



## Timetable

What: **CSD midterm meeting**  
Where: [Solstrand Hotel & Bad](#)  
When: 8<sup>th</sup> – 9<sup>th</sup> of November 2023

### Day 1 – 8<sup>th</sup> of November (Wednesday)

#### Research pillars:

- **P1: Groundbreaking Modelling Concepts for Deformation in Porous Rocks**
- **P2: Fundamentals of Induced Subsurface Deformation**

Time	Project / Affiliation	Activity / Topic	Speaker	Chair
09:30 – 10:00	Morning coffee			
10:00 – 10:10	Director CSD	Welcome & Opening words	Inga Berre	
10:10 – 10:20	Coordinator P 1	Introduction to the first research pillar	Morten Jakobsen	Ingrid Kristine Jacobsen
10:20 – 10:45	P 1.1	Co-chain complexes in fractured porous media	Daniel Førland Holmen	
10:45 – 11:10	P 1.2	An adaptive solution strategy for Richards' equation and fully dynamic Biot models	Jakob Seierstad Stokke	
11:10 – 11:35	P 1.3	Multi-parameter full-waveform inversion using a FFT-accelerated scattering approach	Morten Jakobsen	
11:35 – 12:00	P 1.3	Microseismic waveform modelling and inversion in anisotropic elastic media	Ujjwal Shekhar	
12:00 – 13:00	Lunch			
13:00 – 14:00	Walk & Talk			
14:00 – 14:10	Coordinator P 2	Introduction to the second research pillar	Kundan Kumar	Veljko Lipovac
14:10 – 14:35	P 2.1	Multirate method for coupled flow and deformations in a fractured subsurface	Kundan Kumar	
14:35 – 15:00	P 2.2	Automatic solver selection for multiphysics simulations	Yury Zabegaev	
15:00 – 15:25	P 2.3	Generalizing classic Dix method by using image ray concept	Jokhongir Khayrullaev	
15:25 – 15:50	P 2.4	Characteristics of microseismicity at the Coso Geothermal Field, California	Joanna Holmgren	
15:50 – 16:15	Coffee break			
16:15 – 17:00	Keynote speaker	Understanding and Mitigating Man-made Earthquakes	Ruben Juanes	Marius Nevland
17:00 – 19:00	Leisure time			
19:00 –	Dinner			



**Day 2 – 9<sup>th</sup> of November (Thursday)**

**Externally funded projects and interdisciplinary work**

Time	Project / Affiliation	Activity / Topic	Speaker	Chair
– 08:30	Breakfast			
08:30 – 08:40	<i>PL MaPSI</i>	Introduction to the MaPSI project	Inga Berre	Daniel Førland Holmen
08:40 – 09:05	MaPSI	The unified flash	Veljko Lipovac	
09:05 – 09:30		Nonlinear Solvers for Poromechanics with Fracture Contact Mechanics	Marius Nevland	
09:30 – 09:55		An MPSA-Newmark discretization of the elastodynamic wave equation with absorbing boundary conditions	Ingrid Kristine Jacobsen	
09:55 – 10:20		Mixed finite element formulation of Cosserat elasticity	Omar Duran	
10:20 – 10:45	Coffee break			
10:45 – 11:10	<i>CSD general</i>	Modelling of multiphysics processes in fractured porous media using PorePy	Ivar Stefansson	Yury Zabegaev
11:10 – 11:35	CCS-ER	Will earthquake hazard in Norway be affected by injection of CO <sub>2</sub> in the North Sea	Mathilde Sørensen	
11:35 – 12:00	SiGS	Conceptual model for convective downward migration at the roots of volcanic hydrothermal systems	Sæunn Halldorsdottir	
12:00 – 13:00	Lunch			
13:00 – 13:15	SiGS	Modeling and simulation of geothermal systems in the SiGS project.	Eirik Keilegavlen	Ujjwal Shekher
13:15 – 13:30	GradFlow	Mobility of knowledge: from poromechanics to image analysis	Jakub Both	
13:30 – 13:45	FracFlow	Validating numerical simulation capabilities of complex subsurface systems	Jan Martin Nordbotten	
13:45 – 14:00	NIOT	Comparing simulations and experiments using the Wasserstein distance	Enrico Facca	
14:00– 14:25	<i>Industry partner</i>	<i>Pending.</i>	Gunnar Gunnarsson	
14:25 – 14:35	<i>Director CSD</i>	Concluding words	Inga Berre	
14:35 – 14:45	Coffee break			
14:45 – 15:30	Meeting with Scientific Advisory Board, CSD Board members and PIs			



## Travel information

The public transport options are within [Skyss Sone A](#), regular tickets are valid.

### Departure on the 8<sup>th</sup> of November:

Meet at Bergen Busstasjon Terminal L

- Departure time: 08:15
  - Bus 600 to Osøyro
  - By foot ca. 1km
- Time of arrival: 09:11

### Return on the 9<sup>th</sup> of November

Walk to bus stop Hauge

- Departure time: 16:31
  - Bus 740 to Osøyro
  - Bus 600 to Bergen Busstasjon
- Time of arrival: 17:17

### Traveling from and to Airport:

Besides taking a taxi, you can travel by tram to Lagunen Terminal and change to Bus 600 there. Travel information and departure times can be found on Skyss.no (and the respective app).

## Practical Information

### Walk & Talk:

Please bring clothes and shoes for a longer walk outside (day 1).

### Hotel Bath & Spa:

The hotel offers a very nice swimming pool and spa, included in our stay. We recommend the leisure time on day 1 to check out the offer.



## About

**Keynote speaker:** Ruben Juanes, Professor at Massachusetts Institute of Technology

Ruben Juanes is professor in Civil and Environmental Engineering, and Earth, Atmospheric and Planetary Sciences at MIT, where he has been since 2006. He is an expert in fluid flow through porous media and in geomechanics, and has applied his research to the fields of energy resources, carbon capture and storage, gas hydrates, water infiltration and soil irrigation, and induced seismicity. He holds an undergraduate degree from University of A Coruña (Spain) and graduate degrees from UC Berkeley, all in Civil and Environmental Engineering.

*Abstract:* Earthquakes occur when faults slip. While the most devastating earthquakes are of tectonic origin, human activities have been associated with the triggering of earthquakes that have caused substantial economic damage and societal concern. The demonstration that fluid injection can cause earthquakes dates back to the 1970s (Raleigh et al., Science 1976), but critical gaps remain in our ability to understand and, more importantly, mitigate, the occurrence of induced earthquakes. Here I will discuss some of our recent work employing contrasting approaches to help fill these gaps: from minimal-ingredients spring-slider models that account for poroelasticity (Alghannam and Juanes, Nature Comm. 2020) to sophisticated multiphysics computational models that integrate disparate datasets and have succeeded at setting management strategies that prevent earthquakes while allowing subsurface operations in a tectonically active field (Hager et al., Nature 2021).