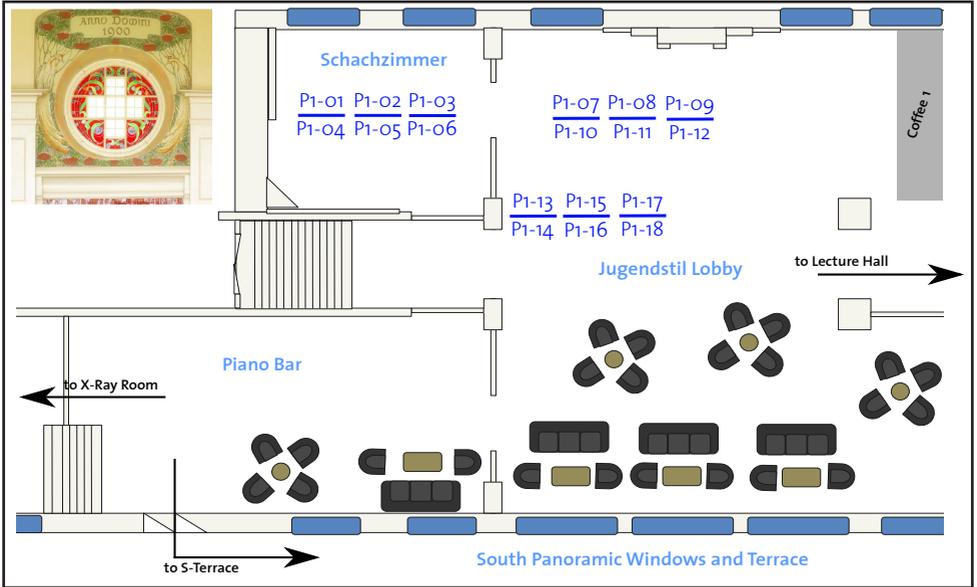
X-Ray Poster Hall



Legend



Jugendstil Lobby Poster Hall



List of Participants

Last update: 25 February 2019

| | | |
|-------------------|--------------------|---|
| Thorbjörg (Tobba) | Ágústsdóttir | Iceland GeoSurvey |
| Andrés | Alcolea | Geo-Energie Suisse AG |
| Michelle | Almakari | Mines ParisTech |
| Celso | Alvizuri | University of Lausanne |
| Amandine | Amemoutou | German Research Centre for Geosciences |
| Pablo | Ampuero | California Institute of Technology, USA |
| Sebastian | Anger | Ludwig-Maximilians-Universität München |
| Maria-Theresia | Apoloner | Zentralanstalt fuer Meteorologie und Geodynamik |
| Amir | Ashrafi Habibabadi | Institute of Fluid Dynamics, ETH Zurich |
| Brian | Baptie | British Geological Survey |
| Andrew | Barbour | United States Geological Survey |
| David | Barge | Tengizchevroil |
| Dario | Baturan | Nanometrics |
| Stephan | Bentz | German Research Centre for Geosciences |
| Falko | Bethmann | Geo-Energie Suisse AG |
| Jens | Birkholzer | Lawrence Berkeley National Laboratory, USA |
| Marco | Bohnhoff | GFZ Potsdam |
| Nepomuk | Boitz | Free University Berlin |
| Julian | Bommer | Imperial College London |
| Felix | Borleanu | National Institute for Earth Physics |
| Stephen | Bourne | Shell Global Solutions International, The Netherlands |
| Chris | Bromley | GNS Science |
| Loes | Buijze | TNO Utrecht |
| Antony | Butcher | University of Bristol |
| Frederic | Cappa | Université Côte d'Azur, France |
| Nathalie | Casas | National Institute of Science Lyon |
| Simone | Cesca | German Research Centre for Geosciences |
| Enrique | Chon | University of Colorado |
| Raymi | Castilla | Geo-Energie Suisse AG |
| Cristiano | Collettini | Sapienza Università di Roma |
| Torsten | Dahm | German Research Centre for Geosciences |
| Giuseppe | De Natale | Istituto Nazionale di Geofisica e Vulcanologia |
| Peter | Devanney | Nanometrics |
| Tobias | Diehl | ETH Zurich |
| Maria Cristina | Dimate Castellanos | Ecopetrol |
| Joseph | Doetsch | ETH Zurich |
| Dirk | Doornhof | Nederlandse Aardolie Maatschappij |
| Bernard | Dost | Royal Netherlands Meteorological Institute |
| Georg | Dresen | German Research Centre for Geosciences |
| Laure | Duboeuf | NORSAR |
| Benjamin | Edwards | University of Liverpool |

| | | |
|-------------|-----------------|--|
| Bill | Ellsworth | Stanford University, USA |
| Tomas | Fischer | Charles University, Faculty of Science |
| Paul | Friberg | ISTI |
| Ralf | Fritschen | DMT GmbH & Co. KG |
| Alice-Agnes | Gabriel | Ludwig-Maximilians-Universität München |
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