InterPore 2021
Online

13th International Conference on Porous Media

CONFERENCE PROGRAM
31 May - 4 June 2021

Kimberly-Clark

Thermo Fisher
S C I E N T I F I C

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InterPore

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We are so glad to welcome you!

WELCOME MESSAGES

Dear Colleagues,

On behalf of the Executive Committee, I welcome you to the 13th International Conference on Porous Media and Annual Meeting of the International Society for Porous Media (InterPore). We are pleased that you can join us for this multidisciplinary international meeting that brings together colleagues from the global porous media community. The Conference presentations include new and exciting advances in porous media studies that cut across disciplines and span from fundamental science to applications, using new experimental methods, machine learning and advanced computational simulation and analysis. This year's program was designed to include many different aspects of porous media along with special sessions that focus on water, energy, agriculture, and climate.

Laura J. Pyrak-Nolte
Purdue University

We appreciate your support and participation in InterPore's 2nd virtual Annual Meeting. With the COVID-19 pandemic still not under control, it is important for the community and the Society to respond and develop appropriate methods to maintain communication and the exchange of ideas as long as travel restrictions remain.

The Symposium could not have happened without the effort and dedication of many people who worked tirelessly on short notice. I am very grateful for their assistance, commitment, and dedication. This year the co-organizers of minisymposia and session moderators had an extensive task and a crucial role in the success of the Conference. The hard work of moderators, the Program Committee, the Organizing Committee, Communication Committee, and InterPore's executive staff is greatly appreciated.

Thank you for participating in the Conference. Please enjoy the conference, learn as much as you can, virtually meet and make friends, and take advantage of the clear view of the presentations from your favorite space.

"Wisdom is not a product of schooling but of the lifelong attempt to acquire it." (Albert Einstein).

"In a time of drastic change it is the learners who inherit the future. The learned usually find themselves equipped to live in a world that no longer exists." (Eric Hoffer)

On behalf of the executive committee,
Laura J. Pyrak-Nolte
President of InterPore

WELCOME MESSAGES

On behalf of the organizing committee, it is our pleasure to warmly welcome you to the InterPore 2021 conference. We hope that you and your dear ones are doing well in this difficult period of COVID-19 pandemic. Due to the current situation, the conference will be online again this year; however, we will bring an enhanced level of interaction through excellent pre-recorded talks, poster sessions and online discussions. We are also going to introduce a new speed networking event along with other social events/tea-coffee breaks. It is a unique opportunity for you to meet and engage with other researchers from diverse research fields, get inspired for your own research, meet old friends and establish new collaborations around the world. The Organizing Committee, with the active participation of the MS moderators and with the decisive support of the InterPore Office, has worked very hard to make this event memorable and fruitful for you. We look forward to interacting with you during the online conference.
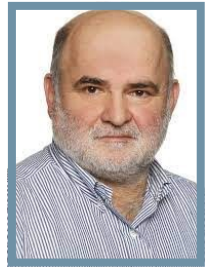
Oleg Iliev
Fraunhofer Institute

Enjoy InterPore2021!

Oleg Iliev
Organizing Committee Chair

Patrick Jenny
ETH Zürich

It is our pleasure to welcome you on behalf of the Program Committee. Like InterPore2020, the conference will be online, but this time we knew that from the beginning of the planning period. Of course we all would have preferred an in-person conference. Nevertheless, we are glad that, thanks to the large number of excellent oral and poster presentations and thanks to the huge commitment of the mini-symposia organizers, we can present an exciting and diverse program. This would have been virtually impossible without the commitment and hard work of mini-symposia organizers, who have played a major role since late last year and whose work will continue as session moderators during the conference We also want to mention the very constructive interaction with the Executive and Organizing committees and the great support by the InterPore office. The success of InterPore also heavily relies on the individual members who volunteer and participate in scientific and organizational activities.

Online conferences do offer possibilities that we didn't have or didn't use before. For example, hundreds of pre-recorded presentations are available online for you and can be watched at convenient times two weeks before and two weeks after the conference. Also, the fee and expenses are much lower and many people, who can't travel for various reasons (such as lack of funds), can now participate and present their work.

Sridhar Ranganathan
Kimberly-Clark Corporation

We hope you will enjoy the conference.

Patrick Jenny and Sridhar Ranganathan
Program Committee Chair & Vice-Chair

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InterPore
National Chapters

National chapters offer elevated visibility, improved local and global networking, platforms for joint workshops and many other benefits.

Existing Chapters

Australia	Benelux	Brazil	China
Colombia	France	Germany	India
Iran	Italy	Mexico	Norway
Saudiarabia	Spain	United Kingdom	

Chapters Under Formation include:
Israel, Greece, Denmark, Austria & Japan

InterPore National Chapter Committee Members:

M. Rucker, Technical University of Eindhoven, *The Netherlands*
E. Abreu, University of Campinas, *Brazil*
M. Quintard CNRS, IMFT, *France*
N. Tomozeiu Canon Production Printing, *The Netherlands*
M. Wang, Tsinghua University, *China*
D. Lasseux (Chair), CNRS, I2M, *France*

Visit the National Chapters booth to learn more about joining or starting your local chapter!

![InterPore Student Affairs logo]

In response to the excellent participation in the previous years, the Student Affairs Committee (SAC) will organize a music event and a career event during the 2021 InterPore virtual meeting. The SAC activities are **free and open to participants from all career stages,** from the early student to the experienced researcher/professor. They form the perfect setting for you to get to know the international porous media community better and expand your professional and personal network. Come along!

More information on both of these events can be found in the detailed program.

InterPore SAC 2021 Board Members

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Mohammad Nooraiepour
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Vice-Chair
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Events Manager and Financial Advisor
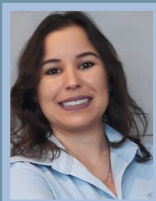Neerja Zambare
Montana State University, USA

Secretary and Communication Advisor
Manuel Bastidas Olivares
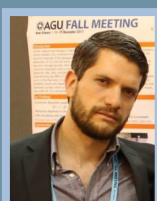*Hasselt University, Belgium*

Events Director
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Communication Officer
Javier E. Santos
The University of Texas at Austin, USA

Communication Officer
Cunqi Jia
University of Petroleum, China

Would you like to join SAC and make InterPore 2021 even better? Contact sac@interpore.org

InterPore
Foundation

One goal of the Foundation is to facilitate the participation of promising **young scientists** in **international scientific gatherings** and support outstanding young scientists from **countries with financial difficulties** in joining InterPore activities.

This year, InterPore Foundation provided **25 conference grants** to students and young scientists. The Foundation aims to increase both the number and amount of these grants for the coming years.

Donate now!
Or visit our booth in the exhibition hall to learn more about the Foundation and how your contributions count!

Make all this possible!
Support us with a donation

InterPore
Academy

Promoting InterPore educational and training activities via:

- **Short courses**
- **Webinars**
- **Thematic workshops**
- **Young Academy activities**

Suggestions for topics, lecturers and new activities are welcomed via email to: **assistant-academy@interpore.org**

Upcoming Short Courses:

- Introduction to open-source computational fluid dynamics using OpenFOAM® technology - *Dr. Soulaine, June 2021*
- Porous media free flow coupling - *Prof. Helmig, November 2021*
- Poromechanics - *Autumn 2021*
- Multiscale Geomechanics & Geothermal Simulation, Prof. Hadjibegi - *Winter 2021/2022*

Upcoming Webinars:

- Guided virtual tour to the experimental facilities of Paul Sherrer Institute

Upcoming Thematic Workshop

- DRP: The challenge of the unresolved porosity, Autumn 2021

Upcoming Young Academy Events:

- Special PMTTT edition with Norwegian Chapter of InterPore- *15 June 2021*

Visit our booth in the exhibition hall to learn more about upcoming events!

www.interpore.org/academy/

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InterPore2021 Partner Events:

GOLDSCHMIDT
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LIST OF MINI SYMPOSIA

(MS01) Porous Media for a Green World: Energy & Climate
Organizers: Bo Guo, Eleni Stavropoulou, Lauren Beckingham, William Rossen

(MS02) Porous Media for a Green World: Water & Agriculture
Organizers: Amilcare Pororato, Diganta Bhusan Das, Jan Vanderborght, Jun Yin, Nima Shokri

(MS03) Flow, transport and mechanics in fractured porous media
Organizers: Hamid Nick, Holger Steeb, Olav Moyner, Yongfei Yang

(MS04) Swelling and shrinking porous media
Organizers: Chris McMinn, Daniel Markl, Sridhar Ranganathan

(MS05) Biochemical processes and biofilms in porous media
Organizers: Anozie Ebigbo, Charles Werth, Eleonora Secchi, Valentina Prigiobbe

(MS06-A) Physics of multi-phase flow in diverse porous media
Organizers: Carl Fredrik Berg, James McClure, Ryan Armstrong, Saman Aryana, Signe Kjelstrup, Steffen Berg, Yaniv Edery

(MS06-B) Interfacial phenomena in multiphase systems
Organizers: Bjornar Sandnes, Eduardo Abreu, Grigori Chapiro, Matteo Icardi, Ran Holtzman

(MS07) Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes
Organizers: Carina Bringedal, Huangxin Chen, Jakub Both, Shuyu Sun

(MS08) Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media
Organizers: Amir Raoof, Branko Bijeljic, Marco Dentz, Mozhdeh Sajjadi, Qingwang Yuan

(MS09) Pore-scale modelling
Organizers: Ke Xu, Oleg Iliev, Stéphane Zaleski, Yashar Mehmani

(MS10) Advances in imaging porous media: techniques, software and case studies
Organizers: Andreas Busch, Liwei Zhang, Maja Rucker, Martin Blunt, Matthijs de Winter, Ting Xiao

(MS11) Microfluidics in porous systems
Organizers: Florian Doster, Hassan Mahani, Hossein Hejazi, Yves Méheust

(MS12) Advances in modeling and simulation of poromechanics
Organizers: Florin A. Radu, Jianchao Cai, Joshua White, Xiaozhe Hu

LIST OF MINI SYMPOSIA

(MS13) Fluids in Nanoporous Media
Organizers: Gennady Gor, Patrick Huber, Ahmad Sakhaee-Pour

(MS14) Uncertainty Quantification in Porous Media
Organizers: Arunasalam Rahunanthan, Fabricio Sousa, Felipe Pereira, Marcio Borges, Morris Flynn

(MS15) Machine Learning and Big Data in Porous Media
Organizers: Alexander Sun, Bailian Chen, Hongkyu Yoon, Jianchun Xu

(MS16) Fluid Interactions with Thin Porous Media
Organizers: Chaozhong Qin, Divesh Bhatt, Richmond Cohen, Satoru Katoh

(MS17) Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales
Organizers: Moran Wang, Bernhard Krooss, Huijin Xu, Peng Zu, Ruina Xu

(MS18) Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers
Organizers: Carlo Bianco, Dean Hesterberg, Jaime Gomez-Hernandez, Masoud Babaei, Tannaz Pak

(MS19) Electrochemical processes in porous media
Organizers: Iryna V. Zenyuk, Jeff Gostick, Pablo A. García-Salaberri, Veronika Schleper

(MS20) Biophysics of living porous media: theory, experiment, modeling and characterization
Organizers: Dominik Obrist, Fred Vermolen, Tobias Koeppl

(MS21) Non-linear effects in flow and transport through porous media
Organizer: Alberto Guadagnini, Michel Quintard, Mohaddeseh Mousavi Nezhad, Yves Méheust

(MS22) Manufactured Porous Materials for Industrial Applications
Organizer: Nikolas Karadimitriou, Senyou An, Vahid Niasar

(MS24) Mathematical and computational challenges related to porous media - Special session in memory of Andro Mikelic
Organizer: Benoit Noetinger, Brahim Amaziane, Mary Fanett Wheeler, Sorin Pop

(MS25) Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken
Organizer: Rien van Genuchten, Jan Vanderborght

MONDAY, 31 MAY 2021

Block A (CET)	09:00 – 09:30	**Invited lecture 1:** Hadi Hajibeygi			**Invited lecture 2:** Oliver Röhrle	
	09:30 – 09:35	Learn about COMSOL Multiphysics			Learn about Thermo Scientific imaging data analysis software	
	09:35 – 09:40	Break				
	09:40 – 11:55	MS16	MS11	MS21 (1)	MS15 (1)	MS04
Block B (CET)	14:00 – 14:10	Opening Ceremony				
	14:10 – 14:20	**Award Ceremony** InterPore Meritorious Service Medal: *Oleg Iliev*				
	14:20 – 15:05	**Keynote Lecture 1:** Thomas Ramstad				
	15:05 – 15:10	Break				
	15:10 – 16:55	MS17 (1)	MS20	MS05 (1)	MS10 (1)	MS19 (1)
Block C (CET)	18:00 – 19:30	MS01 (1)	MS02	MS09 (1)	MS25 (1)	MS08 (1)
	19:30 – 19:35	Break				
	19:35 – 20:35	**Poster Session 1** (MS01, MS04, MS05, MS08)				MS25 (2)

TUESDAY, 01 JUNE 2021

Block A (CET)	09:00 – 09:10	Award Ceremony InterPore National Chapter Awards: *China & Brazil National Chapters* InterPore Honorary Lifetime Membership Award: *Brian Berkowitz*				
	09:10 – 09:55	**Keynote Lecture 2:** Thomas Driesner				
	09:55 – 10:00	Break				
	10:00 – 11:00	Poster Session 2 (MS02, MS03, MS19, MS04)				MS25(3)
	11:00 – 12:00	MS17 (2)	MS19 (2)	MS03 (1)	MS12 (1)	MS07 (1)
Block B (CET)	14:00 – 14:05	Learn about the GeoDict standard			Learn About AxelSemrau	
	14:05 – 14:35	**Invited lecture 3:** Andres Clarens			**Invited lecture 4:** Roseanne Ford	
	14:35 – 14:40	Break				
	14:40 – 16:40	MS06-B (1)	MS09 (2)	MS03 (2)	MS24 (1)	MS07 (2)
	16:40 – 16:45	Break				
	16:45 – 17:00	Presentation by the Student Research Proposal on Face Masks Winner			Speed Networking Event (16:45-17:15)	
Block C (CET)	18:00 – 18:55	Visit the exhibitor booths - Company representatives are available for Interactions			SAC Music & Magic Event	
	18:55 – 19:00	Break				
	19:00 – 20:00	Poster Session 3 (MS06-B, MS07, MS12, MS19, MS21)				
	20:00 – 21:00	Poster Session 4 (MS03, MS09, MS14, MS17)				

WEDNESDAY, 02 JUNE 2021

Block A (CET)	09:00 – 10:00	Poster Session 5 (MS06-A, MS06-B, MS10, MS21)				MS25 (4)
	10:00 – 11:00	Poster Session 6 (MS07, MS09, MS14, MS12)				
	11:00 – 11:55	Visit the exhibitor booths - Company representatives are available for interactions			Networking Coffee Break (11:00 - 11:30)	
Block B (CET)	14:00 – 16:00	MS06-B (2)	MS14	MS03 (3)	MS06-A (1)	MS07 (3)
	16:00 – 17:00	Poster Session 7 (MS20, MS06-B, MS07, MS11, MS16, MS25)				MS22 (1)
Block C (CET)	18:00 – 18:10	Award Ceremony InterPore Time Capsule: *Ghislain de Marsily* Kimberly-Clark Distinguished Lectureship Award: *Jacques M. Huyghe*				
	18:10 – 18:15	Learn about Hiden Isochema sorption analyzers		Learn about InterPore Academy		
	18:15 – 18:45	Invited lecture 5: Rick Chalaturnyk		Invited lecture 6: Masa Prodanovic		
	18:45 – 18:50	Break				
	18:50 – 20:50	MS12 (2)	MS09 (3)	MS03 (4)	MS06-A (2)	MS07 (4)

THURSDAY, 03 JUNE 2021

Block A (CET)	09:00 – 09:10	**Award Ceremony** InterPore PoreLab Award for Young Researchers: *Maja Ruecker* InterPore Award for Porous Media Research: *Hadi Hajibeygi*				
	09:10 – 09:55	**Keynote Lecture 3:** Steven Jansen				
	09: 55 – 10:00	Learn about Thermo Fisher Scientific imaging data analysis software		Learn about InterPore Academy		
	10:00 – 12:00	MS18	MS09 (4)	MS01 (2)	MS06-A (3)	MS24 (2)

Block B (CET)	14:00 – 14:05	Learn about Surface Measurement Systems		Learn about InterPore Foundation		
	14:05 – 14:40	**Invited lecture 7:** Zoe Shipton		**Invited lecture 8:** Jacques Huyghe		
	14:40 – 15:40	**Poster Session 8** (MS10, MS18, MS 17, MS06-A, MS22)			MS19 (3)	MS9 (5)
	15:40 – 15:45	**Break**				
	15:45 – 17:00	Visit the exhibitor booths - Company Representatives Available for Interactions		**SAC Career Development Event** (15:45 - 16:40)		

Block C (CET)	18:00 – 20:00	MS06-B (3)	MS13 (1)	MS21 (2)	MS15 (2)	MS10 (2)
	20:00 – 21:00	**Poster Session 9** (MS06-A, MS13, MS15)				

FRIDAY, 04 JUNE 2021

Block A (CET)	09:00 – 09:05	Learn about Surface Measurement Systems			Learn about Qingdao: InterPore2022	
	09:05 – 09:35	**Invited lecture 9:** Christopher MacMinn			**Invited lecture 10:** Marie Rognes	
	9:35 – 9:40	Break				
	09:40 – 10:40	Poster Session 10 (MS01, MS05, MS08, MS13, MS15)				
	10:40 – 11:40	MS05 (2)	MS22 (2)	MS25 (5)	MS15 (3)	MS08 (2)
Block B (CET)	14:00 – 16:00	MS01 (3)	MS13 (2)	MS25 (6)	MS06-A (4)	MS08 (3)
	16:00 – 16:55	Visit the exhibitor booths - Company Representatives Available for Interactions			Networking Coffee Break (16:00 - 16:30)	
Block C (CET)	18:00 – 18:45	Keynote lecture 4: Lynn Gladden				
	18:45 – 19:00	Award Ceremony MDPI Energies Student Poster Awards Rien van Genuchten Early-Career Award of Porous Media for a Green World: *Kleber Marques Lisboa* InterPore Medal for Porous Media Research: *Marco Dentz* InterPore Rosettes				
	19:00 – 19:15	Closing Ceremony				

PROGRAM HIGHLIGHTS

Invited Lectures: *Hadi Hajibeygi & Oliver Röhrle*
Monday, Time Block A - *09:00 - 09:30 CET*

COMSOL & Thermo Fisher Presentations
Monday, Time Block A - *09:30 - 09:35 CET*

Opening Ceremony
Monday, Time Block B - *14:00 - 14:10 CET*

Award Ceremony: *InterPore Meritorious Service Medal*
Monday, Time Block B - *14:10 - 14:20 CET*

Keynote Lecture: *Thomas Ramstad*
Monday, Time Block B - *14:20 - 15:05 CET*

Award Ceremony: *National Chapter Awards & InterPore Honorary Lifetime Membership Award*
Tuesday, Time Block A - 9:00 - 9:10 CET

Keynote Lecture: *Thomas Driesner*
Tuesday, Time Block A - 9:10 - 9:55 CET

GeoDict & AxelSemrau Presentations
Tuesday, Time Block B - 14:00 - 14:05 CET

Invited Lectures: *Andres Clarens & Roseanne Ford*
Tuesday, Time Block B - 14:05 - 14:35 CET

Speed Networking Event
Tuesday, Time Block B -16:45 - 17:15 CET

Presentation by the Student Research Proposal on Face Masks Winner
Tuesday, Time Block B -16:45 - 17:00 CET

PROGRAM HIGHLIGHTS

Exhibition Booths Open
Tuesday, Time Block C -18:00 - 18:55 CET

SAC Music & Magic Event
Tuesday, Time Block C - 18:00 - 18:55 CET

Exhibition Booths Open
Wednesday, Time Block A - 11:00 - 11:55 CET

Networking Coffee Break
Wednesday, Time Block A - 11:00 - 11:30 CET

Award Ceremony: *InterPore Time Capsule & Kimberly-Clark Distinguished Lectureship Award*
Wednesday, Time Block C - 18:00 - 18:10 CET

Hiden Isochema & InterPore Academy Presentations
Wednesday, Time Block C - 18:10 - 18:15 CET

Invited Lectures: *Rick Chalaturnyk & Masa Prodanovic*
Wednesday, Time Block C - 18:15 - 18:45 CET

Award Ceremony: *InterPore PoreLab Award for Young Researchers & InterPore Award for Porous Media Research*
Thursday, Time Block A - 9:00 - 9:10 CET

Keynote Lecture: *Steven Jansen*
Thursday, Time Block A - 9:10 - 9:55 CET

Thermo Fisher & InterPore Academy Presentations
Thursday, Time Block A- 9:55 - 10:00 CET

Surface Measurement Systems & InterPore Foundation Presentations
Thursday, Time Block B - 14:00 - 14:10 CET

PROGRAM HIGHLIGHTS

Invited Lectures: *Zoe Shipton & Jacques Huyghe*

Thursday, Time Block B - 14:05 - 14:40 CET

Exhibition Booths Open

Thursday, Time Block B - 15:45 - 17:00 CET

SAC Career Development Event

Thursday, Time Block B - 15:45 - 16:40 CET

Surface Measurement Systems & InterPore2022 Qingdao Presentations

Friday, Time Block A - 9:00 - 9:05 CET

Invited Speakers: *Christopher MacMinn & Marie Rognes*

Friday, Time Block A - 9:05 - 9:35 CET

Exhibition Booths Open

Friday, Time Block B - 16:00 - 16:55 CET

Networking Coffee Break

Friday, Time Block B - 16:00 - 16:30 CET

Keynote Lecture: *Lynn Gladden*

Friday, Time Block C - 18:00 - 18:45 CET

Award Ceremony: *MDPI Engergies Student Poster Awards, Rien van Genuchted Early-Career Award of Porous Media for a Green World, InterPore Medal for Porous Media Research & InterPore Rosettes*

Friday, Time Block C - 18:45 - 19:00 CET

Closing Ceremony

Friday, Time Block C - 19:00 - 19:15 CET

MONDAY, 31 MAY 2021
Time Block A

Invited Speakers: Parallel Session 1
9:00 - 9:30 CET

Hadi Hajibeygi
TU Delft

Underground Hydrogen Storage: a multiscale experimental-numerical study

Subsurface geological formations provide giant capacities for storing renewable energy, when it is converted into green gas (e.g. hydrogen) or compressed and hot fluids. While the utilisation of subsurface formations have a long track of success in the past decades, their successful contribution in the energy transition towards a green world comes with new scientific challenges. The cyclically-stored fluids are expected not only to be stored safely, but to be reclaimed efficiently and with the same purity as in the injection phase. The critical stress also will impose restrictions on the volume, rate, and frequency of the storage cycles. In this talk, I will introduce this topic to the Interpore scientific community, and describe its key ingredients. Then a comprehensive multiscale lab -model development is presented. Objectives are to characterize the cyclic hysteretic fluid transport and rock mechanics across scales in variety of rocks from salt caverns to heterogeneous fractured porous media.

Invited Speakers: Parallel Session 1 *(cont.)*
9:00 - 9:30 CET

Oliver Röhrle
University of Stuttgart

The Theory of Porous Media in Modelling Biological Tissues

Experience and training are key aspects in medical practice. However, unlike other professions, medical practitioners have limited opportunities to perfect their skills before they must operate on people. Simulations help overcome such obstacles by carrying out virtual experiments, which would otherwise not be feasible. However, the human body is the most complex system known to mankind. The models for the simulations tend to be equally complex and computationally expensive. As humans are essentially a fluid saturated solid, empowering porous media models provides a useful and cost-effective tool for testing, analysing, planning and training of particular medical procedures. Simulating the vertebroplasty procedure, where a viscous fluid bone-cement is injected to the porous inside of vertebral bones to regain stability after the bone-cement has hardened, is one example. The key to use such simulations as a training / predictive tool is to validate the spread, i.e., the frontiers or the interfaces, of the injected bone cement (which is a PMMA), as it is injected, as well as the phase transition, i.e., the hardening process of the bone cement. Perfusion, i.e. flow of blood through capillaries into the heart or the organs, can be modelled using porous media as well. By including the transport equations, one can also model exchange processes occurring via advection, diffusion, and osmosis. Examples include vital processes like delivery of drugs to target organs, filtration of blood in the kidneys, gas exchange in the lungs, ion diffusion through the intervertebral disc, clotting of blood via thrombosis, etc., to name only a few. Especially linking the micro-scale chemical kinetics to tissue/organ scale porous media modelling is a powerful method for analysing, investigating and predicting (mechanical) behaviour of biological processes. There is a vast scope of applicability for porous media in the medical field, yet it is still largely untapped. Nevertheless, it has the potential to be one of the areas of mainstream research in the field, owing to its efficiency and versatility. In this talk, selected applications like the vertebroplasty and blood perfusion will be addressed.

MONDAY, 31 MAY 2021
Time Block A

Oral presentations: Parallel sessions

MS04: Swelling and shrinking porous media
Chairs: *Daniel Markl, Chris MacMinn*

09:40	[75] **On the mechanical behavior of expansive porous media with consideration on chemical effects** *Angelica Tuttolomondo, Alessio Ferrari, Lyesse Laloui*
09:55	[169] **Mesoporous, Moisture-Absorbent, Temperature-Controlled Hydrogels For Atmospheric Water Harvesting** *Galen Mandes, Sujit Datta, Jean-Francois Louf, Xiaohui Xu, Rodney Priestley, Sankaran Sundaresen*
10:10	[712] **Droplet absorption into thin layers of hydrogel** *Merlin Aragon Etzold, George T. Fortune, Stuart B. Dalziel, Julien R. Landel, M. Grae Worster*
10:25	[761] **Investigating signatures of fracture evolution during the drying of clay-rich architected porous media** *Chven Mitchell, Laura Pyrak-Nolte*
10:40	[478] **Clay settling in fresh and salt water: new dynamic X-ray micro-CT insights** *Wesley De Boever, Jan Dewanckele, Andreas Grießer, Yanhong Wang, Fangli Meng*
10:55	[734] **Diffusion of water in palm leaf materials** *debapriya pinaki mohanty, Anirudh Udupa, Mysore Dayananda, Srinivasan Chandrasekar*
11:10	[209] **A poro-elasto-visco-plastic model of the dewatering of a two-phase suspension** *Tom Eaves, Daniel T. Paterson, Hewitt Duncan R., Neil J. Balmforth, D. Mark Martinez*
11:25	[300] **Dissolution and swelling in porous media** *André F. V. Matias, Rodrigo C. V. Coelho, José S. Andrade Jr., Nuno A. M.*

Oral presentations: Parallel sessions, cont.

MS11: Microfluidics in porous systems

Chairs: Hassan Mahani, Hossein Hejazi

09:40	[94] **The Impact of Microscale Surface Roughness on Fluid Displacement Mechanisms and Residual Saturations in Porous Media** *Rumbidzai Nhunduru, Amir Jahanbakhsh, Krystian Wlodarczyk, Omid Shahrokhi, Susana Garcia, Mercedes Maroto-Valer*
09:55	[137] **Coal Relative Permeability Measurements Using Lab-on-a-chip Method** *jicheng zhang*
10:10	[140] **Pore Scale Visualization of CH4-CO2 Mixed Hydrates Phase Transitions During Stepwise Depressurization** *Jyoti Shanker Pandey, Ørjan Strand, Nicolas von Solms, Geir Ersland, Stian Almenningen*
10:25	[230] **Pore-level observation of the transitional pore clogging by asphaltene deposition using micromodels** *Yutaka Onaka, Kozo Sato*
10:40	[313] **Geometry evolution and fracture alteration controlled by spatial mineral heterogeneity during CO2 sequestration – A reactive transport study** *Mohammad Nooraiepour, hossein fazeli, Mohammad Masoudi, Helge Hellevang*
10:55	[412] **Microfluidic and numerical investigation of recirculation induced reaction hot spots in a porous media analog** *Michael Chen, Sang Lee, Peter Kang*
11:10	[488] **Ice crystallization and mechanical damage at the pore scale** *Rosa Sinaasappel, Clémence Fontaine, Scott Smith, Daniel Bonn, Noushine Shahidzadeh*
11:25	[586] **A quantitative study of transition states between single-phase steady flows in a microfluidic device** *Jindi Sun, Ziqiang Li, Saman Aryana*
11:40	[631] **Investigation of species transport in fractured media using 3D printed micromodels** *Alexandros Patsoukis Dimou, Hannah Menke, Julien Maes, Sebastian Geiger*

MONDAY, 31 MAY 2021
Time Block A

Oral presentations: Parallel sessions, cont.

MS15 (1): Machine Learning and Big Data in Porous Media
Chairs: *Hongkyu Yoon, Jianchun Xu*

09:40	[21] **Promises, Challenges and Prospects of Deep Learning for Providing Insight into Multi-phase Flow Through Porous Media** *Seyed Reza Asadolahpour, Zeyun Jiang, Helen Lewis, Jim Buckman*
09:55	[87] **Research on pore-scale hydrate permeability prediction based on machine learning** *Ziwei Bu, Jianchun Xu, Hangyu Li, Xiaopu Wang, Shuyang Liu*
10:10	[90] **Applying Machine Learning Methods to Speed Up Two-Phase Relative Permeability Upscaling** *Yanji Wang, Hangyu Li, Jianchun Xu, Ling Fan, Xiaopu Wang, Shuyang Liu*
10:25	[83] **Deep learning enhancement of micro-CT images for large-scale flow simulation** *Samuel Jackson, Yufu Niu, Sojwal Manoorkar, Peyman Mostaghimi, Ryan Armstrong*
10:40	[161] **Accelerating Micro-Macro Models for Two-Mineral Reactive Systems with Machine Learning** *Stephan Gärttner, Peter Frolkovic, Peter Knabner, Nadja Ray*
10:55	[324] **Flux Regression Performances of Deep Learning in Discrete Fracture Networks** *Stefano Berrone, Francesco Della Santa, Antonio Mastropietro, Sandra Pieraccini, Francesco Vaccarino*
11:10	[391] **Deep-learning-based surrogate model for brine extraction well placement for geological carbon storage** *Hyunjee Yoon, Yeongju Kim, Hoonyoung Jeong, Alexander Sun, Bo Ren*
11:25	[585] **Particle transport and filtration in 2D and 3D porous media: coupling CFD and Deep Learning** *Agnese Marcato, Gianluca Boccardo, Daniele Marchisio*
11:40	[617] **Inter-well Connectivity Analysis and Productivity Prediction Based on Intelligent Connectivity Model** *Yunqi Jiang, Kai Zhang*

Oral presentations: Parallel sessions, cont.

MS16: Fluid Interactions with Thin Porous Media

Chairs: *Divesh Bhatt, Chao-Zhong Qin*

09:40	[58] **Toolchain from the creation of the mesh to the CFD simulations** *Alaa-eddine Ennazii, Yann Henry, Jean Bouyer, Pascal Jolly, Pascal Doumalin, Aurelian Fatu, Anthony Beaudoin*
09:55	[121] **Inkjet printing lines onto thin, moving porous media - experiments** *Vignesh Murali, Jos C.H. Zeegers, Anton Darhuber*
10:10	[144] **Effect of surfactants on liquid absorption into porous media** *Helder Salvador, Daniel Turkenburg, Jeroen Schell, Nicolae Tomozeiu*
10:25	[197] **Visualizing imbibition in thin porous media with high-speed NMR** *ruben nicasy, Henk Huinink, Bart Erich, olaf adan*
10:40	[340] **High Speed-Laser Speckle imaging to unravel pico-liter droplets substrate interactions** *Riccardo Antonelli, Thomas Kodger, Nicolae Tomozeiu, Joris Sprakel*
10:55	[459] **Generation of Virtual Nonwoven Structures and Simulation Studies of Compression Behavior and Flow Permeability** *Sarah Staub, Sridhar Ranganathan, Stefan Rief, Konrad Steiner*
11:10	[464] **Effect of The Relative Humidity on The Porosity of PEM Fuel Cell Catalyst Layers** *Karrar Alofari, Ezequiel Médici, Jeffrey Allen*
11:25	[539] **Image-based modeling of spontaneous imbibition in porous media** *Chao-Zhong Qin, xin wang*
11:40	[737] **Flow of DNA solutions around cylindrical arrays** *Greg Forest, Paula Vasquez*

MONDAY, 31 MAY 2021
Time Block A

Oral presentations: Parallel sessions, cont.

MS21 (1): Non-linear effects in flow and transport through porous media
Chairs: *Michel Quintard, Yves Méheust*

09:40	[188] **Heat and mass transfer in a shear-thinning fluid through porous media** *Muhammad Sahimi, Senyou An, Vahid.J Niasar*
09:55	[422] **Upscaling Inertia Effects on Mixing and Reaction at Channel Intersections from Flow Topology** *Peter Kang, Sang Lee, Woonghee Lee, Etienne Bresciani, Marco Dentz*
10:10	[733] **Pore-scale Mixing and the Evolution of Hydrodynamic Dispersion** *Marco Dentz, Alexandre Puyguiraud, Philippe Gouze*
10:25	[610] **Cell-scale haemodynamics and transport in canonical disordered porous media: numerical simulation and microfluidic experiments** *Qi Zhou, Kerstin Schirrmann, Igor Chernyavsky, Anne Juel, Oliver E. Jensen, Miguel O. Bernabeu*
10:40	[679] **Scaling of vertical mixing in two-species buoyancy-driven instabilities** *Anne De Wit, Shyam Sunder Gopalakrishnan, Bernard Knaepen*
10:55	[384] **Gravity-driven instability in fracture flows with miscible fluids of different densities** *Hongfan Cao, Seonkyoo Yoon, Zhenyu Xu, Laura Pyrak-Nolte, Etienne Bresciani, Peter Kang*
11:10	[342] **Postitive feedback effects in 2D creeping flow of viscoelastic fluids through porous media amplify preferential flow paths** *Omar Mokhtari, Yohan Davit, Michel Quintard*
11:25	[317] **Non-Newtonian flow in macroscopic heterogeneous porous media: from power-law fluids to rheology with change of behavior** *laurent talon*

MONDAY, 31 MAY 2021

Time Block B

Opening Ceremony
14:00 - 14:10 CET

Award Ceremony
14:10 - 14:20 CET
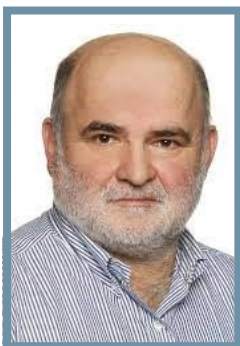
InterPore Meritorious Service Medal

Oleg Iliev

Fraunhofer ITWM, Germany

The InterPore Meritorious Service Medal recognizes individuals for exceptional, prolonged, impactful, and meaningful services to the Society. These individuals have exhibited such exceptional devotion of time, effort, thought, and action as to set them apart from other contributions.
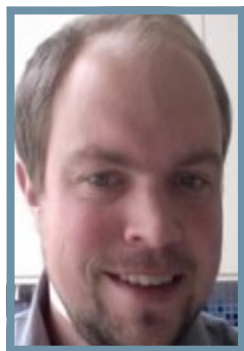
Keynote Lecture
14:20 - 15:05 CET

Thomas Ramstad
Equinor ASA

A digital workflow for analysis of flow in porous media: Multiphase transport phenomena from pore to field scale in subsurface flow

Multiphase flow in porous media is strongly influenced by the pore-scale mechanisms and in-situ arrangement of fluids. How fluids are distributed and transported are dependent on the pore structures in addition to wettability, fluid-fluid interactions and external boundaries. It is essential to understand these pore scale effects to obtain good constitutive relations for characterization of subsurface flow on multiple length scales.

To better predict fluid transport in subsurface reservoirs, the petroleum and subsurface industry rely heavily on analysis of reservoir rock core materials and fluids. By leveraging advances in pore scale imaging technology, we now frequently use high resolution X-ray computed tomography (CT) and micro-CT to get insight in fluid distribution and transport directly inside the pore space. Combined with core flooding experiments, such imaging capabilities may greatly enhance the value of experimental analysis and pore scale modelling.

I will in this talk present development of a workflow that combines core flooding experiments with CT imaging and pore scale modelling. Small samples of rock material are scanned with in-house micro-CT / CT equipment to generate 3D images of pore space and fluid distribution with resolutions down to a few micrometers. Sophisticated image analysis tools are used to acquire and register multiple scans of a sample, so that we can directly compare changes to fluid arrangements. Ultimately, digital pore scale models are generated for simulations of two-phase flow.

By collecting results from the different steps in such a digital workflow, we have gained new knowledge about pore scale transport mechanisms. That is again used to supplement results from traditional special core analysis (SCAL) such as capillary pressure, relative permeability curves and end-point saturations. Such parameters are essential input to large scale reservoir models used to improve drainage strategy, geologic carbon storage and enhance petroleum recovery.

Advances in knowledge of flow in porous media rely on a close collaboration between industry, vendors and academia. We continuously strive to improve and develop our analysis and software toolbox. The rapid evolution of open source development has created additional platforms for direct research collaboration between academia and industry, and faster deployment of novel research results.

Monday Detailed

MONDAY, 31 MAY 2021
Time Block B

Oral presentations: Parallel sessions

MS05 (1): Biochemical processes and biofilms in porous mediaflow

Chairs: *Valentina Prigiobbe, Charles Werth*

15:10	[110] **Studying viral aggregation in porous media** *Dong Zhang, Valentina Prigiobbe*
15:25	[361] **Pore-scale origin of flow-induced bio-aggregation** *Sang Lee, Eleonora Secchi, Peter Kang*
15:40	[367] **Life in a tight spot: How bacteria move in porous media** *Sujit Datta, Tapomoy Bhattacharjee, Daniel Amchin, Jenna Ott*
15:55	[420] **Microbial Induced Desaturation and Precipitation (MIDP) in Stratified Granular Soil** *Elizabeth G. Stallings Young, Leon van Paassen, Claudia E Zapata*
16:10	[547] **Evaluating the interaction of biofilms, organic matter and soil structures at the pore scale** *Alexander Prechtel, Simon Zech, Alice Lieu, Raphael Schulz, Nadja Ray*
16:25	[781] **Study of the Combined Effect of Reservoir Souring and Scale Formation in hydrocarbon reservoirs** *Ali Mahmoodi, Mohammad Reza Alizadeh, moein Jahanbani veshareh, Hamid M. Nick*
16:40	[190] **Enzymatic degradation of biomass: a porous media approach** *Sarah Blosse, Antoine Bouchoux, Paul Duru, Cédric Montanier*

Oral presentations: Parallel sessions, cont.

MS10 (1): Advances in imaging porous media: techniques, software and case studies

Chairs: *Liwei Zhang, Matthijs de Winter, Maja Ruecker*

15:10	[461] **In-Situ Micro-CT Studies to Understand the Role of Salt Precipitation during CO_2 Storage in Saline Aquifers** *Puyan Bakhshi, Omid Shahrokhi, Susana Garcia, Mercedes Maroto-Valer*
15:25	[426] **A framework to map pore volume change and mineral dissolution/precipitation of wellbore cement exposed to high concentration CO2 using micro-CT images** *Liwei Zhang, Yan WANG, Manguang Gan, Kaiyuan Mei*
15:40	[655] **A Novel Technique of Image Analysis on Foam in Fractures** *Kai Li, Karl-Heinz Wolf, William Rossen*
15:55	[646] **Magnetic Resonance and Magnetic Resonance Imaging of Porous Media – Recent Developments** *Armin Afrough, Bruce J. Balcom*
16:10	[561] **Spontaneous imbibition dynamics in yarns and knit stitches by fast X-ray tomography and free energy analysis** *Robert Fischer, Christian M. Schlepütz, René M. Rossi, Dominique Derome, Jan Carmeliet*
16:25	[511] **Use of topological principles to determine wettability from pore-scale images** *Luke Kearney, Martin Blunt*

MONDAY, 31 MAY 2021
Time Block B

Oral presentations: Parallel sessions, cont.

MS17 (1): Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales
Chairs: *Bernard Krooss, Yingfang Zhou*

15:10	[16] **Mesoscale Modelling of Thermal-Chemical processes during Nuclear Fuel Corrosion** *Min Liu*
15:25	[216] **Unsaturated porous media freezing: numerical modeling and validation based on experimental data** *Abdel Hassan Sweidan, Yousef Heider, Bernd Markert*
15:40	[226] **Measuring The Anisotropic Heat Transfer Coefficients In Carbon Fiber Felt** *Shaolin Liu, Azita Ahmadi, Hermes Scandelli, Cyril Levet, Jean Lachaud*
15:55	[232] **A Darcy scale coupled fluid-thermal framework to model radionuclide transport from a deep disposal borehole** *Kaveh Sookhak Lari, Dirk Mallants*
16:10	[310] **Soret effects in porous media** *Bjørn Hafskjold, Signe Kjelstrup, Olav Galteland, Dick Bedeaux*
16:25	[350] **Modelling hydrate formation in porous media: Capillary inhibition effects** *MARIA DE LA FUENTE, Jean Vaunat, Héctor Marín-Moreno*
16:40	[353] **Introduction of Anisotropic Heat Transfer Coefficient** *Hermes Scandelli, Azita Ahmadi, Shaolin Liu, Jean Lachaud*

Oral presentations: Parallel sessions, cont.

MS19 (1): Electrochemical processes in porous media

Chairs: Jeff Gostick, Iryna V. Zenyuk

15:10	[39] **Controlling Gas Diffusion Layer Wettability via Additive Manufacturing and Simulation** *Sadeq Saleh, Sadaf Sobhani*
15:25	[91] **Numerical Modeling of Capillary-Driven, Paper-Based, Flow-Through, Microfluidic Redox Flow-Batteries** *Pardis Sadeghi, Erik Kjeang*
15:40	[460] **Evaluation of the Impact of Flow Field Design on the Porosity of Zinc Deposition in the Zinc-Iodide Flow Battery by X-ray Computed Tomography** *Fatemeh ShakeriHosseinabad, Sohrab Randjbar Daemi, Paul Shearing, Edward (Ted) P.L.Roberts*
15:55	[741] **Insights into capillary pressure in the GDL of operating polymer electrolyte fuel cells** *Adrian Mularczyk, Qingyang Lin, Daniel Niblett, Jens Eller*
16:10	[565] **Non-solvent Induced Phase Separation: A Synthetic Approach Towards High Performance Redox Flow Battery Electrodes** *Rémy Jacquemond, Charles Tai-Chieh Wan, Yet-Ming Chiang, Kitty Nijmeijer, Fikile R. Brushett, Antoni Forner-Cuenca*

MONDAY, 31 MAY 2021

Time Block B

Oral presentations: Parallel sessions, cont.

MS20: Biophysics of living porous media: theory, experiment, modeling and characterization

Chairs: *Fred Vermolen, Tobias Koeppl*

15:10	[199] **Accurate numerical simulation of electrodiffusion and water movement in brain tissue with cortical spreading depression as a case study** *Ada Johanne Ellingsrud, Marie Elizabeth Rognes, Patrick Farrell, Nicolas Boulle, Didrik Dukefoss, Rune Enger, Klas Pettersen, Geir Halnes*
15:25	[343] **A sequential grid-block upscaling method for highly heterogeneous tumors: application to osteosarcoma** *Adel Moreno, Michel Quintard, Anthony Mancini, Anne Gomez-Brouchet, Pacal Swider, Pauline Assemat*
15:40	[142] **Upscaling between an agent-based model (smoothed particle approach) and a continuum-based model for wound contractions** *Qiyao Peng, Fred Vermolen*
15:55	[671] **Simulation of blood flow in a whole mouse brain vasculature** *Erlend Hodneland, Jan Martin Nordbotten, Noeska Smit*
16:10	[316] **Microstrokes and capillary dilations – investigating the effect of single capillary alterations** *Franca Schmid, Giulia Conti, Bruno Weber, Patrick Jenny*
16:25	[482] **The role of collateral vessels in redistributing blood flow during stroke – combining in vivo data with blood flow simulations in semi-realistic networks using an inverse model** *Robert Epp, Nadine F Binder, Chaim Glück, Mohamad El Amki, Susanne Wegener, Bruno Weber, Patrick Jenny, Franca Schmid*
16:40	[676] **Numerical modelling and experimental validation of percutaneous vertebroplasty** *Zubin Trivedi, Dominic Gehweiler, Christian Bleiler, Arndt Wagner, Tim Ricken, Boyko Gueorguiev-Rüegg, Oliver Röhrle*

Oral presentations: Parallel sessions

MS01 (1): Porous Media for a Green World: Energy & Climate

Chairs: *Bo Guo, Lauren Beckingham*

18:00	[71] **Towards Geologic CO2 Sequestration at Scale: A Review of Geomechanical Impacts, Induced Seismicity Concerns, and Mitigation Measure** *Jens Birkholzer, Yves Guglielmi, Keurfon Luu, Jonny Rutqvist, Abdullah Cihan*
18:15	[103] **Lab-scale characterization of a shaly caprock for CO2 storage: advancements and limitations** *Eleni Stavropoulou, Lyesse Laloui*
18:30	[106] **An adaptively coupled multiphysics model for compositional two -phase flow targeting underground gas storage** *Beatrix Becker, Rainer Helmig, Bernd Flemisch*
18:45	[555] **Heterogeneity effects on the Solubility-trapping during CO2 Geological Sequestration** *PRADEEP REDDY PUNNAM, Lakshmi Devi Voleti, Vikranth Kumar Surasani*
19:00	[748] **Mineralisation from carbon dioxide convective dissolution in a packed bed Hele-Shaw reactor** *Delora Gaskins, Sam Dehaeck, Anne De Wit*

MONDAY, 31 MAY 2021
Time Block C

Oral presentations: Parallel sessions, cont.

MS02: Porous Media for a Green World: Water & Agriculture
Chairs: *Diganta Das, Nima Shokri*

18:00	[62] **EVALUATION OF SURFACTANT AND FOAM PROCESSES FOR IN-SITU NAPL REMEDAITION IN A MILITARY BASE, SOUTH KOREA** *Hazem Fleifel, Gyu Sang Lee, SEUNG IHL KAM*
18:15	[311] **The importance of accurate evapotranspiration forecast for crop irrigation: A global sensitivity analysis of two model case studies** *Theodor Bughici, Naftali Lazarovitch, Eran Tas*
18:30	[507] **Multiscale Modeling of Direct Contact Membrane Distillation: Macroscopic Modeling and Pore Scale Modeling** *Hesam Bazargan Harandi , Anahita Asadi, Hossein Fathi, Pang-Chieh Sui*
18:45	[559] **The impact of drought-induced root and root hair shrinkage on root-soil contact** *Patrick Duddek, Mutez Ahmed, Nicolai Koebernick, Luise Ohmann, Goran Lovric, Andrea Carminati*
19:00	[711] **Modelling rhizosphere water movement in whole plant models** *Daniel Leitner, Andrea Schnepf, Jan Vanderborght, Harry Vereecken*
19:15	[282] **EUTROPHICATION CONTROL TREATMENTS AND SEDIMENT POROSITY** *Anne M. Hansen, DAngelo Sandoval-Chacón, Vanessa G. Moreno-Ayala*

Oral presentations: Parallel sessions, cont.

MS08 (1): Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

Chairs: *Amir Raoof, Marco Dentz*

18:00	[147] **Three-Dimensional Imaging of Density-Driven Convection in Porous Media Using X-ray CT Scanning** *Anna-Maria Eckel, Ronny Pini*
18:15	[173] **Experimental investigation of buoyant convection in a heterogeneous porous media: Two-layers separated by an inclined permeability jump*** *Bharath Kattemalalawadi, Morris Flynn*
18:30	[151] **An open-source integrated solution for flow and transport in random heterogeneous porous media** *Eugenio Pescimoro, Matteo Icardi, Federico Municchi, Marco Bianchi*
18:45	[364] **Pore-scale imaging of unsaturated solute transport to determine the influence of fluid distribution on solute spreading and mixing** *Stefanie Van Offenwert, Veerle Cnudde, Shan Wang, Tom Bultreys*
19:00	[658] **Numerical study of dispersion through displacing phase in unsaturated porous media** *Rasoul Soufi, Amir Raoof, Seyed Hossein Mansouri*
19:15	[593] **Effective Transport Parameters of Porous Media from Microstructure Images.** *Lukas Maier, Joern Henning Matthies, Ulrich Nieken*

Monday Detailed Program

MONDAY, 31 MAY 2021
Time Block C

Oral presentations: Parallel sessions, cont.

MS09 (1): Pore-scale modelling

Chairs: *Yashar Mehmani, Oleg Iliev*

18:00	[383] **Growth and upscaling of viscous fingers in immiscible two-phase flow** *Santanu Sinha, Hursanay Fyhn, Subhadeep Roy, Alex Hansen,*
18:15	[404] **Improved micro-continuum formulations for pore-scale simulation of mineral dissolution** *Cyprien Soulaine, Julien Maes*
18:30	[436] **Dynamic pore-network modeling of coupled compositional flow and phase change dynamics in porous media** *Sidian Chen, Jiamin Jiang, Bo Guo*
18:45	[484] **Extending equilibrium thermodynamics to include fluid-surface interaction for nanonconfined fluids** *Narendra Singh, Filip Simeski, Matthias Ihme*
19:00	[545] **Sub-resolution feature size classification based on tunable X-ray dark-field imaging** *Benjamin Blykers, Caori Alejandra Organista Castelblanco, Matias Kagias, Matthieu Boone, Tom Bultreys, Marco Stampanoni, Veerle Cnudde, Jan Aelterman*
19:15	[587] **the impacts of pore-scale two-phase flow on mineral reaction rate** *Hang Deng, Pei Li, Sergi Molins*

Oral presentations: Parallel sessions, cont.

MS25 (1): Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken

Chairs: *Rien van Genuchten, Jan Vanderborght*

18:00	[95] **Transdisciplinary Soil Hydrology** *Jan Hopmans*
18:15	[399] **How Harry Vereecken's work contributes to reach the 2030 global sustainable development goals.** *Marnik Vanclooster, Sebastien Petit, Mathias Tidjani, Pierre Tovihoudji, Pierre Akponikpe*
18:30	[720] **Soil Moisture Data Fusion from Field Scale to Continental Scale** *Binayak Mohanty, Dhruva Kathuria*
18:45	[418] **Near-term forecasts of soil water states** *Michael Young, Tara Bongiovanni, Bridget Scanlon*
19:00	[527] **The Alento hydrological observatory: An advanced open-air laboratory to evaluate the impact of anthropogenic disturbances on ecosystem services in a Mediterranean catchment.** *Nunzio Romano, Carolina Allocca, Luisa Stellato, Sarah Schönbrodt-Stitt, Heye Bogena, Paolo Nasta*
19:15	[732] **On the value of using electrical resistance tomography to enhance sub-surface heterogeneity representation in HYDRUS 2D for simulating solute transport at the hillslope scale.** *Nandita Gaur, Maria Teresa Tancredi, David Radcliffe, Binayak Mohanty*

Monday Detailed Program

MONDAY, 31 MAY 2021
Time Block C

Poster[+] Session 1
19:35 - 20:35 CET

MS01: Porous Media for a Green World: Energy & Climate

[330] **Understanding dynamic pore-scale interactions for underground hydrogen storage through high resolution 3D X-ray imaging**
Zaid Jangda, Kamaljit Singh, Sebastian Geiger, Andreas Busch

[417] **Variations in Airflow Field and Soil Grain-Size of Simulated Shrubs with Different Spatial Configurations based on Wind Tunnel Experiments**
Xia Pan, Zhenyi Wang

[452] **MOFs based CH4 Hydrate Formation and Self-Preservation**
Jyoti Shanker Pandey, Qian Ouyang, Nicolas von Solms

[553] **Optimising site selection for hydrogen storage in porous rocks in the North Sea & Irish Sea**
Lubica Slabon

MS04: Swelling and shrinking porous media

[79] **Pore-scale hydro-mechanical modeling of gas transport in coal matrix**
Ahmad MOSTAFA, Luc Scholtès, Fabrice GOLFIER

[444] **Experimental Investigation of Capillary Number's Control on Stress-Dependent Shifts in Irreducible Saturation in Deformable Porous Media**
Amir Haghi, Richard Chalaturnyk

[497] **Modeling lithium diffusion in battery cathodes considering chemo-mechanically induced damage**
Jeffery Allen, Peter Weddle, Ankit Verma, Anudeep Mallarapu, Francois Usseglio-Viretta, Donal Finegan, Andrew Colclasure, Volker Schmidt, Orkun Furat, David Diercks, Kandler Smith

[672] **A discrete element model (DEM) for swelling behavior of clay**
Srutarshi Pradhan, Martin Alexander Toresen

[773] **Under pressure: Hydrogel swelling in a granular medium**
Jean-Francois Louf, Nancy Lu, Margaret O'Connell, H. Jeremy Cho, Sujit Datta

Poster[+] Session 1, cont.
19:35 - 20:35 CET

MS05: Biochemical processes and biofilms in porous media

[273] **The Influence of Motility on Bacterial Accumulation in a Microporous Channel**
Christoph Lohrmann, Miru Lee, Christian Holm

[290] **To biofilm or not to biofilm: Interplay between chemotactic dispersal and biofilm formation in bacterial communities**
Jenna Ott, Daniel Amchin, Selena Chiu, Tapomoy Bhattacharjee, Sujit Datta

[704] **A review on the use of microbial induced calcite precipitation for problematic soil engineering**
Ehsan Nikooee, Ghassem Habibagahi

[751] **Bacillus subtilis, A Plant Growth Promoting Rhizobacteria, Improves Soil Hydro-Physical Properties**
Fatema Kaniz, Yan Jin, Harsh Bais

[817] **Implications of plant exudates on the formation of rhizosheaths**
Riffat Rahim, Eva Kröner, Adrian Haupenthal

MS08: Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

[81] **Experimental investigation of physical dispersion and in-situ mixing during low salinity waterflooding**
Arman Darvish Sarvestani, Behzad Rostami, Hassan Mahani

[114] **Flow rate and dissolution rate Impacts on the wormhole formation**
Ting Wang, Ran Hu, Zhibing Yang, Yi-Feng Chen

[149] **CPG modelling in fluvial channelised systems under uncertainty**
Amir Mohammad Norouzi, Masoud Babaei

[297] **Evaluation of mineral surface area evolution during dissolution reactions**
Fanqi Qin, Lauren Beckingham

MONDAY, 31 MAY 2021
Time Block C

Poster[+] Session 1, cont.
19:35 - 20:35 CET

MS08: Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media, cont.

[562] **Fabrication of Reactive Rocks with 3D Printing**
Shelby Wales, Ishan Anjikar, Vinita Shinde, Bryan Beckingham, Lauren Beckingham

[624] **Analytical Modeling of Mass Transfer Integrating Diffusion and Dispersion in Solvent Injection Based Heavy Oil Recovery Methods**
Wanju Yuan, Gang Zhao, Chang Su

[650] **Remobilization of Colloids in Porous Media Under Unsaturated Condition in column-scale experiments**
Vahid Nikpeyman, S. Majid Hassanizadeh, Amir Raoof

[666] **A homogenised model for flow, transport andsorption in a heterogeneous porous medium**
Lucy Auton, Satyajit Pramanik, Chris MacMinn, Mohit Dalwadi, Ian Griffiths

[682] **Solute transport during unstable infiltration into layered heterogeneous porous media**
Pedro Pampillon Alonso de Velasco, Luis Cueto-Felgueroso, Ruben Juanes

[692] **Effect of non-uniform passive advection on A+B->C radial reaction-diffusion fronts**
Alessandro Comolli, Anne De Wit, Fabian Brau

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MONDAY, 31 MAY 2021
Time Block C

Oral presentations: Parallel session

MS25 (2) Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken

Chairs: *Rien van Genuchten, Jan Vanderborght*

19:35	[416] **Pedotransfer for infiltration estimation** *Yakov Pachepsky, Seongyun Kim, Gülay Karahan*
19:50	[172] **Unsaturated hydraulic properties in a nearly saturated medium** *John Nimmo*
20:05	[150] **Suction Cup System-Dependent Variable Boundary Condition: Transient Water Flow and Multi-Component Solute Transport** *Iael Raij-Hoffman, Diederik Jacques, Naftali Lazarovitch*
20:20	[293] **Applications of Physics Informed Neural Networks for Modeling Soil Water Dynamics** *TOSHIYUKI BANDAI, Teamrat Ghezzehei*
20:35	[721] **On Fuzzy-Systems Modeling of Subsurface Flow** *Boris Faybishenko, Lavanya Ramakrishnan, Deborah Agarwal*
20:50	[766] **Accurate determination of the time-validity of Philip's two-term infiltration equation** *Jasper Vrugt, Parakh Jaiswal*

TUESDAY, 01 JUNE 2021
Time Block A

Award Ceremony
9:00 - 9:10 CET

InterPore National Chapter Awards

The National Chapter Awards are given in recognition of remarkable activities over the past year.

Visit the National Chapters booth in the exhibition hall to learn more about joining or starting a National Chapter

InterPore Honorary Lifetime Membership Award
Brian Berkowitz
Weizmann Institute of Science, Israel

The Honorary Lifetime Membership Award is reserved for individuals who have made extraordinary contributions to porous media science and technology, who are world renowned in the porous media community, and whose contributions are consistent with the aims and ideals of InterPore.

Keynote Lecture
9:10 - 9:55 CET

Thomas Driesner
ETH Zürich

Numerical simulation aiding the development of superhot geothermal resources

There is mounting evidence that many conventional high-enthalpy geothermal resources that are exploited for power generation in volcanic areas are underlain by so-called superhot resources. Superhot resources are loosely defined as having a temperature higher than the critical temperature of water (374°C) and enthalpies ideally high enough to not intersect the two-phase region upon production, i.e., can be produced to generate dry, superheated steam. Two wells of the Iceland Deep Drilling project indeed tapped such resources: 450°C at 150 bar in well IDDP-1 at Krafla; and potentially up to >500°C in well IDDP-2 at Reykjanes. Although both cases encountered technical problems that prevented production from the wells, the potential of superhot resources is enormous with possibly up to 10 times more power per well. In order to better understand the geologic controls on and the nature of the resources, numerical simulations turned out to be the tool of choice. A key factor is the effect of the brittle to ductile transition temperature on rock permeability as it controls the maximum temperature of exploitable fluid. In the case of saline fluids, complex phase relations impose that economically attractive reservoirs are more likely to occur above deeper (5 vs. 2-3 km) magmatic intrusions. Furthermore, the salinity of the fluid may determine if and how a well can be started to become self-flowing. The presentation will illustrate key examples to highlight important factors as well as the requirements for meaningful numerical simulations.

TUESDAY, 01 JUNE 2021
Time Block A

Poster[+] Session 2
10:00 - 11:00 CET

MS02: Porous Media for a Green World: Water & Agriculture

[115] **Mapping Land Use and Land Cover Changes in Gilan Province of Iran between 1975 and 2015: GIS and Remote Sensing Analyses**
Noushin Khazaei, Ali Zahedi, Nima Shokri, Ralf Otterpohl

[325] **Targeted delivery of fertilizer in coarse textured soils using foam as carrier**
Mohammad Javad Shojaei, Dani Or, Nima Shokri

[474] **How heterogeneous distributions of wettability affects infiltration into soil**
Jonas Bentz, Eva Kröner, Ravi Patel

[476] **Pesticide transport in unsaturated soils: from column tests to laboratory lysimeter.**
Luca Vetere, Monica Granetto, Carlo Bianco, Roberto Revelli, Rajandrea Sethi, Tiziana Tosco

[508] **Pore-Scale Simulation of Mucilage Drainage in the Rhizosphere**
Omid Esmaeelipoor Jahromi, Eva Kröner

[648] **Plants control soil gas exchanges possibly via mucilage**
Adrian Haupenthal, Mathilde Brax, Jonas Bentz, Hermann Jungkunst, Klaus Schützenmeister, Eva Kröner

[780] **Solute Transport in Heterogeneous Soils from Different Land Management Practices**
Mackenzie Dughi, Federico Zabaleta, Fabian Bombardelli, Veronica Morales

MS03: Flow, transport and mechanics in fractured porous media

[46] **Explicit simulation of seismic waves in fluid-filled fractured porous media**
Vasily Golubev, Alexey Shevchenko

[177] **Using PIV and 3D printing to investigate fluid flow and solute transport in fractured porous media.**
Isamu Naets, Mehrdad Ahkami, Po-Wei Huang, Martin Saar, Xiangzhao Kong

[424] **Glass Micromodels Study of Emulsified Polymer Gel System for Conformance Control Applications**
Tinku saikia, Abdullah Sultan, Nur Khamidy

Poster[+] Session 2, cont.
10:00 - 11:00 CET

MS03: Flow, transport and mechanics in fractured porous media, cont.

[467] **Shear Displacements of an Embedded Fracture Network using XFVM – a Sensitivity Analysis**
Giulia Conti, Rajdeep Deb, Stephan Matthai, Patrick Jenny

[517] **Adaptive Virtual Element Methods for simulations in Discrete Fracture Matrix models**
Andrea Borio, Stefano Berrone, Stefano Scialò, Alessandra D'Auria, Fabio Vicini

[528] **Multiscale Model Reduction of Thermoporoelasticity Problems in Heterogeneous and Fractured Media Using Generalized Multiscale Finite Element Method**
Dmitry Ammosov, Maria Vasilyeva, Eric Chung

[592] **Application of the Virtual Element Method to Two-phase Flow of Immiscible Fluids in Porous Media**
Martina Busetto, Stefano Berrone

[628] **3D-1D coupling on non-conforming meshes via an optimization based three-field domain decomposition approach**
Stefano Berrone, Denise Grappein, Stefano Scialò

[803] **The morphology and surface-chemistry of gas-wetting nanoparticles and its effect on the liquid menisci in porous media**
Jiafeng Jin, Sun Jinsheng, Lv Kaihe

MS04: Swelling and shrinking porous media

[252] **Gas shale swelling and shrinkage characterized by controlled suction experiments**
Jinwoo Kim, Alessio Ferrari, Russell Ewy, Lyesse Laloui

[639] **Molecular Dynamics Study on Coal Matrix Swelling Characteristics by CO2, N2, and CO2–N2 Mixture**
Jinrong Cao, Yunfeng Liang, Yoshihiro Masuda, Ziqiu Xue, Toshifumi Matsuoka

[714] **Growth of gas-filled penny-shaped cracks in decompressed hydrogels**
Yansheng Zhang, Merlin Aragon Etzold, Adrien Lefauve

TUESDAY, 01 JUNE 2021
Time Block A

Poster[+] Session 2, cont.
10:00 - 11:00 CET

MS04: Swelling and shrinking porous media, cont.

[786] Microscale modeling of thermo-hydro-mechanical behavior of fruit tissue during drying
Xinzhu Mou, Zhenqian Chen

[789] An investigation of drug release from granules linking structure, process and release performance
Faraj Shmam

(MS19) Electrochemical processes in porous media

[38] EXPERIMENTALLY VALIDATED SIMULATION OF STRAIN-INDUCED BATTERY AGING
Ilona Glatt, Nils Wenzler, Mathias Fingerle, Raphael Zahn, Fabian Biebl, Erik Glatt, Sven Linden, Sebastian Rief, Andreas Wiegmann, Vanessa Wood

[321] Heterogeneous Wettability in Porous Catalyst Layers of PEM Fuel Cells: Modeling-based Analysis and Design
Wolfgang Olbrich, Thomas Kadyk, Ulrich Sauter, Michael Eikerling

[407] Surface Complexation Modeling on the Electrochemical Interactions of Low Salinity Waterflooding in Sandstone Reservoir
Hongna Ding, Xinjian Tan, Yaling Xu, Jihong Zhang

[550] A chronopotentiometric study of polymeric ion-exchange membranes in alcohol-water media
David García-Nieto, Juan Carlos Maroto, Sagrario Muñoz San Martín, V. María Barragán García

[566] Towards bottom-up design of porous electrode microstructures - coupling genetic algorithms with pore network modeling of redox flow battery electrodes
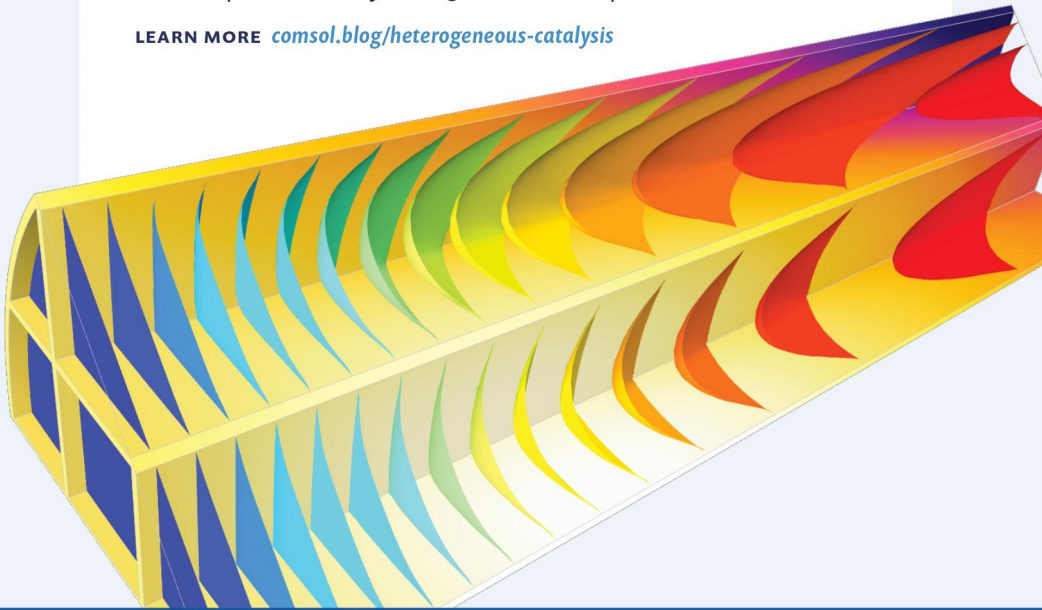*Maxime van der Heijden, Rik van Gorp, Gabor Szendrei, Amin Sadeghi, Jeff Gostick, Zandrie Borneman, Antoni Forner-Cuenca*

TUESDAY, 01 JUNE 2021
Time Block A

Oral presentations: Parallel session

MS25 (3): Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken
Chairs: *Jan Vanderborght, Rien van Genuchten*

10:00	[184] **EPISODIC EXTREME RAINFALL EVENTS DRIVE GROUNDWATER RECHARGE IN ARID ZONE ENVIRONMENTS OF CENTRAL AUSTRALIA** *Dirk Mallants, Theresa Boas*
10:15	[56] **Linearized Water and Air Flow in Porous Media** *Shmulik Friedman, Gregory Communar, Ido Nitsan, Ilan Ben-Noah, Ben Cohen, Alon Gamliel*
10:30	[385] **Transient ground water level simulation scale with pre-calculated time-varying recharge values** *Diederik Jacques, Bertrand Leterme, Matej Gedeon*
10:45	[625] **Revisiting pedotransfer function databases by fitting dual porosity model and analyzing matrix and macro-pore properties** *Yonggen Zhang, Lutz Weihermüller, Brigitta Szabo, Harry Vereecken*

Oral presentations: Parallel sessions

MS03 (1): Flow, transport and mechanics in fractured porous media
Chairs: *Holger Steeb, Yongfei Yang*

11:00	[67] **Gradient discretization of two-phase flows coupled with mechanical deformation in fractured porous media** *Francesco Bonaldi, Konstantin Brenner, Jérôme Droniou, Roland Masson, Antoine Pasteau, Laurent Trenty*
11:15	[77] **Evolution of fracture permeability induced by THMC-coupled processes** *Xiangzhao Kong, Marina Grimm Lima, Xintong Wang, Jin Ma*
11:30	[101] **Homogenization of Flow in Porous Media with Isolated Embedded Fractures** *Patrick Jenny*
11:45	[74] **Fluid charging and hydrocarbon accumulation in the sweet spot, Ordos Basin, China** *Wen Zhao, Lin Jiang, Chengzao Jia, Xiangfang Li*

Oral presentations: Parallel sessions, cont.

MS07 (1): Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Chairs: *Carina Bringedal, Shuyu Sun*

11:00	[100] **Upscaling reactive flow and transport in evolving porous media** *Nadja Ray, Stephan Gärttner, Peter Knabner, Peter Frolkovic*
11:15	[207] **Rigorous derivation of an effective model for reactive transport in evolving porous medium** *Markus Gahn, Iuliu Sorin Pop*
11:30	[514] **Macroscopic model for flow in exuding porous media** *didier lasseux, Francisco J. Valdés-Parada, Jean-François Thovert, Valeri Mourzenko*
11:45	[579] **Upscaling of a Cahn--Hilliard Navier--Stokes Model including Precipitation in a Thin Strip** *Lars von Wolff, Iuliu Sorin Pop*

MS12 (1): Advances in modeling and simulation of poromechanics

Chairs: *Jianchao Cai, Florin A. Radu*

11:00	[304] **Study on poromechanical problems of hydrate sediment during phase transition process** *Linlin Wang, Xiaoliang Dai, Linlin Wang*
11:15	[433] **Numerical yield surface determination of cemented rocks from digital microstructures** *Martin Lesueur, Hadrien Rattez, Manolis Veveakis*
11:30	[645] **Application of Lightning Breakdown Simulation in Inversion of Induced Fracture Network Morphology in Stimulated Reservoirs** *Hui Zhao, Guanglong Sheng,*
11:45	[770] **An Assumed Enhanced Strain (AES) finite element approach in modeling fracture propagation in partially saturated porous media** *Fushen Liu*

TUESDAY, 01 JUNE 2021
Time Block A

Oral presentations: Parallel sessions, cont.

MS17 (2): Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales

Chairs: *Moran Wang, Huijin Xu*

| 11:00	[89] **SIMULATION STUDY OF IN-SITU CONVERSION PROCESS IN LOW-MID MATURITY SHALE OIL RESERVOIR** *Zijie Wang, Jun Yao, Hai Sun, Lijun Liu, Xia Yan*
11:15	[134] **Numerical Modeling for the Reactive Process of Thermochemical Energy Storage Based on Lattice Boltzmann Method** *Bin Guo, Huijin Xu*
11:30	[516] **Marangoni Effect Reshapes Drying Pattern in Porous Media** *Yandong Zhang, Ke Xu*
11:45	[572] **Simulation of Thermochemical Heat Storage in the CaO/Ca(OH)2-System on the Micro-Scale** *Torben Prill, Marc Philipp Linder, Thomas Jahnke*

MS19 (2): Electrochemical processes in porous media

Chairs: *Pablo Garcia Salaberri, Veronika Schleper*

11:00	[470] **Understanding Electrolyte Infilling for Lithium Ion Batteries** *Christina Sauter, Raphael Zahn, Vanessa Wood*
11:15	[185] **Mesoscopic modeling of porous media with application to electrochemical energy conversion and storage devices: the case of gas diffusion layers and proton-exchange membranes** *Pablo Angel Garcia-Salaberri*
11:30	[326] **Peltier Heats in Lithium-Ion Batteries** *Astrid Fagertun Gunnarshaug, Lena Spitthoff, Preben Joakim Svela Vie, Odne Burheim, Signe Kjelstrup*
11:45	[398] **Lattice Boltzmann simulation in the context of battery systems** *Martin Lautenschläger, Julius Weinmiller, Timo Danner, Arnulf Latz*

Invited Speakers: Parallel Session 2
14:05 - 14:35 CET
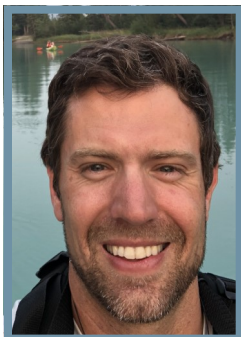
Andres Clarens
University of Virginia

Reinforcing and balancing feedback loops driven by dissolution and precipitation in reactive transport through porous media

In order for us to use the subsurface for novel energy applications, we need a better understanding of the feedback mechanisms wherein chemical reactions accelerate or suppress transport. Applications such as geologic carbon storage, geothermal energy production, waste disposal, or energy storage all present new opportunities for transitioning to a low carbon future but all involve the injection of fluids that interact with host rocks in complex ways. Predicting the flow of fluids in chemically and physically heterogeneously rock will be important to understanding how these technologies will perform over long time scales. Here we report on efforts to measure and then model the transport of CO_2 and water through rock containing mineral silicates. These silicates react with CO_2 to form multiple products some of which can be resolubilized over time and some of which are stable. The soluble species, such as carbonate, will precipitate within pore bodies, creating a reactive front and opening flow pathways over time. The stable species, which consist largely of silicate hydrates, can block flow creating negative feedback loops that will suppress long term fluid migration. Using a suite of micro- and macroscale techniques including air permeability, scanning electron microscopy and energy dispersive X-ray spectroscopy (SEM-EDS), synchrotron µX-ray diffraction (µXRD), and synchrotron µX-ray fluorescence (XRF) mapping I will discuss how these processes play out in diffusion dominated column experiments conducted under reservoir conditions, high pCO_2, high temperature, and buffered pH. The model system is very sensitive to initial pH conditions since dissolution processes control the leading edge of the reaction front. Interesting differences are observed experimentally between polymorphs of the same calcium silicate, which support the idea that regional dissolution processes can play an important role in controlling reactions and in turn fluid transport. After precipitation begins, the ways in which certain phases grows has an outsized impact on fluid transport. The growth of calcium silicate hydrates will be highlighted in particular because it tends to occur selectively within pore throats, which gives these reactions a disproportionally important role in limiting flow. In contrast, carbonates, which crystalize out of solution more uniformly in the pore space, are much less important in controlling fluid flow. Reactive transport modeling of this system reveals the interplay between dissolution-precipitation, volume changes, and porosity/permeability. The model incorporates microporosity in the calcium silicate phases to capture the changes observed in the experimental work and this has important implications for long term fluid transport. The modeling and its comparison with experimental work provides insight about how reactive transport modeling involving complex precipitate formation can be modeled in other contexts.

TUESDAY, 01 JUNE 2021
Time Block B

Invited Speakers: Parallel Session 2, cont.
14:05 - 14:35 CET

Roseanne Ford
University of Virginia

Facilitating the Reproduction of SimulationTransport of chemotactic bacteria in porous media with residual sources of chemical pollutants

Nonaqueous phase liquid (NAPL) contaminants are difficult to eliminate from natural aquifers due, in part, to the heterogeneous structure of the soil matrix. Residual NAPL ganglia remain trapped in regions where the hydraulic conductivity is relatively low and they are consequently less bioavailable. Bioremediation processes depend on adequate mixing of microbial populations and the groundwater contaminants that they degrade. The ability of chemotactic bacteria to sense a chemical gradient and swim preferentially up the gradient toward higher concentration can enhance the accumulation of bacteria near contaminant sources that may otherwise not be readily accessible by advection and dispersion alone.

In this work, we directly imaged Pseudomonas putida bacteria near naphthalene sources trapped within a pore network etched into a microfluidic device. We modeled bacterial transport at the pore scale using a convection-dispersion equation with the addition of chemotactic velocity to the convective term and first-order sorption-desorption kinetics for retention around NAPL ganglia. Previous simulations at the core scale in granular media showed that the heterogeneous hotspots of chemotactic bacteria around NAPL ganglia yielded overall greater retention of biomass in breakthrough curves compared to a nonchemotactic control. Our experimental observations at the pore scale confirmed the core scale simulation results by revealing greater accumulation of chemotactic bacteria (relative to a nonchemotactic control) near ganglia of naphthalene sources. Our pore scale simulation results showed that greater retention of bacteria was due to its chemotactic response to naphthalene gradients and sorption to NAPL ganglia. Our modeling predictions in combination with laboratory experiments at varying scales can be a useful tool to analyze the impact of chemotaxis on in situ bioremediation. This work is in collaboration with Xiaopu Wang, (China University of Petroleum-East China) and Beibei Gao (University of Virginia).

Oral presentations: Parallel sessions

MS03 (2): Flow, transport and mechanics in fractured porous media
Chairs: *Yongfei Yang, Holger Steeb*

14:40	[112] **Impact of Roughness on Multiphase Fracture Flow - Insights from 3D-Printed Fractures** *Tomos Phillips, Jeroen Van Stappen, Tom Bultreys, Stefanie Van Offenwert, Arjen Mascini, Shan Wang, Veerle Cnudde, Andreas Busch*
14:55	[124] **Flow in deformable fractures - From numerical studies to experimental investigations** *Patrick Schmidt, Dongwon Lee, Matthias Ruf , Holger Steeb, Jörg Renner*
15:10	[157] **Online Fast Flow simulations for Discrete Fractured Media with Non-Standard Reduced Basis Method** *Fabio Vicini, Stefano Berrone*
15:25	[535] **Fluid-driven particle transport patterns in fractures** *xinwei Hu, Zhibing Yang, Yi-Feng Chen*
15:40	[198] **A mixed-dimensional model for thermo-chemical-flows in fractured porous media** *Anna Scotti, Alessio Fumagalli*
15:55	[357] **Visualization and segmentation of micro-cracks based on X-ray computed tomography imaging** *Dongwon Lee, Matthias Ruf, Nikolaos Karadimitriou, Holger Steeb*
16:10	[372] **Experimental study of water vapour condensation in cracked concrete with different specimen states visualised by neutron tomography** *Ritesh GUPTA, Bratislav Lukić, Alessandro Tengattini, Matthieu Briffaut*
16:25	[515] **A Virtual Element Discretization of a 3D Elastoplastic Problem** *Francesca Marcon, Andrea Borio, Stefano Berrone*

TUESDAY, 01 JUNE 2021
Time Block B

Oral presentations: Parallel sessions, cont.

MS06-B (1): Interfacial phenomena in multiphase systems
Chairs: *Bjornar Sandnes, Eduardo Abreu*

14:40	[61] **A Laboratory Study of Foam Coarsening in Model Fractures** *Kai Li, Mohammadamin Sharifnik, Karl-Heinz Wolf, William Rossen*
14:55	[162] **Averaged Models for Two-Phase Flow in a Pore: The Effect of Hysteretic and Dynamic Contact Angles** *Stephan B. Lunowa, Carina Bringedal, Iuliu Sorin Pop*
15:10	[223] **A Unified Gas–Alkane Binary Interfacial Tension Calculation for A Broad Range of Pressure and Temperature: A Machine Learning Approach** *Yingnan Wang, Zhehui Jin*
15:25	[241] **Flow patterns and interface stability during drainage of liquid–particle mixtures** *Dongqi Li, Zhibing Yang, Renjun Zhang, Ran Hu, Yi-Feng Chen*
15:40	[294] **Graded viscosity banks on the rear end of the polymer slug** *Fedor Bakharev, Aleksandr Enin, Sergey Tikhomirov, Konstantin Kalinin, Yulia Petrova*
15:55	[453] **On a coupled FE-formulation for the freezing process of ice within the framework of the TPM** *Alexander Schwarz, Joachim Bluhm, Jörg Schröder*
16:10	[557] **Effect of grain circularity on the temporal evolution of interfacial area** *Fizza Zahid, Jeffrey Cunningham*
16:25	[589] **On the effects of colloidal particles in controlled oil-water interfaces.** *Mario Cordova Gonzalez, S. H. Hejazi*

Oral presentations: Parallel sessions

MS07 (2): Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Chairs: *Jakub Both, Carina Bringedal*

14:40	[70] **An iterative scheme for two-scale phase-field models in porous media.** *Iuliu Sorin Pop, Carina Bringedal, <u>Manuela Bastidas</u>*
14:55	[415] **An Efficient Solution Strategy for Variational Models of Brittle Fracture** *<u>Erlend Storvik</u>, Jakub Both, Juan Michael Sargado, Jan Martin Nordbotten, Florin Adrian Radu*
15:10	[629] **Benchmark of different coupling schemes for reactive transport in saturated porous media** *<u>Vanessa Montoya</u>, Renchao Lu, Jaime Garibay-Rodriguez, Thomas Nagel, Dmitri Naumov, Haibing Shao, Olaf Kolditz*
15:25	[186] **Simulation of fractured porous media using partitioned black-box methods** *<u>Alexander Jaust</u>, Patrick Schmidt, Holger Steeb, Miriam Mehl*
15:40	[638] **Dynamic coarsening for efficient simulation of geothermal energy applications** *<u>Øystein Klemetsdal</u>*
15:55	[381] **A 6M Digital Twin for Reservoirs** *tao zhang, <u>Shuyu Sun</u>*
16:10	[170] **Advancements in suction-induced fractures in multiphase porous media: Phase-field and data-driven multiscale modeling** *<u>Yousef Heider</u>*
16:25	[677] **Phase-wise conservative and physics-preserving algorithms for multi-phase flow in porous media** *Shuyu Sun, <u>Huangxin Chen</u>, Haijian Yang*

TUESDAY, 01 JUNE 2021
Time Block B

Oral presentations: Parallel sessions, cont.

MS09 (2): Pore-scale modelling
Chairs: *Stephane Zaleski, Ke Xu*

14:40	[7] **Digital Rock Analysis of Low Resistivity Pay Zones to Refine Saturation** *Ivan Deshenenkov, Aqeel Furaish, Hussain Alhilal*
14:55	[14] **Random Emulation of Large-Scale Natural Pore Networks** *Daniel Meyer*
15:10	[236] **A new probabilistic nucleation model to predict crystal growth in porous medium** *Mohammad Masoudi, Mohammad Nooraiepour, Andreas Berntsen, Helge Hellevang*
15:25	[356] **Pore-by-pore modeling, calibration, and prediction of two-phase flow in mixed-wet rocks** *Sajjad Foroughi, Branko Bijeljic, Qingyang Lin, Ali Qaseminejad Raeini, Martin Blunt*
15:40	[403] **Lattice Boltzmann modeling of contact angle hysteresis in liquid drying in porous media** *Feifei Qin, Jianlin Zhao, Qinjun Kang, Dominique Derome, Jan Carmeliet*
15:55	[458] **Validation and calibration of interface conditions for Stokes-Darcy problems** *Iryna Rybak, Elissa Eggenweiler, Paula Strohbeck*
16:10	[480] **Modeling the force balance controlling spatial distribution of deposited polymeric substances in porous media** *Peter Lehmann, Pascal Benard, Mohsen Zare, Andrea Carminati*
16:25	[485] **Experimental and Numerical Study of the Dynamic Wetting influence on the Multiphase Flow in a Pore Doublet Model** *Amine Ben Abdelwahed, Azita Ahmadi, JOEL BREARD*

Oral presentations: Parallel sessions

MS24 (1): Mathematical and computational challenges related to porous media - Special session in memory of Andro Mikelic

Chairs: *Sorin Pop, Mary Wheeler*

14:40	[224] **Fixed Stress Splitting for Coupled Flow and Poromechanics** *Mary Wheeler, Xueying Lu, Vivette Girault*
14:55	[193] **On the Equations of Nonlinear Single-Phase Poroelasticity** *Cornelis J. van Duijn*
15:10	[30] **The effective boundary condition on a porous wall** *Eduard Marusic-Paloka, Igor Pazanin*
15:25	[406] **Patterns in a reaction-diffusion double porosity system** *Mikhail Panfilov, NOURA EDDAOUI*
15:40	[41] **A Three-Scale Model for Flow in Paleo-Karst Reservoirs** *Marcio Murad, Patricia Pereira, Sandro Valente, Paola Ferraz, Eduardo Abreu*
15:55	[380] **Phase field fracture propagation with proppant transport and two phase flow** *Sanghyun Lee, Andro Mikelic, Mary Wheeler, Thomas Wick*
16:10	[299] **Numerical scheme for a coupled system in geomechanics** *Adrien Beguinet, Danielle Hilhorst, Ludovic Goudenège*
16:25	[28] **Multilayered poroelasticity interacting with Stokes flow** *Suncica Canic*

In Memoriam of Andro Mikelić

Andro MIKELIĆ was born on October 2nd, 1956 in Split, Croatia. He graduated in 1979 from the Faculty of Mathematics at the University of Zagreb, where he received his master's degree in 1981 and his doctorate in 1983. He has been showing a great interest in applied mathematics from his university days.

From graduation until 1992, he worked at the Ruđer Bošković Institute as an assistant, research associate, senior research associate and scientific advisor. He was an invited Professor at the University of Saint Etienne, France during the academic year 1990-91. From 1992 to 2011 he worked as a professor of applied mathematics at Claude Bernard Lyon 1 University in France. Since 2011, he has been a Full Distinguished Professor of Applied Mathematics at the same university.

He spent several sabbatical leaves at prestigious universities in Germany, the Netherlands and the USA (University of Heidelberg, Eindhoven University of Technology, University of Texas at Austin). From 2011 to 2013, he was a visiting professor at the University of Heidelberg.

Andro MIKELIĆ's scientific works pertain to the theory of homogenization, fluid mechanics and statistical hydrodynamics. In particular, he is most famous for his contributions to the homogenization of the Navier-Stokes and Euler equations, which describe multiphase flows through porous media, and to the determination of effective laws at the boundary between a porous medium and a free fluid (the Beavers-Joseph-Saffman condition). He also worked on establishing nonlinear laws of filtration through deformable porous media (the so-called Biot model), for thermoporoelasticity, as well as through soluble media. He obtained a number of fundamental results in such fields as reactive transport in porous media, non-Newtonian flows in complex domains, flows in porous media including random porous media, homogenization in coarse-grained domains, averaging in high contrast environments and for transport dominated regimes, homogenization of hydrodynamics models in domains with microstructure and rough boundary, electrokinetics problems in porous media, or blood flow modeling. He introduced, together with his co-authors, the notion of two-scale convergence in the mean, which became an important tool in stochastic homogenization. He studied also some fundamental asymptotic properties of fluid flows, like the inviscid limit of Navier-Stokes equations and effective boundary conditions on rough surfaces, Cahn-Hilliard equations for phase separation and crack propagation, or contact models with friction in solid mechanics. He contributed to the development of reliable and efficient iterative numerical schemes for coupled flow and geomechanics, or for hydraulic fracturing in a poroelastic medium.

Andro MIKELIĆ collaborated intensively with a large number of mathematicians, physicists, chemists or engineers. He liked very much cooperative work, and was very efficient at that: sharing new ideas and exploring new frontiers with his colleagues was his great pleasure. Being a sparkling scientist, he was able to connect communities, an example in this sense being the series of Dutch-French meetings on porous media he co-organized in the past. Moreover, through the conferences he co-organized in Dubrovnik or Split, many of his collaborators have discovered the beauty of his native country.

For the International Society for Porous Media (InterPore) community his work was truly a source of inspiration. He had a remarkable ability to find and understand critical issues related to porous media, and propose efficient solutions, relying on rigorous mathematical arguments. For his significant achievements in the porous media research, in 2012 he was awarded the InterPore Procter and Gamble Award . He co-authored six books and authored or co-authored more than 165 scientific papers, cited 2,254 times (according to MathSciNet database of the American Mathematical Society), respectively 3350 times (according to Web of Science).

Andro MIKELIĆ was a member of the editorial board of a number of journals: Applicable Analysis, ESAIM Proceedings, Differential Equations and Applications, International Journal of Differential Equations. He was elected a corresponding member of the Croatian Academy of Sciences and Arts in 2014.

Andro MIKELIĆ was not only an experienced scientist and a dedicated colleague. He was also an extraordinary human being and a dear friend to many of us. He was a lively person by all means: his sense of humor is legendary, as well as his love of good food and, of course, of good (red and strong) wines! Working with him was thus a double experience, scientific and humanistic.

The bright memory of Andro MIKELIĆ will live on in the hearts of all who knew him.

Grégoire Allaire, Brahim Amaziane and Sorin Pop
On Behalf of the French and Benelux InterPore Chapters

Speed Networking Event
16:45 - 17:15 CET

Join for our first InterPore Speed Networking Event!

Speed networking combines the casual feeling of spontaneously chatting with a few interesting strangers and the heightened engagement of face-to-face connection within a virtual setting. Attendees will be automatically placed in video chats of 2-4 attendees. After several minutes and an opportunity to chat, the tables will literally be turned, giving you a new opportunity to see new faces and start new discussions. This exciting round-robin will ensure you maximize your networking opportunities in a minimum amount of time.

Join the Speed Networking event directly from the agenda in Whova. It's accessible through both the mobile app and desktop.
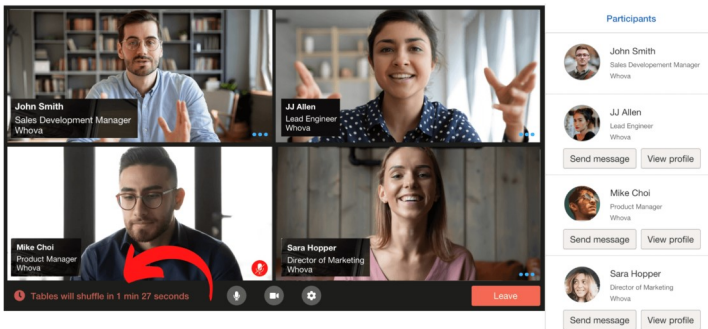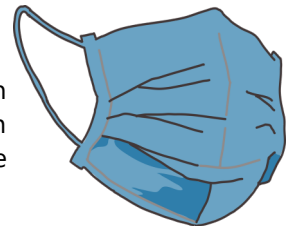

Presentation by the winner of Student Research Proposal on Face Mask Competition
16:45 - 17:00 CET

InterPore Foundation organized a competition among graduate students to write original research proposals on Innovative Ideas to Design/Improve Face Masks against Airborne Bacteria and Viruses.

The recipient, **S. Ali Ghoreishy** from the University of Calgary, will present his work.

SAC Music & Magic Event
18:00 - 18:55 CET

Join the Student Affairs Committee for a musical broadcast featuring talented members of our porous media community!

Majid Hassanizadeh

"I will be singing (karaoke style of course) two Napolitano songs: Besame Mucho and A Vucchela."

Olivier Vincent

"I have played piano and guitar on and off for a long time, and although I used to play with bands, I now mostly do solo improvisations to have fun around the instrument. I start with whatever is on my mind and make it evolve according to the current mood, with elements mostly inspired from jazz, blues, rock, and classical music."

Jeff Gostick

"I have been playing guitar since I was 13, which somehow adds up to more than 30 years experience (yikes!). I still play every day to relax and clear my mind, but also to challenge myself to learn new sk ills. Just before the pandemic hit I had started playing solo shows at local pubs."

Koondanibha Mitra

" I learned Indian classical vocals for about 8 years and then started playing guitar which I have carried on for 10 more years. I would like to play some well-known Rock ballads, so feel free to sing along."

Jaime Gomez-Hernandez

I am a magician known as "Placebus" —formerly known as "The Great Pichin"— and a researcher on porous media in my spare time. I will do a few "radio" tricks, also known as "telephone" tricks because they can be followed along by you if you have a deck of poker cards. Grab your deck of cards, clear some desk space in front of you and be ready to be amazed.

TUESDAY, 01 JUNE 2021
Time Block C

Poster[+] Session 3
19:00 - 20:00 CET

MS06-B: Interfacial phenomena in multiphase systems

[158] Impact of osmosis and emulsification on oil remobilization in pore-scale experiments
LIFEI YAN, Mohammad Hossein Golestan, Wenyu Zhou

[240] Controlling viscous fingering in hierarchal porous media
Harris Rabbani, Jassem Abbasi, Ran Holtzman, Thomas Daniel Seers

[373] Effect of pore geometry and contact angle on the capillary pressure and oil recovery factor in models of porous media
Afshin Davarpanah, Simon Cox

[491] 4D Investigation of groundwater remediation using nanotechnology- a synchrotron-based X-ray micro-tomography study
Tannaz Pak, Luiz Fernando de Lima Luz Junior, Tiziana Tosco, Paola Rodrigues Rangel Rosa, Gabriel Schubert Ruiz Costa, Nathaly Lopes Archilha

MS07: Mathematical and numerical methods for multi-scale multi-physics nonlinear coupled processes

[72] Effect of Viscosity Contrast on Miscible Rayleigh-Taylor Convection in Porous Media
Nasser Sabet, Hassan Hassanzadeh, Anne De Wit, Jalal Abedi

[219] Upscaling of two-phase flows in porous media
Sohely Sharmin, Iuliu Sorin Pop, Carina Bringedal

[603] Hygromechanical Properties of PEG-Treated Archaeological Wood: Molecular Simulation and Poromechanics
Ali Shomali, chi zhang, Eleanor J. Schofield, Benoit Coasne, Dominique Derome, Jan Carmeliet

[608] Computational modeling based on decomposition methods applied to polymer flooding in oil reservoir
Rodrigo Silva Tavares, Renatha Batista dos Santos, Sidarta Araujo de Lima, Adriano dos Santos, Viviane Klein

Poster[+] Session 3, cont.
19:00 - 20:00 CET

MS07: Mathematical and numerical methods for multi-scale multi-physics nonlinear coupled processes, cont.

[627] **Data-Driven Finite Element Method, Energy Conservation approach for temperature, water isotope ($\delta D, \delta ^{18}O$), and $[SiO_{2}]_{sat.}$ conc. distributions of the Culex Basin terrestrial hydrothermal system-Yellowstone, WY.**
Anthony Sorensen, Peter B. Larson, Sergey Lapin, Jarred L. Zimmerman

[718] **Global implicit solver for multiphase multicomponent flow in porous media with multiple gas components and general reactions**
Markus Knodel, Serge Kräutle, Peter Knabner

[746] **Quantifying Evolution of Mineral Reactive Surface Area and Pore Connectivity for Improved Prediction of Mineral Reaction Rates in Porous Media**
Md Fahim Salek, Fanqi Qin, Lauren Beckingham

[776] **Theoretical analysis of poroelastic response of spherical indentation into a half space via step-displacement loading**
Haiying Huang, Ming Liu

MS12: Advances in modeling and simulation of poromechanics

[27] **Numerical simulation of slope failure in a gas hydrate-bearing continental slope**
Sulav Dhakal, Ipsita Gupta

[76] **On predicting pore fluid pressure changes in unsaturated porous media subject to undrained processes**
Angelica Tuttolomondo, Alessio Ferrari, Lyesse Laloui

[256] **Comparision Modified Method of Peng-Robinson Equation of State in the Process of Gas Injection of Nanopores**
yuan zheng wang, 仁义 曹, 明 马

[499] **Transport analysis in deformable porous media through integral transforms**
Alessandra Bonazzi, Birendra Jha, Felipe P. J. de Barros

[820] **Extending a low permeability fluid flow model for transient flow of compressible and slightly compressible fluids.**
Susan Schrader

TUESDAY, 01 JUNE 2021
Time Block C

Poster[+] Session 3, cont.
19:00 - 20:00 CET

MS19: Electrochemical processes in porous media

[40] **Lattice Boltzmann simulations of invasion in porous transport layer (PTL) at anode side of polymer electrolyte membrane (PEM) water electrolyser**
Supriya Bhaskaran, Nicole Vorhauer, Vikranth Kumar Surasani, Evangelos Tsotsas, Shubhani Paliwal, DEBASHIS PANDA, Tanja Vidakovic-Koch

[164] **The Importance of Microstructure in Redox Flow Batteries**
Mohammadjavad Shokriafra, Vahid.J Niasar

[206] **Towards scalable multi-scale open-source solvers for ionic transport and electrochemistry**
Robert Barnett, Matteo Icardi, Federico Municchi, John King

[214] **Multiphysics modeling of vanadium redox flow batteries.**
Vanesa Muñoz Perales, Sabrina Berling; Pablo Angel Garcia-Salaberri; S.Enrique Ibañez; Marcos Vera-Coello; Jesús Palma; Enrique García

[296] **Applying Reaction-Diffusion Models to Analyse Turing Patterns on Batteries**
Rebecca Inkpen, Anotida Madzvamuse, Benedetto Bozzini

MS21: Non-linear effects in flow and transport through porous media

[221] **Drying of cellulose studied by Nuclear Magnetic Resonance**
Xiaoyan MA, Alban Gossard, Philippe Coussot

[277] **Permeability Decay Evaluation for a Nonlinear Oil flow through Porous Media in a Wellbore Near a Sealing Fault through Green's Functions (GF's)**
Fernando Bastos Fernandes

[298] **A stochastic analysis of the non-Newtonian hydraulic behavior of rough fractures**
Alessandro Lenci, Yves Méheust, Mario Putti, Vittorio Di Federico

[456] **Deformation-driven solute transport in soft porous media**
Matilde Fiori, Chris MacMinn, Satyajit Pramanik

[719] **On compressibility error of the lattice Boltzmann method for pore scale modeling of non-Darcy flow**
Milad Hosseini, Majid Siavashi, Milad Shirbani, Mohaddeseh Mousavi Nezhad

Poster[+] Session 3, cont.
19:00 - 20:00 CET

MS21: Non-linear effects in flow and transport through porous media, cont.

[755] **Modification of Darcy's Law by Considering the inertial effect**
Tian Zhiguo, Moran Wang

[777] **Resolving flow path resistance in heterogeneous porous media as a graph-theory problem**
Zoe Kanavas, Veronica Morales, Francisco Perez-Reche Perez-Reche

Poster[+] Session 4
20:00 - 21:00 CET

MS03: Flow, transport and mechanics in fractured porous media

[195] **Extension of SAFT equation of state to include calcite wall effect in water properties within water-calcite interface using molecular dynamic simulations**
Sajjad Ahmadigoltapeh, Saeed Abdolahi, Helge Hellevang, Miri Rohaldin

[431] **Strain evolution, faulting, and slow slip in Draupne shales**
Aldritt Scaria Madathiparambil, Fredrik Kristoffer Mürer, Kim Robert Tekseth, Nicolaine Agofack, Pierre Cerasi, Jessica McBeck, Francois Renard, Basab Chattopadhyay, Dag Werner Breiby

[532] **Coupled flow and deformation in heterogeneous fractured media: A multirate mass transfer approach for double-porosity poroelasticity**
Sandro Andres Martinez, Marco Dentz, Luis Cueto-Felgueroso

[774] **A midsurface extraction framework applied to core sample images for dimension reduction of fracture objects**
Carlos Augusto Soares Ferreira, Hamid M. Nick

MS09: Pore-scale modelling

[10] **Pore-throat structure and fractal characteristics of shale oil reservoirs in the Lucaogou Formation of Jimusaer Depression, China**
Rui Shen, Xiaoyi Zhang, Wei Xiong, Hekun Guo, Hongtao Zhou, Hang Yang, Huichen Ren

[19] **How does the power law dependency of flow rate on pressure gradient when viscous and capillary forces compete, scale with system size?**
Subhadeep Roy, Santanu Sinha, Alex Hansen

TUESDAY, 01 JUNE 2021
Time Block C

Poster[+] Session 4, cont.
20:00 - 21:00 CET

[279] **A new pore-merging method for simulating mineral dissolution in porous media using pore-network models**
Barbara Esteves, Paulo Laranjeira da Cunha Lage, Paulo Couto, Anthony Kovscek

[303] **A dynamic pore network model for imbibition simulation considering corner flow**
Jianlin Zhao, Feifei Qin, Qinjun Kang, Dominique Derome, Jan Carmeliet

[395] **Multi-phase flow parameters for unconsolidated reservoirs using digital rock physics**
Pit Arnold, Alexandru Badescu, Hendrik Rohler, Holger Ott

[397] **Poiseuillean viscous flows in menisci–bounded "bridges" and crevices of triangular pore channels: Blunt's model revisited**
Anvar Kacimov

[717] **Impact of Wettability on Reservoir Quality Distribution and Preservation**
stephen Gundu, Cees Der Land, Sanem Acikalin, Tannaz Pak

[509] **Estimation of auto-covariance of log hydraulic conductivity from Generalized sub-Gaussian porosity and particle size random fields**
Matthew Harrison, Mohaddeseh Mousavi Nezhad, Monica Riva, Alberto Guadagnini

[598] **Parametrization of uncertainty for predictive modeling of subsurface flow problems**
Alsadig Ali, Abdullah Al-Mamun, Marcio Borges, Maicon Correa, Felipe Pereira, Arunasalam Rahunanthan

[795] **Towards HPC simulations of Billion-cell Reservoirs by Multiscale Mixed Methods**
Roberto Ausas, Alfredo Jaramillo, Rafael Trevisanuto Guiraldello, Stevens Paz, Fabricio Sousa, Felipe Pereira

Poster[+] Session 4, cont.
20:00 - 21:00 CET

(MS17) Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales

[546] **Pore-scale physics in imposed thermal gradient drying in porous media using Lattice Boltzmann Method**
DEBASHIS PANDA, Shubhani Paliwal, Divyansh Pandey, Dasika Prabhat Sourya, Evangelos Tsotsas, Abdolreza Kharaghani, Vikranth Kumar Surasani

[642] **A (dual) network model for heat transfer in porous media**
Timo Koch, Kilian Weishaupt, Johannes Müller, Bernhard Weigand, Rainer Helmig

[743] **Porous Media Flow as a Heat Sink in a Triple Layered Electromagnetic Heat Exchanger**
Ajit Mohekar, Burt Tilley, Vadim Yakovlev

[792] **Experimental analysis and modeling of non-isothermal transient flows in granular porous media at large Biot numbers**
Cyril Levet, Azita Ahmadi, Guillaume Bon, Hermes Scandelli, Jean Lachaud, Shaolin Liu

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WEDNESDAY, 02 JUNE 2021
Time Block A

Poster[+] Session 5
9:00 - 10:00 CET

MS06-A: Physics of multi-phase flow in diverse porous media

[59] Modeling rate-dependent relative permeability of three-dimensional heterogeneous structures with a one-dimensional semi-analytical approach
Ziv Moreno, Avinoam Rabinovich

[107] Event-based measurements of contact angles during imbibition to evaluate contact angle hysteresis on a pore-by-pore basis using micro-CT
Sharon Ellman, Arjen Mascini, Tom Bultreys

[220] Modeling of the droplets capture/release dynamic of Water-Alternated-Emulsion flooding in porous media through a non-equilibrium mass transfer.
Fabian Andres Tapias Hernandez, Ranena V. Ponce F., Marcio Carvalho, Rafael Valladares de Almeida

[362] Pore-Scale Imaging of Tertiary Controlled-Salinity Waterflooding in a Heterogeneous Carbonate Rock at Reservoir Conditions
Ahmed Selem, Nicolas Agenet, Martin Blunt, Branko Bijeljic

[439] Laboratory scale investigation of CO2 flow mechanisms across clay-rich caprock
Iman Rahimzadeh Kivi, Victor Vilarrasa, Roman Makhnenko

[469] Image-based morphological characterization of multiphase porous media flow
Samaneh Vahid Dastjerdi, Nikolaos Karadimitriou, Holger Steeb

[568] Flow instabilities of viscoelastic polymer solutions in multiple contraction channels
Eseosa Ekanem, Steffen Berg, Shauvik De, Ali Fadili, Paul Luckham

MS06-B: Interfacial phenomena in multiphase systems

[242] Analytical modelling of foam in porous media
Abdallah El_Zamli, Lei Ding, Kofi Osei-Bonsu, Harris Rabbani

[243] Bulk and interfacial properties of alkanes in the presence of carbon dioxide, methane, and their mixture
Arun Kumar Narayanan Nair, Shuyu Sun

[244] Analytical Model for Predicting Dynamic Capillary Pressure-Saturation Relationship in Porous Media
Jawairia Abdul Salik, Thomas Daniel Seers, Jassem Abbasi, Harris Rabbani

Poster[+] Session 5, cont.
9:00 - 10:00 CET

MS06-B: Interfacial phenomena in multiphase systems, cont.

[281] **Fluid-structure interactions in a soft-walled Hele-Shaw cell**
Callum Cuttle, Satyajit Pramanik, Jian Hui Guan, Chris MacMinn

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[427] **Stability and performance of emulsion in bulk-scale and pore-Scale**
Mohammad Javad Shojaei, Senyou An, Vahid.J Niasar

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[554] **Threshold pressure for the capillary with irregular cross section**
Bei Wei, Jian Hou

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[700] **The influence of surfactant flooding on oil displacement in Nano-Silica Pores**
wei yong, Jos Derksen, Yingfang Zhou

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[762] **Fluid-solid interfacial area at different wetting conditions during multiphase in a porous medium**
Deepshikha Singh, Jyoti Phirani

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[804] **Rapid spreading of complex fluids in porous substrates**
Prashant Agrawal, Hemant Kumar, Prasoon Kumar

MS10: Advances in imaging porous media: techniques software and case studies

[155] **CT histogram-based estimation of sub-resolution porosity of sintered lunar regolith simulant**
Li Zhuang, Chuyen Ngoc Pham, Sun Yeom, Young-Jae Kim, Hyu-Soung Shin

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[269] **Impact of pore-space variations and orientation of layering on the flow properties of Coquina limestone**
Mohammad Madankan, Mehrdad Vasheghani Farahani, Elli Maria Charalampidou, Helen Lewis, Alessandro Tengattini, Erika Tudisco

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[409] **Multiscale pore network modeling of a carbonate rock sample using micro-CT and SEM images**
Gwenole Tallec, Arsalan Zolfaghari,

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[526] **Microstructure changes of oilwell cement enhanced by micro crystalized Ca-montmorillonite in ScCO2 condition**
Kaiyuan Mei, Liwei Zhang, Yan WANG, Manguang Gan, Xiaojuan Fu, Quan Xue

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WEDNESDAY, 02 JUNE 2021
Time Block A

Poster[+] Session 5, cont.
9:00 - 10:00 CET

MS10: Advances in imaging porous media: techniques software and case studies, cont.

[615] **Microstructural Evolution of Sand Assembly in Direct Shear Test: An Experimental Study using X-Ray Tomography**
Lalit Kandpal, Anurag Gautam, Nimisha Roy, Satoshi Matsumura, Prashanth Vangla, J. David Frost

[659] **Self-sealing in wellbore cement under CGUS conditions by micro-CT, SEM, DM, and Raman**
Yan WANG, Liwei Zhang, Manguang Gan

MS21: Non-linear effects in flow and transport through porous media

[268] **Identification of transport and clogging parameters of porous media**
Boris Maryshev, Anna Evgrafova, Nikolay Kolchanov, Mikhail Khabin

[408] **On the inverse problem of identifying the effective pore size distribution using non-Newtonian fluids**
Martin Lanzendörfer

[413] **Water infiltration to sandstone outcrops at the soil-rock interface**
Martin Slavík, Tomáš Weiss, Ondřej Sysel, Martin Lanzendörfer

[504] **An investigation on the accuracy and simulation performance of permeability estimation from 3D pore-scale imaging based on the solution of the Laplace's equation**
Ahmed Zoeir, Jafar Qajar, Hamed Aghaei

[583] **Converging gravity currents of power-law fluids in the subsurface**
Sandro Longo, Luca Chiapponi, Diana Petrolo, Alessandro Lenci, Vittorio Di Federico

WEDNESDAY, 02 JUNE 2021
Time Block A

Poster[+] Session 6
10:00 - 11:00 CET

(MS07) Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

[9] **Assessment of two hydraulic models of canal of Calais regarding the control issue**
Roza Ranjbar, Eric Duviella, Lucien Etienne, Jose Maria Maestre

[37] **COUPLING FREE FLOW AND POROUS-MEDIUM FLOW: COMPARISON OF NON-REFINED, GLOBALLY-REFINED AND LOCALLY-REFINED AXIPARALLEL FREE-FLOW GRIDS**
Melanie Lipp, Martin Schneider, Kilian Weishaupt, Rainer Helmig

[84] **3D adaptive modelling of transient multiphase flow experiments using the MOOSE framework**
Samuel Jackson, Chris Green, Mojtaba Seyyedi, Michael Clennell

[93] **A numerical study on the role of the slight compressibility on viscous fingering**
Fatemeh Bararpour, Mozhdeh Sajjadi

[400] **Coupled LBM-MHFEM simulator for vapor transport in air over a moist soil layer**
Jakub Klinkovský, Radek Fučík, Andrew Trautz, Tissa Illangasekare

[421] **Filtration with multiple species of particles**
Yixuan Sun, Lou Kondic, Linda Cummings

[462] **Implementation of Higher-Order methods for Modeling of the Single-Phase Multicomponent Flow in Porous Media**
Petr Gális, Jiří Mikyška

[660] **Global random walk solvers for flow and multi-component reactive transport in heterogeneous porous media**
Nicolae Suciu, Florin Adrian Radu

[764] **Efficient methane gas production strategies from gas hydrate reservoir using the numerical simulations**
Neelam Choudhary, Jyoti Phirani

Poster[+] Session 6, cont.
10:00 - 11:00 CET

[17] **Rheology of a mixture of compressible and incompressible immiscible fluids in the capillary fiber bundle model**
Hyejeong Cheon, Subhadeep Roy, Santanu Sinha, Alex Hansen

[116] **PORE-SCALE MODELLING IN SUPPORT OF SAFETY ASSESSMENT STUDIES FOR NUCLEAR WASTE REPOSITORIES IN FRACTURED ROCK**
Paolo Trinchero, Aitor Iraola, Patrick Bruines, Martin Stigsson, Bjorn Gylling, Jan-Olof Selroos

[154] **Direct Pore-scale Simulation of Thermal-Hydraulic-Mechanical Coupling Effect on the Process of Waterflooding with FVM Method**
Shaobin Cai, Yongfei Yang, Jun Yao

[196] **Meshless Lattice Boltzmann Method for pore-scale porous media flow**
Dawid Strzelczyk, Maciej Matyka

[272] **The effect of tomographic imaging resolution on residual saturations during the drainage process**
Barzan Karimi, Mohammadreza Moshtari, Saeid Sadeghnejad, Frieder Enzmann, Michael Kersten

[287] **A macroscopic two-length-scale model for natural convection in porous media driven by a species-concentration gradient**
Stefan Gasow, Yan Jin, Marc Avila, Andrey V. Kuznetsov

[334] **Pore Connectivity Analysis and Electrical Conductivity Model for Tight Sandstones**
Xiaowei Zhang, Xuefeng Liu, jingxu yan, Hao Ni, Fujun Xia

[335] **Modelling Multi-scale 3-D Digital Rocks by a New Image Segmentation Method**
jingxu yan, Xuefeng Liu, Xiaowei Zhang, Hao Ni, Fujun Xia

[405] **Operator Splitting with Capillary Relaxation (OSCAR)**
Julien Maes

[438] **Understanding the combined effect of structural and wettability heterogeneity on two-phase flow in porous media**
Amir Jahanbakhsh, Omid Shahrokhi, Mercedes Maroto-Valer

WEDNESDAY, 02 JUNE 2021
Time Block A

Poster[+] Session 6, cont.
10:00 - 11:00 CET

MS09: Pore-scale modelling, cont.

[465] **Transport properties modelled on multiscale porous media images**
Iman Nabipour, Jafar Qajar, Hamed Aghaei

[471] **Incompressible Smoothed Particle Hydrodynamics as a tool for modelling electrolyte distribution in Gas Diffusion Electrodes**
Thorben Mager, Manuel Hopp-Hirschler, Ulrich Nieken

[611] **Representative elementary volume for Opalinus Clay from three-dimensional pore structure and transport analysis**
Yuankai Yang, Naila Ait-Mouheb, Jenna Poonoosamy, Guido Deissmann, Dirk Bosbach

[819] **Block Copolymer Ultrafiltration Membranes: Stochastic Microstructure Delineation and Flow Simulation**
M. Sadegh Riasi, Lilly Tsaur, Ulrich Wiesner, Lilit Yeghiazarian

(MS12) Advances in modeling and simulation of poromechanics

[64] **Pore Pressure Sensitivity-Permeability Decay Evaluation for Nonlinear Oil Flow in Porous Media through Green's Functions (GF's)**
Fernando Bastos Fernandes

[234] **Shale microstructures: Experimental and fractal characterization**
Zhenhua Tian, Jianchao Cai, Wei Wei, Yuxuan Xia, Yihua Xiong

[246] **Coupled Thermal-Hydrological-Mechanical-Chemical Model For Reactive Dissolution and Wormhole Formation in Vugs Carbonate Rocks**
Cunqi Jia, Jun Yao

[688] **Imbibition Effect and Driving Mechanism of Nanofluid in Porous media**
Rundong Qiu, Chunyuan Gu

Poster[+] Session 6, cont.
10:00 - 11:00 CET

MS14: Uncertainty Quantification in Porous Media

[92] **Data assimilation for reducing uncertainty of subsurface flow modeling using meshless method**
Shang-Ying Chen, Kuo-Chin Hsu

[233] **Statistical prediction of waterflooding performance by K-means clustering and empirical modeling**
Qinzhuo Liao, gang lei, Xu Liu, Liang Xue, Shuyu Sun, Shirish Patil

[454] **Uncertainty-aware Validation Benchmarks for Coupling Free Flow and Porous-Medium Flow**
Farid Mohammadi, Bernd Flemisch, Sergey Oladyshkin, Elissa Eggenweiler, Iryna Rybak, Kilian Weishaupt, Martin Schneider

[540] **Quantification of uncertainty associated with the estimation of hydraulic parameters for saturated porous media**
SAHIL SHARMA, Chandni Thakur, Deepak Swami, K S Kasiviswanathan

[674] **Improvements of stochastic simplex approximate gradient (StoSAG) for production optimization**
Xu Jianchun, WENXIN ZHOU

WEDNESDAY, 02 JUNE 2021
Time Block A

Oral presentations: Parallel session

MS25 (4): Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken

Chairs: *Jan Vanderborght, Rien van Genuchten*

09:00	[446] **Non-invasive characterization of soils and aquifers: 20 years of hydrogeophysics at the Agrosphere institute** *Johan Alexander Huisman, Anja Klotzsche, Jan van der Kruk*
09:15	[662] **Data driven analysis of evapotranspiration estimated by the water balance and eddy covariance methods** *Tanja Denager, Majken Looms Zibar, Torben Sonnenborg, Karsten H. Jensen*
09:30	[647] **Estimation of unsaturated soil hydraulic properties by integrated hydrogeophysical inversion of time-lapse ground-penetrating radar measurements** *Khan Zaib Jadoon, Lutz Weihermüller, Sebastian Lambot, Sebastian Moghadas, Harry Vereecken*
09:45	[126] **Simple models of soil hydraulic properties in the complete moisture range: Testing the new PDI model system with a comprehensive experimental dataset** *Wolfgang Durner, Tobias Hohenbrink, Sascha C. Iden, Andre Peters*
10:00	[178] **HYDRUS and analytical modeling of seepage in porous banks of commingled ephemeral streams having triangular flash-flood hydrographs: emergence and extinction of an "ephemeral" unconfined aquifer** *Anvar Kacimov, Jiri Šimůnek*
10:15	[145] **Modelling and analysis of multicomponent transport at the interface between free and porous-medium flow influenced by radiation and roughness** *Rainer Helmig, Katharina Heck, Edward Coltman*
10:30	[725] **Effects of Soil Heterogeneity and Transient Flow on Multicomponent Biodegradation** *Darrell Tang, Sjoerd van der Zee*

WEDNESDAY, 02 JUNE 2021
Time Block A

Networking Coffee Break
11:00 - 11:30 CET

Missing the face-to-face interactions of in-person events? Don't worry - we have you covered!

Grab a cup of coffee, tea or your favorite beverage (it's 5 o'clock somewhere, right?) and join our ambassadors for a fun and informal chat. It'll be a great way to connect with other participants from around the globe. Join us!

Ambassadors:

Junjie Zhong
University of
Petroleum (East
China)

Liang Gong
University of
Petroleum (East
China)

Oral presentations: Parallel sessions

MS03 (3): Flow, transport and mechanics in fractured porous media
Chairs: *Olav Moyner, Hamid Nick*

14:00	[96] **Gas water two phase flow in fractured-porous carbonates** *Yingwen Li, Yongfei Yang*
14:15	[266] **A Stochastic Particle-Based Framework for Multiphase Flows in Fractured Porous Media** *Ranit Monga, Daniel Meyer, Patrick Jenny*
14:30	[651] **Numerical Simulation of Coupling Darcy and Forchheimer Flow in the Carbonate Reservoir** *Yueying Wang, Sebastian Geiger, Jun Yao*
14:45	[366] **Dynamic mesh optimisation for geothermal reservoir modelling** *Pablo Salinas, Geraldine Regnier, Carl Jacquemyn, Christopher C. Pain, Matthew D. Jackson*
15:00	[375] **Higher-Order Finite Element Multiphase Multicomponent Reactive Transport Model for Unstructured and Fractured Grids** *Mengnan Li, Derrick James, Joachim Moortgat*
15:15	[428] **Application of Adaptive Conservative Time Integration for Transport in Fractured Porous Media** *Michael Liem, Stephan Matthai, Patrick Jenny*
15:30	[607] **Investigation of Emulsion Flow in Microfluidic Fracture with Varying Aperture** *Wei Yang, Qingrong He, Ke Xu*
15:45	[669] **Strength and stability of fractured rocks** *Srutarshi Pradhan*

WEDNESDAY, 02 JUNE 2021
Time Block B

Oral presentations: Parallel sessions, cont.

MS06-A (1): Physics of multi-phase flow in diverse porous media
Chairs: *Carl Fredrik Berg, James McClure*

14:00	[78] **Dynamics of Water and Gas Injection in an Oil-Wet Reservoir Rock at subsurface conditions: A Pore-Scale Synchrotron X-ray Imaging Study** *Abdulla Alhosani, Alessio Scanziani, Qingyang Lin, Ahmed Selem, Amer Alhammadi, Sajjad Foroughi, Branko Bijeljic, Martin Blunt*
14:15	[393] **Material balance and mixing behavior during emulsification of crude oil by using micro-X-ray tomography** *Mostafa Borji, Ahmad Kharrat, Rene Ritter, Pit Arnold, Holger Ott*
14:30	[468] **Modelling pressure-saturation curves that exhibit hysteresis and forced imbibition with the pore-morphology method** *Christian Hinz, Andreas Wiegmann, Sven Linden, Jens-Oliver Schwarz*
14:45	[653] **Experimental study of steady state flow paths during the immiscible flow of ganglia in stochastic porous media micromodels** *Athanasios Anastasiou, Ioannis Zarikos, Andreas Yiotis, laurent talon, Dominique Salin*
15:00	[435] **A pore-network upscaling framework for the nanoconfined thermodynamic phase behavior in shale rocks** *Sidian Chen, Jiamin Jiang, Bo Guo*
15:15	[286] **Using colloidal deposition to mobilize immiscible fluids from porous media** *Schneider Joanna, Rodney Priestley, Sujit Datta*
15:30	[739] **Free flow over porous media: Heterogeneity and the Beavers-Joseph interface condition** *Matthijs de Winter, Kilian Weishaupt, Amir Raoof, Rainer Helmig*
15:45	[168] **ANALYTICAL SOLUTION FOR THE POPULATION-BALANCE MODEL DESCRIBING FOAM** *Rosmery Q. Zavala, Luis F. Lozano, Pacelli Zitha, Grigori Chapiro*

Oral presentations: Parallel sessions, cont.

MS06-B (2): Interfacial phenomena in multiphase systems
Chairs: *Ran Holtzman, Matteo Icardi*

14:00	[148] **Effect of grain shape on quasi-static fluid-fluid displacement in porous media** *Zhongzheng Wang, Pereira Jean-Michel, Yixiang Gan*
14:15	[180] **Droplet formation, growth and detachment on the interface of a coupled free flow – porous medium system** *Maziar Veyskarami, Rainer Helmig, Cynthia Michalkowski, Carina Bringedal*
14:30	[249] **Modelling dynamic behavior of an infiltration trenches system** *Marco Berardi, Francesco M. Di Lena, Rita Masciale, Michele Vurro, Ivan Portoghese*
14:45	[434] **Generalized coupling conditions for arbitrary flows to the fluid-porous interface** *Elissa Eggenweiler, Marco Discacciati, Iryna Rybak*
15:00	[360] **An energy-preserving MAC numerical scheme for the Volume Of Fluid method and application on Taylor flows** *Mohamed Id Moulay, Yohan Davit, Fabien Duval, Jean-Claude Latché, Michel Quintard*
15:15	[567] **Pore-scale effects during the transition from capillary- to viscosity-dominated flow dynamics within microfluidic porous-like domains** *Andreas Yiotis, Nikolaos Karadimitriou, Ioannis Zarikos, Holger Steeb*
15:30	[573] **Phase-field modelling of bulk-surface PDEs and adhesive interfaces** *Anne Boschman, Matteo Icardi, Kristoffer G. van der Zee, Bindi S. Brook, Federico Municchi*
15:45	[649] **Inverse modeling of transient three-dimensional core-scale two-phase flows** *andrea manzoni, Aronne Dell'Oca, Martina Siena, Alberto Guadagnini*

WEDNESDAY, 02 JUNE 2021
Time Block B

Oral presentations: Parallel sessions, cont.

MS07 (3): Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Chairs: *Jakub Both, Huangxin Chen*

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14:00	[125] **Reduced-dimensional models for flow in fractured porous media** *Florian List, Florin Adrian Radu, <u>Iuliu Sorin Pop</u>, Koondanibha Mitra, Kundan Kumar, Stephan B. Lunowa*
14:15	[181] **Density instabilities due to evaporation from porous media** *<u>Carina Bringedal</u>, Cornelis J. van Duijn, Gert-Jan J. M. Pieters, Rainer Helmig, Theresa Kurz*
14:30	[200] **Porosity Dynamics through Carbonate-Reaction Kinetics in High-Temperature Aquifer Storage Applications** *<u>Burt Tilley</u>, Martina Ueckert, Thomas Baumann*
14:45	[363] **A Graphical Representation of Membrane Filtration with Adsorption** *<u>Binan Gu</u>, Linda Cummings, Lou Kondic*
15:00	[490] **A hybrid-dimensional compositional two-phase flow model in fractured porous media with phase transitions and Fickian diffusion** *<u>Joubine Aghili</u>, Jean-Raynald de Dreuzy, Roland Masson, Laurent Trenty*
15:15	[119] **BDDC for MHFEM discretization of unsteady two-phase flow in porous media** *<u>Jakub Solovský</u>, Radek Fučík, Jakub Šístek*
15:30	[29] **Swelling beyond Flory** *<u>Jacques Huyghe</u>, Eanna Fennell, Philip Poillot*
15:45	[369] **Random Walks and Simplified Marching Cube for image-based simulations of heat or mass transfer in evolving porous media and applications to Ceramic-Matrix Composites** *<u>Gerard Vignoles</u>*

Oral presentations: Parallel sessions, cont.

MS14: Uncertainty Quantification in Porous Media
***Chairs:*** *Morris Flynn, Felipe Pereira*

|	
14:00	[23] **Uncertainty Quantification of Relative Permeability Measurements by Inverse Modelling** *Steffen Berg, Evren Unsal, Harm Dijk*
14:15	[437] **Reversible Degradation of Diclofenac under Biotic, Denitrifying Redox Conditions: Geochemical Model and Uncertainty Quantification** *Laura Ceresa, Alberto Guadagnini, Monica Riva, Giovanni Porta*
14:30	[578] **Multiscale Sampling for Subsurface Characterization** *Arunasalam Rahunanthan, Alsadig Ali, Abdullah Al-Mamun, Felipe Pereira*
14:45	[584] **Bayesian Inference of Poroelastic Properties from Induced Seismicity Data Using an Energy-based Poromechanics Model** *Mina Karimi, Mehrdad Massoudi, Matteo Pozzi, Kaushik Dayal*
15:00	[591] **A parallel recursive implementation of the Multiscale Perturbation Method for two-phase flow** *Arthur Espírito Santo, Eduardo Abreu, Felipe Pereira, Fabricio Sousa, Franciane Rocha*
15:15	[637] **Stochastic 3D microstructure modeling for three-phase electrode materials with an emphasis on transport relevant characteristics** *Matthias Neumann, Volker Schmidt*
15:30	[689] **A sequential implicit solver for two-phase subsurface flows using the Multiscale Robin Coupled Method** *Franciane Rocha, Fabricio Sousa, Roberto Ausas, Gustavo Buscaglia, Felipe Pereira*
15:45	[693] **Improving the accuracy of multiscale methods with informed interface spaces based on physics** *Fabricio Sousa, Franciane Rocha, Roberto Ausas, Gustavo Buscaglia, Felipe Pereira*

TESCAN Dynamic micro-CT
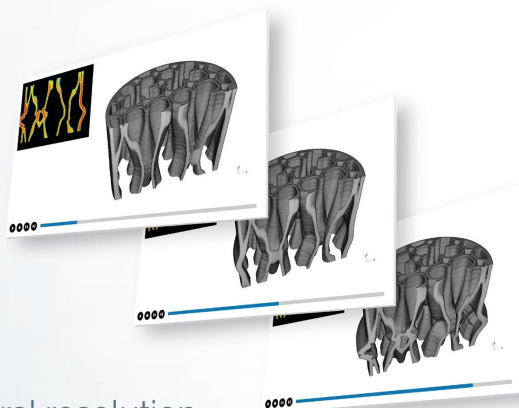
Leading the way in temporal resolution – shifting your research from 3D to 4D
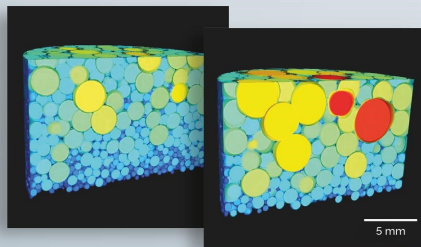
Dynamic Imaging of Aluminum Foam Compression - 20 sec/scan, 190 total scans

4 mm
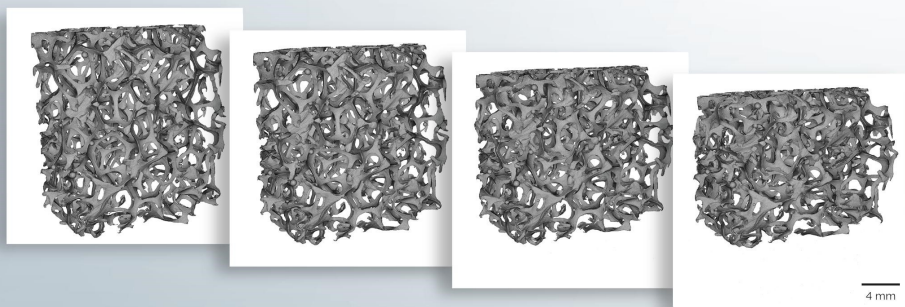
Dynamic Imaging of Dissolving Soap Bubbles - 30 sec/scan, 150 total scans

5 mm
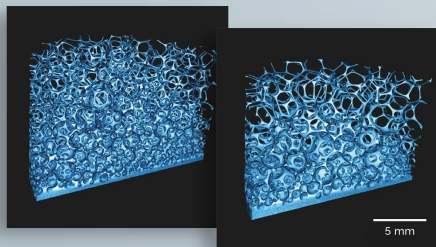
Analysis of Soap Bubble Coalescence

5 mm

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WEDNESDAY, 02 JUNE 2021
Time Block B

Poster[+] Session 7
16:00 - 17:00 CET

MS06-B: Interfacial phenomena in multiphase systems

[179] **Calculation Studies on Miscibility Characteristics of the CO2/n-Hexadecane System with Presence of Water Component under Geological Conditions**
Wang Xinrong, Dongxing DU

[238] **Multi-parameter Screening Study on Static Properties of Nanoparticle Stabilized Supercritical CO2 Foam**
Xiakai Song, Dongxing DU

[346] **Mathematical Modeling of the Effect of Acoustic Waves on oil Recovery in Porous Media**
Harris Rabbani, Albertus Retnanto, Amani Mahmood

[347] **Direct Visualization of Induced Asphaltenes Removal in Carbonate Rock Using Confocal Imaging**
Amani Mahmood, Arnel Carvero, Harris Rabbani

[450] **Hindered thermally driven migration of a drop on a chemically patterned wall chemically patterned solid wall**
Guangpu Zhu, Gretar Tryggvason, Jun Yao

[805] **Calcite dissolution in crude oil and formation of crystals on surface of Mica during Ageing Process**
Keshavarzi Shirazi Mosalman Mehrbod, Paul Luckham, Maja Ruecker, Apostolos Georgiadis, Fons Marcelis

MS11: Microfluidics in porous systems

[247] **Multi-scale dynamics of colloidal deposition and erosion in porous media**
Navid Bizmark, Schneider Joanna, Rodney Priestley, Sujit Datta

[327] **Visualization Research of Clay Mineral Migration in Low Salinity Water Flooding Based on 2.5D Microfluidic Model**
Fei Xu, Hanqiao Jiang, Shiyuan Qu, Fuwei Yu, Junjian Li

[374] **The Effect of Surface roughness on the Equilibrium Contact Angle in a Mixed-Wet Medium**
Shahab Ghasemi, Mohammad Reza Rasaei, Sahar Bakhshian

Poster[+] Session 7, cont.
16:00 - 17:00 CET

MS11: Microfluidics in porous systems, cont.

[449] In-situ real-time imaging to characterize spatially heterogeneous calcite dissolution rates at the nanoscale

Gianlorenzo Bussetti, Lamberto Duo', Alberto Guadagnini, Chiara Recalcati, Monica Riva, Martina Siena

[519] Analysis of droplet mobilization confined in a micro pore-doublet system at low capillary number

Qumars Azizi, Amir Hossein MOHAMMADI ALAMOOTI, Hossein Davarzani

[548] Film entrainment and particle transport during gas invasion in suspension -filled microchannels

ting wu, Ran Hu, hua zhong, lei yang, wenbiao jin, Yi-Feng Chen, Zhibing Yang

[570] Experimental study of drying in the presence of fluorescent colloidal particles in model porous media

Elisa Ghiringhelli, Marc Prat, Manuel MARCOUX

[727] Does the imaging domain size matter in modeling the permeability of bioclogged porous media inside a microfluidic channel with evolving biofilms?

Shahab Karimifard, Xu Li, Yusong Li

[767] Separation of colloidal particles in microchannels using diffusiophoresis

Mamta Jotkar, Luis Cueto-Felgueroso

MS16: Fluid Interactions with Thin Porous Media

[122] Inkjet printing lines onto thin, moving porous media - simulations

Gianmarco Venditti, Vignesh Murali, Anton Darhuber

[146] Electrical Impedance Spectroscopy: a tool to investigate interactions between complex fluids – porous materials

Nicolae Tomozeiu, Helder Salvador

[370] Lubricated hydrodynamic interactions between a hard spherical indenter and a poroelastic nanolayer

Caroline Kopecz-Muller, Vincent Bertin, Marjan Abdorahim, Yvette Tran, Patrick Tabeling, Elie Raphaël, Thomas Salez, Joshua McGraw

[429] Experimental Determination of Intrinsic In-Plane Permeability for Thin Porous Media

Luwen Zhuang, S. Majid Hassanizadeh

WEDNESDAY, 02 JUNE 2021
Time Block B

Poster[+] Session 7, cont.
16:00 - 17:00 CET

MS16: Fluid Interactions with Thin Porous Media, cont.

[477] **The effect of void structure on the permeability of fibrous networks**
Antti Koponen, Axel Ekman, Keijo Mattila, Ahmad Al-Qararah, Jussi Timonen

[560] **Numerical studies of capillary flow in paper-based microfluidic devices**
王杨, Dingding Ye, Xun Zhu, Yang Yang, Chao-Zhong Qin, Rong Chen, Qiang Liao

[816] **Nanofluid Evaluation for Enhanced Oil Recovery**
David Arguijo Muñiz, Ana Paulina Gómora Figueroa

[825] **Measuring co-diffusion kinetics on thin films**
Meishan Guo, Majid Naderi

MS20: Biophysics of living porous media: theory, experiment, modeling and characterization

[333] **Modelling the role of vWF in initiating arterial thrombosis**
Edwina Yeo, Netanel Korin, James Oliver, Sarah Waters

[602] **Characterising multi-domain porous structure of the human placenta by synchrotron X-ray micro-tomography**
Win M. Tun, Gowsihan Poologasundarampillai, Helen Bischof, Gareth Nye, Oliver N. F. King, Mark Basham, Yasuaki Tokudome, Rohan M. Lewis, Edward D. Johnstone, Paul Brownbill, Michele Darrow, Igor L. Chernyavsky

[605] **Hygromechanical mechanisms of wood cell wall revealed by molecular modeling and mixture rule analysis: Role of components, interphases and hydrogen bonding**
chi zhang, Sinan Keten, Benoit Coasne, Dominique Derome, Jan Carmeliet

MS25: Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken

[740] **Reactive Transport Modeling of Nanocapsules for Controlled Release of Cross-linking Agents for Conformance Control**
Hamed Mohammadnejad, Kurt D. Pennell, Linda M. Abriola

[810] **Impact of operational factors on Aquifer Storage and Recovery (ASR) scheme in saline regions**
Shubhaam Tiwari, Brijesh Kumar Yadav

WEDNESDAY, 02 JUNE 2021

Time Block B

Oral presentations: Parallel session

MS22 (1): Manufactured Porous Materials for Industrial Applications

Chairs: *Nikolaos Karadimitriou, Senyou An*

16:00	[250] **Fluid flow control devices with 3D-graded permeability** *David Robinson, Maher Salloum, Denis Ridzal, Drew P. Kouri*
16:15	[88] **Additive Manufacturing Via Digital Light Processing of Durable Ceramic Porous Structures for Application to Combustion Systems** *Giancarlo D'Orazio, Sadaf Sobhani*
16:30	[218] **Reaction-induced changes to structure and transmissivity of foamed wellbore cements** *Johnathan Moore, Magdalena Gill, Dustin Crandall, Richard Spaulding, Barbara Kutchko*
16:45	[358] **Study of the impregnation process of electric engines' rotors with a reactive thermosetting resin: modeling and characterization of multi-physical coupling** *Amélie Moisy, Sébastien Comas-Cardona, Nicolas Désilles, Pascal Genevée, Jere Kolehmainen*

Canon

Canon Production Printing develops and manufactures high-tech printing products and workflow software for the commercial printing market. The product offering includes continuous-feed and cut-sheet printers for high-volume printing and publishing, and large-format printers for display graphics and CAE/GIS applications.

Canon Production Printing has an impressive track record of innovation. These achievements are possible due to high quality and dedicated employees, significant investments in human and technical resources as well as profitable synergies with external parties.

Theoretical, numerical and experimental research in thin porous media and their interactions with a large variety of fluids is of great importance for several industries and products. For Canon Production Printing the most relevant instance of liquid interaction with porous paper is in the inkjet printing with water-based inks. Note that the phenomena associated with ink-media interactions is highly complex due to the media characteristics, the ink properties and the time scale of the physico-chemical processes.

The collaboration between the Canon Production Printing and the InterPore society started in 2012 and since then it has grown continuously. InterPore is the forum where technical and scientific questions are debated and the future research in the field of porous materials is penciled. Canon Production Printing is generating knowledge and experiments in the field of porous materials and their interactions with complex liquids.

WEDNESDAY, 02 JUNE 2021
Time Block C

Award Ceremony
18:00 - 18:10 CET

InterPore Time Capsule
Ghislain de Marsily

Often we know those pioneers of our field from their scientific work. We are aware of their scientific legacy and technical details of their achievements. But, usually we don't actually know much about their personal history, motivations, and philosophy.

With the intent of capturing that knowledge, the InterPore Time Capsules are a collection of interviews with some of the most eminent contemporary porous media scientists, who have played a major role in the development of porous media science and technology. The interviews are usually carried out by one or two well-known scientists, who have had some kind of professional connection to the interviewee.

Kimberly-Clark Distinguished Lectureship Award
Jacques M. Huyghe
*University of Limerick, Ireland*

Each year, InterPore selects a porous media researcher with an esteemed international recognition and excellent presentation skills, who works on a broad range of porous media topics, as the "InterPore Kimberly-Clark Distinguished Lecturer on Porous Media Science & Technology". The awardee will share a topic relevant to the industrial porous media community through a series of lectures at various member and non-member organizations.

Secure your chance to host Prof. Huyghe at your institute: Visit the InterPore booth for more information on how to apply.

A word of gratitude: This award has been made possible by a generous grant from Kimberly-Clark, home to some of the world's most iconic and trusted brands, including: Huggies, Scott, Kleenex, Cottonelle and Kotex. For more than a century Kimberly-Clark has been transforming insights and technologies into innovative products and services that improve the lives of nearly a quarter of the world's population.

Invited Speakers: Parallel Session
18:15 - 18:45 CET
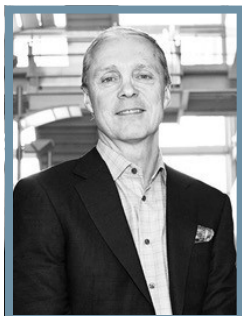
Rick Chalaturnyk
University of Alberta

Impact of Multi-scale Deformations on Multi-phase Flow Considerations in Porous Media

Subsurface processes reflected in groundwater hydrology in the vadose zone, geological CO_2 sequestration, transport of non-aqueous phase liquid contaminant in aquifers, extraction of geothermal energy and enhanced oil recovery require an accurate characterization of mechanical pore deformation, multiphase fluid transport, and their physical interactions (i.e., poromechanical interactions). Recognizing that the subsurface will also be exploited as an energy storage resource as society makes a transition to renewable energy sources, an improved understanding of the imposed coupled hydraulic, thermal, mechanical and chemical processes is required to ensure the subsurface is developed in a safe, secure manner. Pore-spaces present within these subsurface formations will deform in response to the changes in effective stress, and in general, the physical mechanisms controlling stress-dependent pore deformations are well-understood, both analytically (based on poroelasticity theory), and experimentally. These poromechanical interactions have been shown to have a major impact on single-phase (i.e., absolute permeability) and multiphase flow properties of porous media and so it is expected that multiphase flow mechanisms including drainage and imbibition would also expected to be deformation-dependent in porous media. Today, sophisticated models are being developed and implemented that can capture complex multiscale, multiphysics phenomena but rarely do these models incorporate dynamic changes (i.e. pore volume and topology changes due to changes in effective stress) in relative permeability and/or capillary pressure relationships. This presentation will explore recent experimental studies that have revealed significant impacts on the multiphase flow properties (e.g., relative permeability and capillary pressure) of rocks as a result of effective stress-induced pore deformation and the impacts on modeling from the pore network scale to reservoir scale will be discussed in relation to these studies.
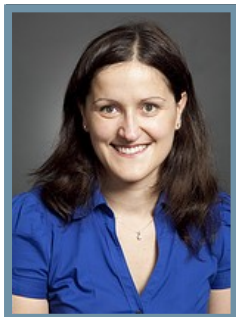
Wednesday Detailed Program

Invited Speakers: Parallel Session, cont.
18:15 - 18:45 CET

Maša Prodanovic
The University of Texas at Austin

Data-based prediction of transport in heterogeneous porous media

The current barrier to scientific progress in many science and engineering fields is not acquiring data, but efficiently using it for characterization, simulation of transport processes and integration across spatial and temporal scales. In digital rock petrophysics, specifically, advances in high-resolution imaging techniques in the past 30 years have provided a wealth of 2D and 3D datasets that reveal the microstructure of and transport phenomena in rocks and soil on scales ranging from nanometers to centimeters. Many of those are curated in Digital Rocks Portal, https://www.digitalrocksportal.org/.

I present a novel multiscale deep learning model that is able to learn from large number of images of porous media (harvested from Digital Rocks Portal) and data resulting from related high performance computing. The main novelty is ability to perform accurate inference of large computational domains exhibiting heterogeneity thanks to its efficient architecture of linked neural networks. The model opens up the possibility of solving domain sizes that would not be feasible using traditional direct simulation tools on a desktop computer, as well as integrating multiple imaging scales available. The method is validated with a laminar fluid flow case using vuggy and fractured porous samples. While we currently focus on validating single phase flow application, we expect the methodology to be applicable to many other transport problems where geometry has the first order influence. We finally discuss integration of both geometry and wettability information in predicting two phase flow in fractures. The presented work is collaboration with J. E. Santos, Y. Yin, M. Pyrcz, N. Lubbers, E. Guiltinan, H. Viswanathan and Q. Kang.

Oral presentations: Parallel sessions

MS03 (4): Flow, transport and mechanics in fractured porous media
***Chairs:** Hamid Nick, Olav Moyner*

18:50	[376] **Quantifying the corrosive influence of water and carbon dioxide on crack propagation in silica** *Filip Simeski, Matthias Ihme, Alireza Ostadhossein*
19:05	[425] **Oil recovery mechanisms in fractured tight carbonates by low-IFT foams** *Xiongyu Chen, Kishore Mohanty*
19:20	[520] **Predicting the long-term thermal performance of EGS reservoirs from tracer tests using ensemble smoother with multiple data assimilation** *Hui Wu, Pengcheng Fu, Adam Hawkins, Hewei Tang, Joseph Morris*
19:35	[664] **Quick estimation of capillary pressure barrier of fractured caprocks.** *Christine Maier, Rafael March, Niko Kampman, Kevin Bisdom, Florian Doster*
19:50	[665] **Comparison of mechanical and hydro-mechanical models for rough fracture closure** *Amanzhol Kubeyev, Kevin Bisdom, Niko Kampman, Florian Doster*
20:05	[687] **A Flow Discretization for Conforming Discrete Fracture Matrix Models with Upscaling of Microscale Fractures** *Eirik Keilegavlen, Alessio Fumagalli*
20:20	[757] **A Phase-Filed-Based Formulation for Chemically-Assisted Fracture** *Pania Newell, Schuler Louis*
20:35	[760] **Transport-Related Consequences of Geochemical Interactions between Shale, Formation Brine, and Reactive Fluid** *Asli S. Gundogar, Cynthia M. Ross, Jennifer Druhan, Adam D. Jew, John Bargar, Anthony Kovscek*

Wednesday Detailed Program

WEDNESDAY, 02 JUNE 2021
Time Block C

Oral presentations: Parallel sessions, cont.

MS06-A (2): Physics of multi-phase flow in diverse porous media
Chairs: *Saman Aryana, Yaniv Edery*

18:50	[709] **Modeling capillary fluctuations for fluid flow with lattice Boltzmann methods using LBPM** *Ming Fan, James McClure, Steffen Berg, Ryan Armstrong*
19:05	[705] **Relative Permeability in Reactive Carbonate Rock** *Johnathan Moore, Dustin Crandall, Paul Holcomb*
19:20	[396] **Long-term redistribution of residual gas due to non-convective transport** *Yaxin Li, Sally Benson*
19:35	[102] **Measuring and modelling multi-scale fluid distributions in heterogeneous rocks based on X-ray micro-computed tomography** *Shan Wang, Leo Ruspini, Stefanie Van Offenwert, Arjen Mascini, Tom Bultreys*
19:50	[20] **From the non-linear Darcy law for immiscible two-phase flow in porous media to constitutive equations for each fluid species** *Subhadeep Roy, Håkon Pedersen, Santanu Sinha, Alex Hansen*
20:05	[574] **Calculation of relative permeabilities for two-phase flows in highly permeable porous media: direct calculation vs. closure problems** *Maxime Cochennec, Hossein Davarzani, Yohan Davit, Stéfan Colombano, Ioannis Ignatiadis, Michel Quintard*
20:20	[318] **Re-evaluation of the evolution and hysteresis of relative permeability in gas-brine systems: time to shift the paradigm?** *Michael Clennell, Samuel Jackson, Mojtaba Seyyedi*
20:35	[55] **Forced air and water flow in granular media – models and experiments** *Ilan Ben-Noah, Shmulik P. Friedman, Ido Nitsan*

Oral presentations: Parallel sessions, cont.

MS07 (4): Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Chairs: *Carina Bringedal, Shuyu Sun*

18:50	[302] **GMsFEM for Reduced Model of Darcy Flow in Fractured Porous Media** *Manal Alotibi, Huangxin Chen, Shuyu Sun*
19:05	[706] **A space-time multiscale mortar mixed finite element method for flow in porous media** *Caroline Japhet, Manu Jayadharan, Michel Kern, Martin Vohralik, Ivan Yotov*
19:20	[730] **A multiscale mixed finite element method applied to the simulation of two-phase flows** *Philippe Remy Bernard Devloo, Omar Duran, Jose Villegas*
19:35	[738] **A Maximum Principle Preserving Finite Element Method with Mass Conservation Property for Solving Two-Phase Flow in Heterogeneous Porous Media** *Mohammad Sarraf Joshaghani, Beatrice Riviere*
19:50	[171] **A posteriori estimates for the Richards equation (nonlinearity, degeneracy & heterogeneity)** *Koondanibha Mitra, Martin Vohralik*
20:05	[430] **Compositional modeling in porous medium using iterative IMPEC scheme and constant volume-temperature flash** *Tomáš Smejkal, Jiří Mikyška*
20:20	[31] **On Modeling Nonlinear Flow and Reactive-Diffusion Processes in Heterogeneous Fractured-Porous Media** *Boris Faybishenko, Jens Birkholzer*
20:35	[15] **Drying of capillary porous media simulated by coupling of continuum model and pore network model** *Xiang Lu, Evangelos Tsotsas, Abdolreza Kharaghani*

Wednesday Detailed Program

WEDNESDAY, 02 JUNE 2021
Time Block C

Oral presentations: Parallel sessions, cont.

MS09 (3): Pore-scale modelling
Chairs: *Yashar Mehmani, Oleg Iliev*

18:50	[18] **Rheology of two-phase flow in mixed-wet porous media: Dynamic network model and capillary fiber bundle results** *Hursanay Fyhn, Santanu Sinha, Subhadeep Roy, Alex Hansen*
19:05	[82] **Reactive Imbibition of Acidic Fluids in Unconventional Shales: A New Experimental Approach to Pore-Scale Reactive Transport Modeling** *Vincent Noel, Jennifer Druhan, Florent Brondolo, Wenjia Fan, Anthony Kovscek, John Bargar, Gordon Brown*
19:20	[166] **A fully parallel Pore Network Simulator for plug size pore scale simulations** *Mohamed Regaieg, Clément Varloteaux, Arthur Moncorge, Titly Farhana Faisal, Igor Bondino*
19:35	[248] **Oil Displacement by Water Through an Ultra-Narrow Kerogen Pore Throat: a Molecular Dynamic Study** *Yinuo Zhao, Wenhui Li, Shiyuan Zhan, Zhehui Jin*
19:50	[699] **On pore scale simulation of reactive flows in the case of complex catalytic reactions** *Pavel Toktaliev, Oleg Iliev*
20:05	[702] **Multi-scale imaging and modelling for reactive diffusion at the pore scale** *Abdellatif SAADALDIN, Dominique Bernard*
20:20	[754] **Influence of intermittency effects on anomalous transport in single- and multi-phase flow in porous media** *Zoë Penko, Yaofa Li , Amirhosein Begmohammadi, Diogo Bolster, Kenneth Christensen*

Oral presentations: Parallel sessions, cont.

MS12 (2): Advances in modeling and simulation of poromechanics
Chairs: *Florin A. Radu, Xiaozhe Hu*

18:50	[463] **Two-grid coupled multiphase flow and geomechanics: A computational framework to monitor surface deformation along with fault slip due to pore pressure perturbations** *Saumik Dana, Birendra Jha*
19:05	[111] **High-order ADE solution for the fluid diffusion equation and application in coupled hydro-mechanical simulation** *Marte Gutierrez, Simon Prassetyo*
19:20	[441] **Computational analysis of Single- and Two-Phase Flow with Poroelasticity** *Maria Warrren, Hongkyu Yoon, Mario J. Martinez, Alex Kucala, James E. Bean*
19:35	[596] **Block-partitioned solvers for poromechanics via gradient flows and minimization** *Jakub Both, Kundan Kumar, Jan Martin Nordbotten, Florin Adrian Radu*
19:50	[698] **Pore scale modelling of elastic properties of hydrate bearing sediment based on high resolution synchrotron x-ray computed tomography imaging** *Rui Li, Yingfang Zhou, Wenbo Zhan, Jianhuy Yang*
20:05	[735] **Scalable Multilevel Methods for Poroelasticity** *Arne Naegel*
20:20	[165] **Study on the coupling mathematical model of gas-water two-phase seepage and wellbore pipe flow in fractured horizontal Wells in volcanic gas reservoirs** *Qingyuan Li, Cheng Fu*
20:35	[775] **FEM Modeling of Spherical Indentation in a Poro-elasto-plastic Medium** *Haiying Huang, Ming Liu*

For the Originals

Welcome Original Thinkers

Our business is built upon original thinking. For more than 145 years, we have challenged conventional wisdom to reimagine how we can better serve our consumers and impact the world around us. We invented new product categories and built an $18+ billion global business with top brands such as Kleenex®, Scott®, Huggies®, Cottonelle®, Depend® and U by Kotex®.

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We seek Original Thinkers to be part of a growing team that delivers disruptive solutions and exceptional consumer experiences. At Kimberly-Clark, you will be part of an entrepreneurial team with the freedom to express yourself, develop your capabilities and grow your career. You will work with others who are inspired to do their best in a unique environment where inclusion is expected, and original thinking is welcomed.

You stand apart. Your career opportunities should too. Bring your innovative ideas and passion where you can make a difference. Learn more.

THURSDAY, 03 JUNE 2021
Time Block A

Award Ceremony
09:00 - 9:10 CET

InterPore PoreLab Award for Young Researchers
Maja Ruecker
Eindhoven University of Technology, The Netherlands

This award is given to a young researcher in recognition of outstanding contributions in the field of porous media from a fundamental point of view. The research may be theoretical, computational, or experimental.

A word of gratitude: This award has been made possible by a generous grant from PoreLab (a research center of excellence jointly formed by Norwegian University of Science and Technology (NTNU)) in Trondheim and the University of Oslo (UiO). PoreLab focuses on the physics of porous media using experimental, theoretical and computational methods.

InterPore Award for Porous Media Research
Hadi Hajibeygi
TU Delft, The Netherlands

The InterPore Award for Porous Media Research is bestowed upon senior scientists who have demonstrated significant theoretical, experimental and/or modelling advances in understanding of problems involving natural and/or industrial porous media.

Keynote Lecture
9:10 - 9:55 CET

Steven Jansen
Ulm University

How do plants transport water under negative pressure?

A longstanding question in biology is how plants are able to transport water under negative pressure without continuously developing large gas bubbles in their transport system, which would reduce sap transport from roots to leaves. This process, which is known to be driven by transpiration at the leaf level, is highly puzzling because the water transported is saturated with gas and includes insoluble, amphiphilic lipids with a potent surface activity. Yet, plants seem to be able to perform this process seemingly effortlessly on a daily basis.

In this talk, we will discuss the importance of mesoporous cell walls between neighbouring conduits, and their functional significance as safety valves. The 200 to 1,000 nm thick porous cell walls, which have an estimated porosity of 80%, and ca. 20 nm wide pore constrictions, are shown to produce surfactant coated nanobubbles by the local surface tension of lipids at gas-liquid interfaces. In an interdisciplinary approach, an overview of experimental evidence will be presented, together with porous cell wall models, and simulations of multiphase interactions between gas, surfactants, water, and solid substances. These efforts contribute not only to our understanding of the mechanisms of plant water transport, but will also enable us to develop evaporation-driven transport devices that do not rely on fossil fuels. Moreover, understanding hydraulic failure in plants has implications for global water conservation, and how plants will deal with increased levels of drought at many places worldwide.

Thursday Detailed Program

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THURSDAY, 03 JUNE 2021
Time Block A

Oral presentations: Parallel sessions

MS01 (2): Porous Media for a Green World: Energy & Climate
Chairs: *Eleni Stavropoulou, William Rosen*

10:00	[345] **The effect of the diffusion transport on CO2-water-rock reactions in CO2 sequestration condition** *Mingkun Chen, Yi Zhang, Yongchen Song*
10:15	[389] **Mineral reaction and salt precipitation on a chip: understanding aquifer-relevant geological processes during CO2 injection** *Tiancheng Ji, Peixue Jiang, Ruina Xu*
10:30	[245] **Fault permeability and rupture in injection-induced earthquakes** *David Santillan Sanchez, Ruben Juanes, Juan Carlos Mosquera, Luis Cueto-Felgueroso*
10:45	[577] **Gravitational instabilities in a 2D porous medium for carbon dioxide sequestration** *Jaybrata Dhar, Shabina Ashraf, François Nadal, Patrice Meunier, Yves Méheust*
11:00	[229] **Numerical modelling workflow for the assessment of long term CO2 storage in saline aquifers using the Sleipner dataset** *Takashi Akai, Daima Hasegawa, Hiroshi Okabe*
11:15	[643] **Evolution of Bentheimer Sandstone Wettability During Cyclic scCO$_2$-Brine Injections** *Anna Herring, Zhe Li, Chenhao Sun, Ryan Armstrong, James McClure, Mohammad Saadatfar*
11:30	[681] **A physics-based model to predict the impact of horizontal layers on CO2 plume migration** *Maartje Boon, Sally Benson*
11:45	[710] **Insights from reactive percolation experiments on the geological storage of CO2 in natural serpentinites** *Florian Osselin, Michel Pichavant, Hugues Raimbourg, Marc Ulrich*

Oral presentations: Parallel sessions, cont.

MS06-A (3): Physics of multi-phase flow in diverse porous media
Chairs: Steffen Berg, Ryan Armstrong

10:00	[68] **The impact of pore scale complexity on fluid invasion patterns in heterogeneous rocks** *Tom Bultreys, Arjen Mascini, Shan Wang, Sharon Ellman, Leo Ruspini, Marijn Boone, Veerle Cnudde*
10:15	[85] **Dynamic imaging of the impacts of flow instabilities and rock heterogeneity on CO2 plume migration** *Mojtaba Seyyedi, Michael Clennell, Samuel Jackson*
10:30	[127] **Modeling transport of methane under nanoconfinement and in complex geometries using LBM** *Lingfu Liu, Yuhang Wang, Saman Aryana*
10:45	[447] **Energy dissipated through Haines jumps in disordered media** *Ran Holtzman, Marco Dentz, Ramon Planet, Jordi Ortin*
11:00	[8] **Energy dissipation as heat in porous media flow** *Signe Kjelstrup, Dick Bedeaux, Olav Galteland, MIchael Rauter, Carl Fredrik Berg, Alex Hansen*
11:15	[22] **Non-thermal Fluctuations in Stead-State Multiphase Flow in Porous Media** *Maja Ruecker, Steffen Berg, Apostolos Georgiadis, Ryan Armstrong, Holger Ott, Niels Brussee*
11:30	[473] **Regimes of fluid-driven grain transport in a confined channel** *Miles Morgan, David James, Bjornar Sandnes*
11:45	[541] **Thermodynamic Stability of Bubble Population in Porous Media** *Ke Xu, Yashar Mehmani, Chuanxi Wang, Yuehongjiang Yu*

Thursday Detailed Program

THURSDAY, 03 JUNE 2021
Time Block A

Oral presentations: Parallel sessions, cont.

MS09 (4): Pore-scale modelling
Chairs: *Stephane Zaleski, Ke Xu*

10:00	[66] **A level set approach to Ostwald ripening of real gases in porous media** *Deepak Singh, Helmer André Friis, Espen Jettestuen, Johan Olav Helland*
10:15	[34] **Flow behavior in a rough channel with pore scale simulation** *Chao Xu, Lei Zhang, Guangpu Zhu, Hai Sun, Yongfei Yang, Jun Yao*
10:30	[708] **A parallelized method to model combined conductive-radiative heat transfer at local scale within highly porous media** *Atin Kumar, Jerome Vicente, Yann Favennec, Benoit Rousseau*
10:45	[167] **Plug size pore network extraction with pore scale resolution** *Clément Varloteaux, Mohamed Regaieg, Titly Farhana Faisal , Igor Bondino*
11:00	[175] **Digital rock approach for unconsolidated sandpacks using pore network modelling: comparison between experiments and simulations** *Erika Shiota, Takashi Akai, Michiharu Hiyama*
11:15	[487] **Towards Unified Pore-Scale Imaging and Modelling: Comparison of the Generalized Network Model with Direct Numerical Simulation** *Luke Giudici, Ali Qaseminejad Raeini, Martin Blunt, Takashi Akai, Branko Bijeljic*
11:30	[619] **A Dynamic Hybrid Multiscale Model for Simulating Flow and Mixing-Controlled Reactions in Porous Media** *Haoran Sun, Xuhui Meng, Xiaofan Yang*
11:45	[623] **Pore-scale observation and insight on how wettability impacts oil recovery and its dependence on rock structure** *Fanli Liu, Moran Wang*

Oral presentations: Parallel sessions, cont.

MS18: Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers

Chairs: *Carlo Bianco, Tannaz Pak*

10:00	[201] **The Chemical/Biological Remediation of Non-Aqueous Phase Liquids in Heterogeneous Porous Microfluidic Devices** *Yan Li, Wang Xu, Hangyu Li, Jianchun Xu, Shuyang Liu, Xiaopu Wang*
10:15	[765] **Graphene oxide nanoparticles for aquifer remediation: transport experiments and reactivity batch tests.** *Ali Beryani, Carlo Bianco, Tiziana Tosco, Mohammad Reza Alavi-Moghaddam, Rajandrea Sethi*
10:30	[479] **Development of a new complex fluid for DNAPL recovery and nZVI delivery** *Sagyn Omirbekov, Stéfan Colombano, Amir Hossein MOHAMMADI ALAMOOTI, Azita Ahmadi, Hossein Davarzani*
10:45	[506] **Assessment of the role of densification on the displacement of DNAPL in high permeable porous media using a polymer solution** *Amir Hossein MOHAMMADI ALAMOOTI, Stéfan Colombano, Sagyn Omirbekov, Azita Ahmadi, Hossein Davarzani*
11:00	[685] **Reconstructing contaminant release function in a sandbox experiment** *J. Jaime Gómez-Hernández, Zi Chen*
11:15	[707] **Pore-Scale Investigation of Nano-Enhanced Chemical Strategy for In-situ Crude Oil Contaminated Soils Remediation** *Zahra Sakhaei, Najmeh Ghorbani Saadatabadi, Ehsan Nikooee, Masoud Riazi*
11:30	[715] **Synchrotron Microtomography Investigation of Nanoparticle Entrapment and Mobility in Porous Media** *Tannaz Pak, Daphne Silva Pino, Alexander Wood, Luiz Fernando de Lima Luz Junior, Tiziana Tosco, Nathaly Lopes Archilha*
11:45	[772] **A multiscale approach for the characterization of bio-chemo-mechanical processes in contaminated marine sediments** *Claudia Vitone, francesca sollecito, Federica Cotecchia, Alexander Puzrin, Michael Plötze, Rossella Petti*

Thursday Detailed Program

THURSDAY, 03 JUNE 2021
Time Block A

Oral presentations: Parallel sessions, cont.

MS24 (2): Mathematical and computational challenges related to porous media - Special session in memory of Andro Mikelic
Chairs: *Brahim Amaziane*

10:00	[156] **Coupling strategies for free flow with porous media -from single to two phase flow-** *Rainer Helmig*, Edward Coltman, Martin Schneider, Melanie Lipp
10:15	[276] **Micro-macro Modeling Approaches for Reactive Multiphase Flow and Transport in Complex Media** *Peter Knabner*, Nadja Ray, Stephan Gärttner
10:30	[352] **Interaction Problems between Fluids and Poro-Elastic Media - Applications in Life Sciences** *Willi Jäger*
10:45	[284] **Correctors and error estimates for reaction-diffusion processes through thin heterogeneous layers** Markus Gahn, Willi Jäger, *Maria Neuss-Radu*
11:00	[253] **A phase-field method for propagating fluid-filled fractures coupled to a surrounding porous medium** *Thomas Wick*, Sanghyun Lee, Mary Wheeler
11:15	[457] **Homogenization approach to the upscaling of a reactive flow through particulate filters with wall integrated catalyst** *Oleg Iliev*, Andro Mikelic, Torben Prill
11:30	[641] **Long-time shadow limit for a reaction-diffusion-ODE system** *Anna Marciniak-Czochra*
11:45	[259] **Homogenization of the linearized ionic transport equations in random porous media** *Andrey Piatnitski*, Andro Mikelic

Invited Speakers: Parallel Session
14:05 - 14:40 CET

Zoe Shipton
University of Strathclyde

Pore-scale capillary heterogeneity in reservoir rocks and its influence on reservoir-scale flow

It is increasingly important to understand multiphase fluid flow in rocks: not just in conventional hydrocarbon applications, but in geoengineering technologies for net zero such as geothermal heat production, carbon capture and storage, subsurface storage of energy fluids etc. Deformation bands in sandstone reservoir rocks are localized zones of grain crushing, grain reorganisation and/or cementing that can form capillary barriers to fluid flow, and which are common in. Here we analyse the extent and mechanisms of fluid compartmentalization due to clustered deformation bands. Multiphase fluid flow experiments were performed on a core sample of Navajo sandstone that contained fine-scale laminae cut by diversely oriented clusters of deformation bands. Medical X-ray CT images were acquired while nitrogen was injected at progressively higher flow rates into a water-saturated core during transient and steady-state conditions. Spatial and temporal analyses of the non-wetting phase plume migration suggest that the deformation bands act as capillary barriers, resulting in the development of an extremely tortuous saturation front. Differential pressure behavior across the core is linked to breakthrough of N2 into the individual compartments, resulting in highly variable N2 saturation throughout the experiment. Migration into downstream compartments occurs when capillary entry pressure is exceeded across restricted portions of the bands. These observations confirm that clusters of deformation bands have the potential to strongly compartmentalize a subsurface reservoir, increasing the risk of overestimating reservoir capacity, and requiring novel production strategies to miminise the effect.

Invited Speakers: Parallel Session, cont.
14:05 - 14:40 CET

Jacques Huyghe
University of Limerick

Poromechanics in extremely large deformation: swelling and fracture

Biomedical engineers face porous media with very low stiffness, high osmolarity and extremely large deformations. Examples are superabsorbent hydrogels and living cells. Volume strains above 1000 % strain are commonplace in diapers, female pads and growth plates. The strong nonlinearities of large deformation formulations of poromechanics hamper the use of analytical solutions. Large deformation u-p formulations fail in this regime. This means that simulation tools of poromechanics are inapt to a great deal of biology, which typically unfolds in the intracellular space. Local mass balance violation is the culprit under extremely large deformations. In order to address this issue, we developed a mixed hybrid formulation of poromechanics of swelling gel based on a Raviart-Thomas finite element. This formulation strictly complies with local mass balance. Swelling computations are possible down to a shear modulus of 10 kPa. Surface instabilities easily develop as osmotic forces overtake the stabilising effect of the elasticity. Fracture simulation using large deformation XFEM including flow within the crack, between the crack and the formation and within the crack, allows for initiation, coalescence and bifurcation of cracks. XFEM computations predict experimentally observed staccato propagation of cracks in hydrogels. Constitutive modelling of swelling require the concurrent use of elastic, mixing and ionic energies in Flory-Rehner swelling model. Interaction terms between elastic and ionic energies occur because the stiffness of gels directly depends on ionic concentrations. Future perspectives on constitutive modelling of swelling and fracturing gels include herniation of intervertebral disc, mechanotransduction of extracellular matrix and design of biomimetic hydrogels. Hydraulic fracturing of shale is an important geotechnical application.

The presented work is collaboration with Cong Yu (Eindhoven University of Technology), Jingqian Ding (Eindhoven University of Technology), and Eanna Fennel (University of Limerick.)

Poster[+] Session 8
14:40 - 15:40 CET

MS06-A: Physics of multi-phase flow in diverse porous media

[231] **Stochastic homogenization of some porous media models**
Hakima Bessaih, Razvan Florian Maris, Yalchin Efendiev

[235] **Study on Oil Recovery Effect and Mechanism of the Supercritical CO2 Huff-n-Puff Process in Tight Cores with Nuclear Magnetic Resonance (NMR)**
Li Chaofan, Dongxing DU

[388] **RHEOLOGICAL RESPONSE OF FOAM FLOODING MODELS CONSIDERING EXPERIMENTAL UNCERTAINTIES**
Andres Valdez, Bernardo Rocha, Grigori Chapiro, Rodrigo Weber

[599] **Analytically Derived Upscaled Relative Permeability Curves for Viscous Limit Flow through Layered Porous Media**
AbdAllah Youssef, Stephan Matthai

[696] **A Semi-Analytical Solution for Modeling of Early-Time and Late-Time Countercurrent Spontaneous Imbibition in Porous Media**
Moises Velasco Lozano, Matthew Balhoff

[697] **Dynamics of unsaturated flow in fracture networks: impact of local splitting behavior at the intersection**
Zhibing Yang, song xue, Ran Hu, Yi-Feng Chen

[736] **Wettability behavior of preserved core material compared to dry stored core plugs during a low salinity water core-flooding investigation**
Rasoul Mokhtari, Armin Afrough, Karen Feilberg

MS10: Advances in imaging porous media: techniques, software and case studies

[222] **Cone beam computed tomography reconstruction for digital rock**
Vijitha Periyasamy, Vishal Metri, Avanindra Singh, Ronny Hoffman, Kunj Tandon, Phaneendra K Yalavarthy, Jaya Prakash

[354] **Adaptive phase recovery method for three-dimensional porous media reconstruction from its bi-dimensional thin-section**
Aleksei Cherkasov, Andrey Ananev, Aleksey Khlyupin, Kirill Gerke

THURSDAY, 03 JUNE 2021
Time Block B

Poster[+] Session 8, cont.
14:40 - 15:40 CET

MS10: Advances in imaging porous media: techniques, software and case studies, cont.

[472] **Visualization of optically opaque flow systems through lab-based, dynamic X-ray micro-CT**
Jan Dewanckele, Marijn Boone, Luke Hunter, Andreas Grießer, Christian Wagner, Simo A. Makiharju

[533] **Development of flow through cell method for in-situ visualization of dissolution processes in solid dosage forms**
Niloofar Moazami Goudarzi, Aseel Samaro, Chris Vervaet, Matthieu Boone

[588] **Fluid rearrangements during Haine's jumps using time-resolved micro-computed tomography**
Kim Robert Tekseth, Dag Werner Breiby

[695] **Magnetic Resonance Imaging of Fluid Compositions in CO_2 Displacement of Decane in Berea Sandstone**
Armin Afrough, Laura B. Romero-Zerón, Mojtaba Shakerian, Caleb A. Bell, Florea Marica, Bruce J. Balcom

[723] **FLEXT – A Flexible Scripting X-ray Computed Tomography System for Multiscale and Dynamic Imaging of Porous Materials**
Armin Afrough, Karen Feilberg

MS17: Thermal Processes Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales

[445] **Numerical simulation of EGS thermal recovery in Multi-stage Hydraulic Fractured Horizontal Wells**
Guohan Xu, Hongjun Yin, Jing Fu

[551] **Analysis of the thermal conductance of polymeric ion-exchange membranes**
Sagrario Muñoz San Martín, V. María Barragán García

Poster[+] Session 8, cont.
14:40 - 15:40 CET

MS18: Innovative Methods for Characterization Monitoring and In-Situ Remediation of Contaminated Soils and Aquifers

[323] **Electrokinetic delivery of reactants in porous media: solution chemistry controls transport, mixing and degradation**
Riccardo Sprocati, Andrea Gallo, Rajandrea Sethi, Massimo Rolle

[501] **Modeling on contaminants removal by foam with nanoparticles in heterogeneous porous media**
Qingjian Li, Valentina Prigiobbe

[537] **Study on the reuse of shut-down offshore platform**
hongbo huo, Jinman LI, shiming he, zhong li, xiaocheng zhang

[558] **Use of DNA tracers for determining aquifer hydraulic properties in a 3-dimensional laboratory sand tank**
Swagatam Chakraborty, Rayan Elhaj, Chamath Akalanka Pamunugama Arachchilage, Jan Foppen, Thom Bogaard, Jack Schijven

[691] **Study of the mobility of zero-valent iron nanoparticles in porous media – Effect of grain size and composition**
Nathaly Lopes Archilha, Raoul Djou Fopa, Tannaz Pak, Tiziana Tosco

[716] **Capillary pumping: a transport mechanism in partially wet porous networks**
Joachim Falck Brodin, Marcel Moura, Knut Jorgen Maloy, Per Arne Rikvold

[811] **'Cocktail effects' of co-existing hydrocarbon on heavy metal remediation**
Anuradha Garg, Brijesh Kumar Yadav, Shashi Ranjan, Amit Vatsa

(MS22) Manufactured Porous Materials for Industrial Applications

[563] **Use of porous algal biochar in water treatment in the state of Ceará in Brazil**
Andre Frota, Jose Capelo Neto, Erdin Ibraim, Tannaz Pak

[597] **Additive Manufacturing of open porosities: from fabrication and characterization to the application**
Robert Otto, Christoph Kiener, Knut Sørby

[818] **Efficient Numerical Design of Porous Materials With Target Properties and Microstructure**
Benjamin Paisley, M. Sadegh Riasi, Mircea Grigoriu, Lilit Yeghiazarian

Thursday Detailed Program

Oral presentations: Parallel sessions

MS9 (5): Pore-scale modelling
Chairs: *Ke Xu, Stephane Zaleski*

14:40	**[510] Pore-scale study to understand the influence of porosity on mass transport in Anodic Porous Transport Layer of PEM electrolyser using Lattice Boltzmann Method** *Shubhani Paliwal, Supriya Bhaskaran, Jenil Agarwal, DEBASHIS PANDA, Nicole Vorhauer, Tanja Vidakovic-Koch, Evangelos Tsotsas*
14:55	**[604] Determination of Characteristic Transport Coefficients of Porous Media: A Diffuse Interface approach** *Chahat Aggarwal, Amin Sadeghi, Elizabeth Monte, James Lowman, Jeff Gostick, Nasser Mohieddin Abukhdeir*
15:10	**[722] Scaling and errors estimates of the effective Brinkman viscosity** *Shervin Bagheri, Ugis Lacis, Aidan Rinehart*
15:25	**[769] Pore-scale simulations of water droplet interaction with a hydrophobic wire screen for purpose of Water-Diesel separation** *Omar Elsayed, Ralf Kirsch, Sebastian Osterroth, Sergiy Antonyuk*

MS19 (3): Electrochemical processes in porous media
Chairs: *Jeff Gostick, Pablo Garcia Salaberri*

14:40	**[11] Pore Graded Anodic Transport Layers in PEM Electrolysers: A Pore Network Study** *Haashir Altaf, Nicole Vorhauer, Evangelos Tsotsas, Tanja Vidakovic-Koch*
14:55	**[80] Modeling coupled porous media/free flow/drop interaction in a PEM fuel cell using a pore-network approach** *Cynthia Michalkowski, Veronika Schleper, Rainer Helmig*
15:10	**[255] Application of Helmholtz EDL Theory in a Pore Network Model for Studying Capacitive Deionization** *Michael McKague, Hamed Fathiannasab, Mehrez Agnaou, Amin Sadeghi, Jeffrey Gostick*

Thursday Detailed Program

THURSDAY, 03 JUNE 2021
Time Block B

SAC Career Development Event
15:45 - 16:40 CET

One of the most common struggles for a PhD student is to decide which career path to follow after graduate school. There are numerous opportunities that are potentially open to us as PhDs, which can take us on very different career paths. There are likely many questions you have about picking a direction (industry/academia/government) and the pros and cons of the various possibilities. A good approach to making an informed decision is listening to experiences and personal views of established professionals. The SAC's career event will have speakers from varied backgrounds, sharing their professional journeys and the important choices they had to make along the way. You will also have the chance to ask the speakers any questions you have!

This event is free and open to all participants of InterPore2021!

Inga Berre
Professor
University of Bergen

Rainer Helmig
Professor
Stuttgart University

Maja Rücker
Assistant Professor
Eindhoven University of Technology

Andreas Busch
Professor
Heriot Watt University

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Oral presentations: Parallel sessions

MS06-B (3): Interfacial phenomena in multiphase systems
Chairs: *Grigori Chapiro, Eduardo Abreu*

18:00 — [60] **Fluid-Fluid Displacement in Mixed-Wet Porous Media**
Ashkan Irannezhad, Bauyrzhan Primkulov, Ruben Juanes, Benzhong Zhao

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18:15 — [288] **Characterization of wettability control on dynamics of two phase flow in natural porous media**
Sahar Bakhshian, Harris Rabbani, Nima Shokri

18:30 — [295] **Effect of Wettability on Immiscible Liquid Displacement in 2D and 3D Porous Media**
Debora do Nascimento, Jorge Avendaño, Nicolle Lima, Marcio Carvalho

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18:45 — [368] **Lamellae Generation and Dynamics During Gas Invasion of a Porous Medium Occupied by a Surfactant Solution**
Nicolle Lima, Marcio Carvalho

19:00 — [442] **Pore network modeling of bubble ripening in porous media**
Yashar Mehmani, Ke Xu

19:15 — [483] **Gas-liquid phase separation in a soft porous medium**
Oliver Paulin, Liam Morrow, Matthew Hennessy, Chris MacMinn

19:30 — [549] **Pattern formation controlled by friction and viscous forces in deformable granular media**
DAWANG ZHANG, Bjornar Sandnes

19:45 — [782] **Microfluidic investigation of phase banking during low tension displacements**
Lucas Mejia, Matthew Balhoff

Thursday Detailed Program

THURSDAY, 03 JUNE 2021
Time Block C

Oral presentations: Parallel sessions, cont.

MS10 (2): Advances in imaging porous media: techniques, software and case studies

Chairs: *Andreas Busch, Martin Blunt, Ting Xao*

18:00	[217] **How to capture centimeter-scale local variations in the pore space of paper: A benchmark study using µ-CT** *Matthias Neumann, Eduardo Machado Charry, Ekaterina Baikova, André Hilger, Ulrich Hirn, Ingo Manke, Volker Schmidt, <u>Karin Zojer</u>*
18:15	[575] **Non-destructive 3D mapping of mineral composition and clay mineral orientation in shale** *<u>Fredrik Kristoffer Mürer</u>, Aldritt Scaria Madathiparambil, Kim Robert Tekseth, Pierre Cerasi, Basab Chattopadhyay, Dag Werner Breiby*
18:30	[518] **Automatic cracks detection in 3D µCT images using DVC total variation strain regularization** *<u>Zaira Manigrasso</u>, Jan Aelterman, Wilfried Philips*
18:45	[486] **4D µCT reconstruction with improved time resolution for imaging fluid flow in porous media** *<u>Wannes Goethals</u>, Jan Aelterman, Tom Bultreys, Matthieu Boone*
19:00	[210] **MATBOX, an Open-Source Microstructure Analysis Toolbox for Meshing, Generation, Segmentation, and Characterization of 3D Heterogenous Volumes** *<u>Francois Usseglio-Viretta</u>, Prehit Patel, Jeffery Allen, Aashutosh Mistry, Partha Mukherjee, Kandler Smith*
19:15	[86] **Improved Watershed-based Pore Space Partitioning Algorithm for Pore Network Modelling** *<u>Zeyun Jiang</u>, Rink van Dijke*
19:30	[33] **Benchmarking Conventional and Machine Learning Segmentation Techniques for Analysis of Digital Rock Physics Properties** *<u>Marcel Reinhardt</u>, Arne Jacob, Michael Kersten, Frieder Enzmann, Francesco Cappuccio, Pit Arnold, Olga Moravcova*

Thursday Detailed Program

Oral presentations: Parallel sessions, cont.

MS13 (1): Fluids in Nanoporous Media
Chairs: *Ahmad Sakhee-Pour, Patrick Huber*

| 18:00 | [182] **Phase behavior of a confined ionic discotic liquid crystal**
 Mohamed Aejaz Kolmangadi, Andreas Schoenhals, Sabine Laschat, Patrick Huber |

| 18:15 | [211] **Elasticity of argon in nanopores of different sizes**
 Klaus Schappert, Rolf Pelster |

| 18:30 | [387] **Examining the Structure of Supercritical CO2 using X-ray Raman Spectroscopy and Atomistic Scale Modeling**
 Priyanka Muhunthan, Dimosthenis Sokaras, Matthias Ihme |

| 18:45 | [283] **Linking DFT and MD to simulate grand canonical ensemble: selectivity of binary mixtures in nanopores**
 Mariia Vaganova, Irina Nesterova, YURIY KANYGIN, Andrey Kazennov, Aleksey Khlyupin |

| 19:00 | [189] **A Unified Plot for Fluid Phase Transitions**
 Henry Enninful, Dirk Enke, Rustem Valiullin |

| 19:15 | [382] **A DFT study on the effect of strain on the adsorption of gas in tight gas carbonates**
 Elkhansa Elbashier, Ibnelwaleed Hussein, Giuliano Carchini, Ahmad Sakhaee-Pour, Golibjon Berdiyorov |

| 19:30 | [475] **Perturbation Theory for Fluids under Confinement**
 Vilde Bråten, Daniel Tianhou Zhang, Morten Hammer, Ailo Aasen, Sondre Kvalvåg Schnell, Øivind Wilhelmsen |

| 19:45 | [481] **Mechanisms of gas separation through 2D porous graphene membranes : theory and molecular simulations**
 Romain Vermorel, Juncheng Guo, Guillaume Galliero |

Thursday Detailed Program

THURSDAY, 03 JUNE 2021

Time Block C

Oral presentations: Parallel sessions, cont.

MS15 (2): Machine Learning and Big Data in Porous Media
Chairs: *Hongkyu Yoon, Bailian Chen*

18:00	[423] **CCSNet: a deep learning modeling suite for CO2 storage** *Gege Wen, Sally Benson, Catherine Hay*
18:15	[455] **Semantic segmentation of microCT and FIB-SEM rock images using deep learning methods** *Jack Ringer, Hongkyu Yoon*
18:30	[489] **Heterogeneity Evaluation of Microstructures in a Sandstone Reservoir Using Micro-CT Imagery** *Lingyun Kong, Bethany Kurz, Shane Butler, Matthew Burton-Kelly, Cesar Barajas-Olalde, Blaise Mibeck, Xue Yu*
18:45	[503] **Non-intrusive reduced order modeling of natural convection in porous media** *Teeratorn Kadeethum, Francesco Ballarin, Hongkyu Yoon, Nikolaos Bouklas*
19:00	[521] **Geostatistical Inversion in Geologic CO2 Sequestration Using a Variational Autoencoder** *Bailian Chen, Dylan Harp, Daniel O'Malley, Rajesh Pawar*
19:15	[564] **Machine learning prediction of Lennard-Jones fluid self-diffusion in pores** *Calen Leverant, Jeffery Greathouse, Jacob Harvey, Todd Alam*
19:30	[590] **Physics Impact on Deep Neural Networks for Multiphase Flow in Porous Media** *Bicheng Yan, Dylan Harp, Bailian Chen, Rajesh Pawar*
19:45	[779] **Integrating Machine Learning into a Methodology for Early Detection of Wellbore Failure** *Edward Matteo, Barry Roberts, Steven Sobolik, Samuel Gilletly, Casey Doyle, Stephen Verzi*

Oral presentations: Parallel sessions, cont.

MS21 (2): Non-linear effects in flow and transport through porous media

Chairs: *Alberto Guadagnini, Mohad M. Nezhad*

18:00	[684] **Bounds for effective Forchheimer coefficient in randomly heterogeneous porous media** *Valentina Ciriello, Alessandro Lenci, Farhad Zeighami, Vittorio Di Federico*
18:15	[601] **Viscous Fingering in Miscible Displacements in Porous Media with Dead-End Pores** *Baizheng An, Qingwang Yuan*
18:30	[5] **A theoretical analysis of the nonlinear behaviors in the measurements for two-phase flow in low-permeability core considering the capillary effects** *Xiao-Hong Wang, YuMin Yao, Min Wang, Zhifeng Liu*
18:45	[228] **Elastic turbulence generates anomalous flow resistance in porous media** *Christopher Browne, Sujit Datta*
19:00	[443] **Population balance models for particulate flows in porous media: breakage and shear-driven events** *Nicodemo Di Pasquale, Daniele Marchisio, Matteo Icardi*
19:15	[163] **The relevance of simple probabilitic models for deposition, accumulation and transport of colloidal particles proved by real time, internal observations (MRI, confocal microscopy)** *Philippe Coussot, Philippe Coussot*
19:30	[496] **Hydraulically driven fractures in deformable porous media-Impact of non-linear flow patterns in vicinity of fractured zone** *Nima Sarmadi, Mohaddeseh Mousavi Nezhad*
19:45	[143] **Pore scale two-phase simulation of viscous fingering of non-Newtonian fluids** *Takshak Shende, Vahid.J Niasar, Masoud Babaei*

THURSDAY, 03 JUNE 2021
Time Block C

Poster[+] Session 9
20:00 -21:00 CET

MS06-A: Physics of multi-phase flow in diverse porous media

[215] **Pore-scale analysis of gas injection in gas-condensate reservoirs**
Paula Reis, Marcio Carvalho

[280] **Experimental Evaluation of Polymeric Fluid Displacement in Carbonates using an X-ray Imaging Technique**
Nara Brandão Costa Santos, Arsalan Zolfaghari, João Jorge Ribeiro Damasceno, Fábio Oliveira Arouca, Shahin Negahban, Amirmasoud Kalantari Dahaghi

[336] **Homogenization of two-phase flow in porous media: A diffuse interface approach explaining capillary pressure-staturation hysteresis**
Stefan Metzger, Peter Knabner

[523] **Experimental Study on Long Core of Fractured Vuggy Metamorphic Rock Rich in Condensate Gas Reservoir with Different Development Methods**
Jinman LI, Jinze LI, hongbo huo, Yang LIN, Linsong CHENG, Jinsheng SUN

[750] **Use of infrared nano-spectroscopy to study the existence and thickness of the wetting film in oil-wet carbonates**
Tannaz Pak, Isadora Caixeta, Luiz Fernando de Lima Luz Junior, Nathaly Lopes Archilha, Ingrid David Barcelos

[752] **Surface-washing of contaminated porous substrates**
Francesco Paolo Conto, Merlin Aragon Etzold, Stuart B. Dalziel, Julien R. Landel

MS13: Fluids in Nanoporous Media

[73] **Effects of nanopore geometry on confined water flow: a view of lattice Boltzmann simulation**
Wen Zhao, Lin Jiang, Chengzao Jia

[120] **Phase Transitions in Disordered Mesoporous Solids: Effect of Geometric Disorder**
Henry Enninful, Daniel Schneider, Dirk Enke, Rustem Valiullin

[314] **Methane adsorption on Silica-Kaolinite interface for shale gas application: A theoretical study**
Abdulmujeeb Onawole, Mustafa Nasser, Ibnelwaleed Hussein, Mohammed Al-Marri, Ahmad Sakhaee-Pour, Santiago Aparicio

Poster[+] Session 9, cont.
20:00 -21:00 CET

MS13: Fluids in Nanoporous Media, cont.

[322] **Global sensitivity analysis of a low permeability media gas flow model with multiple transport mechanisms**
Leonardo Sandoval, Monica Riva, Ivo Colombo, Alberto Guadagnini

[348] **Molecular dynamics study of methane diffusion in flexible microporosity of source rock's organic matter**
Kristina Ariskina, Guillaume Galliero, Amael Obliger

[351] **Impact of salt on sorption isotherms in nanoporous media**
Hugo Bellezza, Marine Poizat, Olivier Vincent

[359] **Two-scale poromechanical model incorporating adsorption effects of a fluid mixture in arbitrary geometrical nanopores**
HA Quoc Dat, Tien Dung Le, Irina Panfilov, Christian Moyne

[634] **Steady-State Liquid Permeability Measurements in Ultra Tight Rock Samples**
Hadi Bagherzadeh, Hossein Khorshidian, S. H. Hejazi

[759] **The Effect of Surface Chemistry on Phase Behavior in Nanoporous Confinement: An Experimental Study of iso-Butane Isotherms**
Rami Alloush, Keerti Sharma, Mohammad Piri

MS15: Machine Learning and Big Data in Porous Media

[25] **Permeability Prediction via 3D Convolution Neural Networks**
Mohamed Elmorsy, Wael El-Dakhakhni, Benzhong Zhao

[136] **Image Segmentation with Transfer Learning for Carbonate Rock Images**
Ramanzani Kalule, Hamid Abderrahmane, Waleed Alameri, Mohamed Sassi

[176] **Development of a simple-to-use and novel correlation to predict apparent viscosity of waxy crude oils mixed with polymeric additives**
Mohammad Madani, Maryam Hasanzadeh

[267] **Introduction of an Integrated Workflow for Optimal Well Placement Using Machine Learning Methods**
Mohammadreza Moshtari, Barzan Karimi, Saeid Sadeghnejad, Arne Jacob, Frieder Enzmann, Michael Kersten

Thursday Detailed Program

Time Block C

Poster[+] Session 9, cont.
20:00 -21:00 CET

MS15: Machine Learning and Big Data in Porous Media, cont.

[495] **OPTIMUM SEGMENTATION OF A SANDSTONE RESERVOIR MICRO-CT IMAGERY USING MACHINE LEARNING ALGORITHMS**
Xue Yu, Lingyun Kong, Blaise Mibeck, Cesar Barajas-Olalde, Matthew Burton-Kelly, Bethany Kurz, Shane Butler

[580] **Deep Learning-based sensitivity analysis for subsurface flow and transport**
Jonghyun Lee, Vincent Liu, Hongkyu Yoon

[667] **Generating unrepresented geological realizations using Generative Adversarial Networks**
Alhasan Abdellatif, Ahmed H. Elsheikh

[694] **Improving the reliability of phase segmentation by combining 3D imaging and machine learning methods**
Parisa Asadi, Lauren Beckingham

[701] **Deep-learning-based Image Segmentation Techniques for Porous Media Property Estimation**
Yuhan Hsi, Fangya Niu, Prakash Purswani, Xiaolei Huang, Zuleima Karpyn, Parisa Shokouhi

[749] **Comparison of Response Surface and Artificial Neural Network Model for Relative Permeability using Saturation and Phase Connectivity**
Hanif Yoga, Prakash Purswani, Russell T. Johns

[756] **Application of Convolutional Neural Networks in Flow Simulation of Porous Media: Unsupervised Image Segmentation and Lat-Net for LBM Simulation**
Hongsheng Wang, Dustin Crandall, Laura Dalton, Cheng Chen

FRIDAY, 04 JUNE 2021
Time Block A

Invited Speakers: Parallel Session
*09:05 - 09:35 CET*
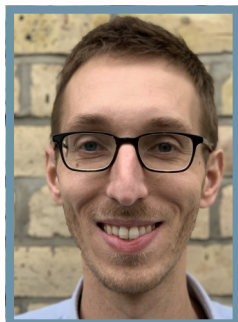
Christoper MacMinn
University of Oxford

Fluid-fluid phase separation in a soft porous medium

The interactions of two fluids within a porous medium depend strongly on flow conditions, wettability, and the structure of the pore space. At the pore scale, these interactions are characterised by the formation of wetting films that coat solid surfaces and occupy corners and throats, and the formation of non-wetting blobs that occupy larger pore bodies. The invasion of non-wetting blobs into narrow throats is energetically unfavorable, but it can be forced with a sufficiently high pressure gradient. A soft porous medium is one in which the pore structure can deform in response to the flow. The most striking feature of two-fluid-phase flow in a soft porous medium is the tendency of the non-wetting phase to enlarge the pore space by pushing the solid grains apart, to the point of forming macroscopic cavities in the medium. These cavities can be much larger than the pore scale, and they form spontaneously when the energetic benefit of reducing the Laplace pressure exceeds the energetic cost of deforming the solid skeleton. Here, we consider this process through the lens of phase separation, where a non-wetting phase separates (or not) from a fluid-fluid-solid mixture. Informed by the thermodynamics and large-deformation poromechanics of this system, we construct a phase-field model in which two immiscible fluids interact with a poroelastic solid skeleton. Our model captures the competing effects of elasticity, confinement, flow, and fluid-fluid-solid interactions. We then use our model to consider an initial distribution of non-wetting fluid in the pore space that separates into multiple cavities. We identify the key parameters that control phase separation, the conditions that favor the formation of cavities, and the characteristic size of the resulting cavities. We complement this analysis with experimental observations. Our results have implications for a wide variety of natural and industrial systems, such as the nucleation and growth of gas bubbles in lake beds and waste ponds.

Invited Speakers: Parallel Session, cont.
09:05 - 09:35 CET
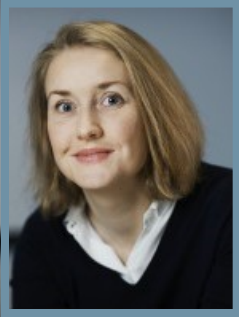
Marie Rognes
Simula Research Laboratory

Understanding the mechanisms of the brain's waterscape

Your brain has its own waterscape: whether you are reading or sleeping, fluid flows around or through the brain tissue and clears waste in the process. These physiological processes are crucial for the well-being of the brain. In spite of their importance we understand them but little. Mathematics and numerics could play a crucial role in gaining new insight. Indeed, medical doctors express an urgent need for modeling of water transport through the brain, to overcome limitations in traditional techniques. Surprisingly little attention has been paid to the mechanisms and the numerics of the brain's waterscape however, and even fundamental knowledge is missing.

In this talk, we will look at mathematical, mechanical and numerical aspects for understanding mechanisms involved in the brain's watercape across scales. At the macroscale, the brain can be viewed as a poroelastic medium with multiple fluid and pressure compartments interacting. At the mesoscale, the vasculature twist and turn through the brain parenchyma: defining lower dimensional structures interacting with the brain tissue. And at the microscale, brain cells and extracellular space interact via electrical, chemical and mechanical signalling.

FRIDAY, 04 JUNE 2021
Time Block A

Poster[+] Session 10
09:40 - 10:40 CET

MS01: Porous Media for a Green World: Energy & Climate

[6] **Optimizing gradient functional material for enhanced performance of solar-driven thermochemical fuel production**
Da Xu, Meng Lin

[183] **Comparative study on oil recovery efficiencies of ScCO2 and N2 injection processes in tight cores**
Li Chaofan, Dongxing DU, Luming Jiang, Yong Shu

[289] **Dynamics of organic pore evolution in shale under varying thermal and oxygen environments**
tuli bakshi, Debanjan Chandra, Vikram Vishal

[626] **Understanding the influence of pore-scale rock heterogeneity in CO2 geo-sequestration**
Farshad Daraei Ghadikolaei, Yulai Zhang, Lydia Knuefing, Anna Herring, Mark Knackstedt, Mohammad Saadatfar

[802] **Comparison and Reduction of the Chemical Kinetic Mechanisms Proposed for Thermal Partial Oxidation of Methane (TPOX) in Porous Media**
Farzam Fotovat, Mehrnaz Rahimpour

MS05: Biochemical processes and biofilms in porous media

[386] **Stabilization of mine tailings using biological induced precipitation methods for wind erosion control**
Farideh Ehsasi, Leon van Paassen

[432] **Conceptual model of reactive transport incorporating with dynamic biofilm growth and multicontinuum media**
Jingjing Wang, Maarten W. Saaltink, Jesús Carrera

[531] **Multiscale modeling and simulation of microbially-induced calcite precipitation in porous media**
Yurong Yang, Haoran Sun, Jinhua Hu, Xiaofan Yang

[640] **Characterization of microbial distribution of packaging material processes over a production cycle**
Stephanie Maitz, Paul Jakob Schmid, Clemens Kittinger

Poster[+] Session 10, cont.
09:40 - 10:40 CET

MS05: Biochemical processes and biofilms in porous media, cont.

[686] **The evolution of preferential flow paths during Enzymatically Induced Calcite Precipitation and its effect on the permeability**
Felix Weinhardt, Jingxuan Deng, Nikolaos Karadimitriou, Johannes Hommel, Robin Gerlach, Holger Class, Holger Steeb

[726] **Self-assembly of Comamonas denitrificans: formation of a living bacterial gel**
Sam Charlton, Eleonora Secchi, Gavin Melaugh

MS08: Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

[571] **Feedback mechanisms between precipitation and dissolution reactions across randomly heterogeneous conductivity fields**
Alberto Guadagnini, Giovanni Porta, Martin Stolar, yaniv edery

[713] **Simulating solute transport through saturated heterogenous medium using triple porosity non equilibrium model**
Aman Chandel, Deepak Swami

[731] **Control of chemically-driven convective dissolution by differential diffusion effects**
Mamta Jotkar, Laurence Rongy, Anne De Wit

MS13: Fluids in Nanoporous Media

[263] **Dynamic adsorption of CO2 in shale organic pores using molecular dynamic simulation**
Jingru Zhang, Yi Zhang, Lei Yuan

[264] **Wetting, Imbibition and Switchable Elastocapillarity in Nanoporous Media**
Patrick Huber

[609] **Capillary imbibition dynamics under various solid–liquid interactions: A molecular dynamics study**
Hubao A, Zhibing Yang, Ran Hu, Yi-Feng Chen

Poster[+] Session 10, cont.
09:40 - 10:40 CET

MS13: Fluids in Nanoporous Media, cont.

[613] **A modifed pulse-decay approach to simultaneously measure permeabilty and porosity of tight rocks**
Yue Wang, Bernhard KROOSS, Moran Wang, Steffen Nolte

[823] **Modification method and adaptability of fluid phase states in nanopores**
yuanzheng Wang, renyi Cao, ming Ma

(MS15) Machine Learning and Big Data in Porous Media

[133] **Deep learning for digital rock image segmentation in pore structure characterization**
Jiuyu Zhao, Jianchao Cai

[159] **Tortuosity and permeability of random porous medium using deep learning**
Maciej Matyka, Krzysztof Graczyk

[174] **Rotated Bounding Box Faster RCNN for Fracture Detection in X-Ray CT Image of Rocks**
Chuyen Ngoc Pham, Changlun Sun, Sun Yeom, Li Zhuang, Hyu-Soung Shin

[616] **Reconstruction of 3D shale digital rock based on generative adversarial network**
Yongfei Yang, Fugui Liu, Jun Yao, Huajun Song, Min Wang

[636] **Digital Rock Typing**
Omar Al-Farisi, Mohamed Sassi, Djamel Ouzzane

[670] **Study on the Production Characteristics of Shale Oil using Machine Learning: Case Study of Jimsar Field**
万航 郭 , Jianchun Xu

FRIDAY, 04 JUNE 2021
Time Block A

Oral presentations: Parallel sessions

MS05 (2): Biochemical processes and biofilms in porous media
Chairs: *Eleonora Secchi, Anozie Ebigbo*

10:40	[680] **Investigating the Effect of Enzymatically Induced Carbonate Precipitation on Hydraulic Properties** *Johannes Hommel, Felix Weinhardt, Holger Steeb, Holger Class*
10:55	[771] **Capsule-based biomimetic regulating technique of MICP and its application for soil reinforcement** *Alexandra Clarà Saracho, Lorenzo Lucherini, Dimitrios Terzis, Lyesse Laloui*
11:10	[194] **Numerical study of the temperature effects on MICP** *Xuerui Wang, Udo Nackenhorst*
11:25	[652] **Quantifying sulfate reduction rates of biofilm on shale fracture walls within a microfluidic reactor** *Lang Zhou, Ananda S Bhattacharjee, Glenn A Fried, Mayandi Sivaguru, Kyle Michelson, Robert A Sanford, Bruce W Fouke, Charles J Werth*

MS08 (2): Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media
Chairs: *Amir Raoof, Mozhdeh Sajjadi*

10:40	[654] **Saturated Colloid transport experiments under unfavorable conditions in Dual-Porosity PDMS micro-models.** *Enno de Vries, Amir Raoof, Qianjing Tang*
10:55	[440] **Lagrangian Intermittency in Colloid Transport Through Porous Media** *Veronica Morales, Markus Holzner*
11:10	[530] **A detailed pore scale modelling of colloid transport in porous media using lattice Boltzmann method** *Mandana Samari Kermani, Saeed Jafari, Mohammad Rahnama, Amir Raoof*
11:25	[204] **Porosity-permeability relationships for subflorescent salt crusts from evaporation of sand columns with varying initial salt concentration** *Joseph Piotrowski, Dongwon Lee, Andreas Pohlmeier, Harry Vereecken, Holger Steeb, Johan Alexander Huisman*

Oral presentations: Parallel sessions, cont.

MS15 (3): Machine Learning and Big Data in Porous Media
Chairs: *Hongkyu Yoon, Jianchun Xu*

10:40	[203] **Prediction of Flow and Reactive Transport using Physics-Informed Neural Networks** *Hongkyu Yoon, <u>Vincent Liu</u>, Jonghyun Lee*
10:55	[319] **Integrating process-based reactive transport modeling and machine learning for surrogate model development: an application to electrokinetic remediation of contaminated groundwater** *<u>Riccardo Sprocati</u>, Massimo Rolle*
11:10	[668] **Robust porous media flow control using Deep Reinforcement Learning** *<u>Atish Dixit</u>, Ahmed H. Elsheikh*

MS22 (2): Manufactured Porous Materials for Industrial Applications
Chairs: *Vahid Niasar, Senyou An*

10:40	[32] **How does the structure of a gas diffusion layer control the performance of fuel cells** *Daniel Niblett, Adrian Mularczyk, Jens Eller, Stuart Holmes, <u>Vahid.J Niasar</u>*
10:55	[258] **nvestigation of water freezing in gas diffusion layer of PEMFC using lattice Boltzmann method** *<u>Gao Yuan</u>, Jin Teng, Ding Zhaofeng*
11:10	[153] **Redox Flow Battery operation may be limited by "Hot Spots" observed in pore scale simulation of flow in carbon fibre felt electrodes** *<u>Edo Boek</u>, Rhodri Jervis, Farrel Gray*
11:25	[498] **Manufacturing of polycrystalline nickel-based superalloy membranes by directional coarsening through rolling and ageing** *<u>Christian Voelter</u>, Joachim Rösler,*

FRIDAY, 04 JUNE 2021

Time Block A

Oral presentations: Parallel sessions, cont.

MS25 (5): Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken

Chairs: *Jan Vanderborght, Rien van Genuchten*

10:40	[328] **Magnetic resonance imaging of water content and flow processes in natural soil using pulse sequences with ultrashort detection** *Sabina Haber-Pohlmeier, David Caterina, Andreas Pohlmeier*
10:55	[141] **Process-dependent solute transport in porous media** *Hamidreza Erfani Gahrooei, Nikolaos Karadimitriou, Alon Nissan, Monika Walczak, Brian Berkowitz, Vahid.J Niasar*
11:10	[690] **Injectivity Decline by Nanoparticles in High Permeability Sandstone Rock** *Ali Fadili, Ali Murtaza, Pacelli Zitha, Paul van den Hoek*
11:25	[239] **Unsaturated Flow Effects on Solute Transport in Soils** *Luwen Zhuang*

Oral presentations: Parallel sessions

MS01 (3): Porous Media for a Green World: Energy & Climate
Chairs: Lauren Beckingham, Eleni Stavropoulou

14:00	[254] **Unified multiphysics framework for assessment of CO2 storage in heterogeneous saline aquifers** *Yuhang Wang, Cornelis Vuik, Hadi Hajibeygi*
14:15	[104] **Pore-scale modelling and sensitivity analyses of hydrogen-brine multiphase flow in geological porous media** *Leila Hashemi, Martin Blunt, Hadi Hajibeygi*
14:30	[131] **Pore-scale Investigation of the Capillary Pressure Effect on the Upward Migration of Hydrogen through Water-filled Porous Media** *Mehrdad Vasheghani Farahani, Aliakbar Hassanpouryouzband, Katriona Edlmann*
14:45	[494] **Reactive CO2 Density-Driven Flow in Aquifers** *Hamidreza Erfani Gahrooei, Masoud Babaei, Vahid.J Niasar*
15:00	[552] **Micro-scale Insights into the Effects of Ionic Strength on CO2 Induced Carbonate Rocks Dissolution** *Shima Ghanaatian, Omid Shahrokhi, Susana Garcia, Mercedes Maroto-Valer*
15:15	[524] **Hydrate formation and migration in stratified porous media** *Tianjia Huang, Ke Xu*
15:30	[632] **Thermal fracturing and natural convection – a hidden source of geothermal activity in the earth's crust?** *Sæunn Halldorsdottir, Inga Berre, Eirik Keilegavlen, Ivar Stefansson, Gudni Axelsson*
15:45	[673] **In situ study of 3D fluid fingering in porous media using X-ray Computed Tomography** *Athanasios Papazoglou, Barbara Fayard, Jean Doucet, Olivier Guiraud*

FRIDAY, 04 JUNE 2021
Time Block B

Oral presentations: Parallel sessions, cont.

MS06-A (4): Physics of multi-phase flow in diverse porous media
Chairs: James McClure, Signe Kjelstrup

14:00	[492] **Coffee is for drinking, tea is for porous media science: intermittent burst dynamics in slow drainage experiments in porous media** *Marcel Moura, Knut Jorgen Maloy, eirik flekkøy, Renaud Toussaint*
14:15	[394] **Developed emulsification in porous media flow** *Ahmad Kharrat, Bianca Brandstätter, Rene Ritter, Mostafa Borji, Pit Arnold, Gerhard Popovski, Oskar Paris, Holger Ott*
14:30	[227] **Experimental study of the contact angle of hydrogen-brine-rock for subsurface energy storage** *Leila Hashemi, Wuis Glerum, Rouhi Farajzadeh, Hadi Hajibeygi*
14:45	[379] **The impact of roughness and wettability on imbibition in a fracture** *Yu Qiu, Ke Xu, Amir Pahlavan, Ruben Juanes*
15:00	[620] **Wettability effects on multiphase displacements in heterogeneous porous media** *Wenhai Lei, Moran Wang*
15:15	[595] **Nano-scale wetting film impact on multiphase transport properties in porous media** *wenhui song, Masa Prodanovic, Jun Yao, Kai Zhang*
15:30	[118] **Effect of Pore-Scale Wettability Distribution Patterns on Fluid Connectivity** *Omid Shahrokhi, Amir Jahanbakhsh, Krystian Wlodarczyk, Duncan P. Hand, Mercedes Maroto-Valer*
15:45	[744] **Quantification of non-linear multiphase flow in porous media for both water-wet and mixed-wet conditions** *Yihuai Zhang, Branko Bijeljic, Ying Gao, Qingyang Lin, Martin Blunt*

Oral presentations: Parallel sessions, cont.

MS08 (3): Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

Chairs: *Qingwang Yuan, Branko Bijeljic*

14:00	[291] **Optimal Fluid Stretching for Mixing-limited Reaction in Rough Fracture Flows** *Seonkyoo Yoon, Marco Dentz, Peter Kang*
14:15	[301] **Impact of Physical Heterogeneity on Effective Reaction Rates** *Rodolfo Oliveira, Martin Blunt, Branko Bijeljic*
14:30	[292] **Effects of Inertia and Diffusion on Reactive Transport with Fluid-Solid Reactions in Rough Fractures** *Woonghee Lee, Seonkyoo Yoon, Peter Kang*
14:45	[745] **Effective dispersion coefficients for the upscaling of pore-scale mixing and reaction in heterogeneous porous media** *Alexandre Puyguiraud, Lazaro Perez, Juan J. Hidalgo, Marco Dentz*
15:00	[49] **Coupled Thermal-Hydrological-Mechanical-Chemical Model For Reactive Dissolution and Wormhole Formation in Vugs Carbonate Rocks** *Cunqi Jia, Jun Yao*
15:15	[622] **Modeling the evolution of fractured media using a multiscale approach** *Sergi Molins, David Trebotich, Carl Steefel*
15:30	[576] **Rayleigh-Taylor Instability in 2D and 3D Dispersive Porous Medium** *Jaybrata Dhar, Patrice Meunier, François Nadal, Yves Méheust*
15:45	[500] **Relative contributions of permeability heterogeneity and viscosity contrast on scalar mixing** *Alessandra Bonazzi, Maria Morvillo, Jinwoo Im, Birendra Jha, Felipe P. J. de Barros*

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Oral presentations: Parallel sessions, cont.

MS13 (2): Fluids in Nanoporous Media
Chairs: *Patrick Huber, Gennady Gor*

Friday Detailed Program

14:00	[320] **Water transport in soft nanoporous materials: Impact of mechanical deformation on collective dynamics, interfacial slippage and permeance** *Alexander Schlaich, Matthieu Vandamme, Marie Plazanet, Benoit Coasne*
14:15	[411] **The Interplay of Spreading, Imbibition and Evaporation of Water Droplets on Nanoporous Surfaces** *Laura Gallardo, Hugo Bellezza, Juan Sanchez, Patrick Huber, Olivier Vincent*
14:30	[451] **Imbibition-Induced Deformation in Nanoporous Vycor Glass** *Juan Sanchez, Patrick Huber, Zhuoqing Li, Michael Fröba, Dirk Enke, Howard Stone*
14:45	[349] **Multiphase imbibition dynamics in xylem-like nanoporous media** *Olivier Vincent, Théo Tassin, Erik Huber, Abraham Stroock*
15:00	[191] **Study of convective drying of a mortar with a paste cover by NMR and MRI** *Hicham DIALLA, Benjamin Maillet, Alban Gossard, Jean-Baptiste Champenois, Philippe Coussot*
15:15	[493] **Beyond tortuosity: evaluating connectivity in multimodal catalysis supports** *Marc Fleury, Gerhard Pirngruber, Aleksandra Glowska, Leonor Catita, Thibaud Chevalier, Elsa Jolimaitre*
15:30	[663] **Particle Flow Through a Hydrophobic Nanopore** *Kim Kristiansen, Signe Kjelstrup*
15:45	[635] **Progress towards SAXS-based PEFC catalyst layer saturation determination** *Kinanti Hantiyana Aliyah, Lorenz Gubler, Jens Eller*

Oral presentations: Parallel sessions, cont.

MS25 (6): Subsurface Water Flow and Contaminant Transport Processes – Special Session in Honor of Harry Vereecken

Chairs: *Rien van Genuchten, Jan Vanderborght*

14:00	[410] **Linking processes, scales, and research communities to advance research on the most important porous medium we have: our Earth.** *Jan Vanderborght, Martinus van Genuchten*
14:15	[791] **Intermediate-scale testing of a spatially distributed sensing technology for monitoring gas emission from soils as applied to climate change** *Ana Ilie, Tissa Illangasekare, Kenichi Soga, Richard Whalley, Andrew Trautz, Abdullah Cihan*
14:30	[307] **Dispersive effects in buoyancy-driven flow including plume-fed gravity currents** *Saeed Sheikhi, Morris Flynn*
14:45	[683] **Investigating the Influence of Non-Linear Interfacial Partitioning on Aqueous Film Forming Foam (AFFF) Transport and Retention in the Unsaturated Zone** *Masoud Arshadi, Shuchi Liao, Chen Liu, Kurt D. Pennell, Linda M. Abriola*
15:00	[600] **Optimal Irrigation control in Richards Equation Framework** *Marco Berardi , Roberto Guglielmi, Fabio Difonzo*
15:15	[344] **Initial estimation of field-scale macropore parameters for use in dual-permeability models** *Carlos Faundez Urbina, Jarbas Honorio de Miranda, Martinus van Genuchten, Bruna Marques de Queiroz*
15:30	[448] **Numerical modeling to optimize nitrogen fertigation with consideration of transient drought and nitrogen stress** *Thomas Groenveld, Amir Argaman, Jiri Šimůnek, Naftali Lazarovitch*
15:45	[419] **Root zone soil moisture estimation with Random Forest** *Coleen Carranza, Corjan Nolet, Michiel Pezij, Martine van der Ploeg*

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Networking Coffee Break
16:00 - 16:30 CET

Missing the face-to-face interactions of in-person events? Don't worry - we have you covered!

Grab a cup of coffee, tea or your favorite beverage (it's 5 o'clock somewhere, right?) and join our ambassadors for a fun and informal chat. It'll be a great way to connect with other participants from around the globe. Join us!

Ambassadors:

Giovanni Porta
Politecnico di
Milano

Alberto Guadagnini
Politecnico di
Milano

Keynote Lecture
18:00 - 18:45 CET

Lynn Gladden
University of Cambridge

3D Magnetic Resonance Imaging Studies of Porous Media: From Operando Catalysis to Fluid Transport in Rock Cores

Magnetic resonance techniques are well-established in application to studying structure-transport relationships in porous media. This presentation will focus around studies of two porous media systems: heterogeneous catalysis and fluid transport in rock cores. A range of magnetic resonance techniques are employed. The basic principles of these methods will be explained. In particular, the contribution made by combining undersampling and compressed sensing image reconstruction techniques with standard magnetic resonance acquisitions will be summarized.

Operando Catalysis: The main focus of our work is to understand catalytic behavior at real operating conditions in a representative process environment, and hence gain insight into catalyst design and optimal process operating conditions. Reactions of interest to date have been ethene oligomerization and Fischer-Tropsch synthesis. We can now measure molecular diffusion within the pores of catalysts while they are operating, and track gas and liquid phase composition as a function of time-on-stream. By spatially mapping diffusion measurements it becomes possible to see how molecular processes in the catalyst pores vary along the length of a tubular reactor.

Fluid Transport in Rock Cores: Understanding how fluids flow through porous media has been a topic of long-standing research interest with regard to optimizing hydrocarbon recovery processes. More recently, research interest is moving to even more challenging problems such as carbon sequestration and hydrogen storage. We will show how three-dimensional (3D) images of fluid flow velocity within the porous structure of rocks can be measured at an isotropic spatial resolution of 35 microns. These maps can then be co-registered with magnetic resonance images of the pore structure or with higher resolution X-ray microtomography datasets to enable us to explore structure-flow correlations within the rocks. These data are of interest in their own right and, of course, provide invaluable data with which to validate and hence develop numerical simulation codes.

Award Ceremony
18:45 - 19:00 CET

MDPI Energies Student Poster Awards

The MDPI Energies Student Poster Award is given in recognition of outstanding student poster presentations at the annual InterPore conference. Each year, at the annual InterPore conference, the Honors and Awards Committee will choose the best student poster presentations to win the MDPI Energies Student Poster Award.

Rien van Genuchten Early-Career Award of Porous Media for a Green World
Kleber Marques Lisboa
Universidade Federal do Rio de Janeiro, Brazil

The Rien van Genuchten Early Career Award is given to an early-career researcher whose focus is the general topic of "porous media research for a green world". This may involve significant theoretical, experimental and/or modeling advances addressing major soil, hydrologic and/or environmental problems facing our planet.

A word of gratitude: This award has been made possible by a generous donation from Dr. Betty-May Pontedeiro to the InterPore Foundation and is created in honor of the eminent soil and groundwater scientist Marthinus (Rien) Th. van Genuchten. Rien van Genuchten is world renown for his enormous achievements in the area of fluids flow and solutes transport in partially-saturated porous media. He has made highly impactful contributions to the understanding and modeling of subsurface processes, in such widely varying fields as soil physics, hydrology, geology, the environmental sciences, and civil engineering.

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Time Block C

Award Ceremony, cont.
18:45 - 19:00 CET

InterPore Medal for Porous Media Research
Marco Dentz
Spanish National Research Council (CSIC), Barcelona, Spain

The InterPore Award for Porous Media Research (formerly Procter & Gamble Award for Thin and Swelling Porous Media Research) is given to mid-career researchers in recognition of outstanding research in general porous media, with emphasis on research conducted over the past 5 years.

InterPore Rosettes

InterPore activities are carried out mainly by volunteers. It takes many voluntary working hours to make an international platform like InterPore a success. Recognizing and honoring volunteers sets a standard for service, encourages a sustained commitment to participation, and inspires others to commit themselves as well.

Each year, InterPore honors selected individuals who have made very significant contributions to InterPore activities; they receive the InterPore Rosette.

Closing Ceremony
19:00 - 19:30 CET

InterPore2022

14th International Conference on Porous Media

30 May - 02 June, 2022
Qingdao, China & Online

The scientific program will include subjects related to porous media and range from **pore-scale modeling**, **pore-scale imaging**, to **experimental and numerical methods on larger scales**, to **sensitivity and uncertainty analysis**.

Topics and Applications

- Mass and heat transport
- Multiphysics-multiphase flow
- Reservoir engineering, CO_2 sequestration, geothermal energy and energy storage
- Colloids and nanoparticle transport
- Soil mechanics and engineering
- Swelling porous media
- Geotechnical engineering
- Wave propagation
- Biotechnology and biofilms
- Thin and nanoscale poromechanics
- Fuel cells and batteries
- Food, wood, composites
- Fibers and textiles
- Filters, foams, membranes, papers
- Ceramics and construction materials

Local Organizing Committee
Chair: Jun Yao
Co-Chair: Yongfei Yang

Program Committee
Chair: Patrick Jenny
Vice-Chair: Sridhar Raganathan

Hybrid Conference Format

The 14th Annual InterPore Meeting will offer physical as well as virtual lectures and attendees. The conference will be held at the Shangri-La Hotel in the heart of Qingdao, named one of the most livable cities in China. The international port city is best known for Tsingtao Beer and international festivals which promote economic & cultural exchanges between China and others all over the world.

In order to accommodate those who, for various reasons, may be unable to join in the physical meeting, InterPore2022 will offer the option to participate and present online.

www.interpore.org/2022