



## CouFrac 2018 Technical Program

**Monday, November 12, 2018**

	Track A: Session 1-1	Track B: Session 4-1	Track C: Session 5-1
Time	Fracture Mechanics	Induced Seismicity (I)- Hydro-Mechanical Modeling	Thermal-Hydro-Mechanical Processes: Numerical Modeling and Experiments(I)
	Session Chairs: Hideaki Yasuhara & Wancheng Zhu	Session Chairs: Pania Newell & Ki-Bok Min	Session Chairs: ZhijunWu & Sheng-Qi Yang
10:15-10:35	<a href="#">Influence of fracture deformation on grout penetrability in fractured rock Masses [Invited Talk]</a> Xiao Fei, Zhiye Zhao*	Discrete element based numerical analysis of seismicity associated with fluid injection – Comparison of fluid pressure induced and poroelastic stress triggered Jeoung Seok Yoon, Arno Zang, Hannes Hofmann, Ove Stephansson, Günter Zimmermann	Influence of water saturation and real-time high temperature on failure mechanical behavior of sandstone under conventional triaxial compression Sheng-Qi Yang, Yan-Hua Huang
10:35-10:55	<a href="#">Some issues in the simulation of dynamic and static cracking [Invited talk]</a> Hong Zheng	Geomechanical modelling of fault reactivation and seismicity driven by overpressured fluid Xinglin Lei	Permeability sensitivity of fractured sandstone on account of scale-dependent aperture evolution Chaojie Cheng, Harald Milsch, Christian Kluge
10:55-11:15	Estimation of crack width in porous media by nano/micro particles Junzhe Cui, Anna Suzuki, Satoshi Uehara, Keiichi Shirasu, Takatoshi Ito	Geomechanical modeling of fault reactivation and induced seismicity by the flowback of hydraulic fracturing fluid Zirui Yin, Fengshou Zhang, Zhaowei Chen, Lianyang Zhang, Shawn Maxwell	Fracture growth in gels as analogs to understand fracture behaviour in shale gas reservoirs Zheng Li, Jingyi Wang, Ian D. Gates
11:15-10:35	A semi-analytical method for predicting the mechanical responses around a non-circular wellbore associated with in situ stress measurement Bisheng Wu, Bailin Wu, Zuorong Chen, Xi Zhang	A basic study on the injection-induced seismicity during shut-in stage Ju Hyi Yim, Kwang-II Kim, Ki-Bok Min	<a href="#">Estimation of the Biot coefficient for an ultra-low permeability rock [Invited Talk]</a> Antony Patrick Selvadurai
11:35-11:55	Influence of roughness on the shear strength, slip stability, and permeability evolution of fractures Chaoyi Wang, Derek Elsworth	<a href="#">Modeling coupled THMC processes and microseismicity in the Fallon FORGE and Newberry Volcano EGS projects [Invited Talk]</a> Eric Sonnenthal	Investigation of cooling effects on hydraulic fracture and induced seismicity in deep geothermal systems Xiaochen Wei, Jiawei Shen, Xiangjun Liu, Lixi Liang, Qi Li



# CouFrac 2018 Technical Program

Monday, November 12, 2018

Time	Track A: Session 1-2	Track B: Session 2-1	Track C: Session 6-1
	Experimental Studies of THMC Processes	Computational Methods in THMC: Continuum-Based Models (I)	Underground Rock Engineering (I)
	Session Chairs: Li Zhuang & Christophe Tournassat	Session Chairs: Bruno Figueiredo & Quan Gan	Session Chairs: Jili Feng & Lubomir Stas
14:20-14:40	<p><b>Wellbore instability control via water-based drilling fluid in brittle gas shale: a case study</b> Xiaopeng Yan, Lijun You, Yili Kang, Chengyuan Xu, Xiangchen Li, Chong Lin</p>	<p><b>Recent developments in FRACOD2D/FRACOD3D in modelling coupled fracture propagations [Invited talk]</b> Baotang Shen</p>	<p><b>The determination of crustal stress orientation in deep rock mass engineering by using borehole stereopair imaging technique</b> Xianjian Zou, Chuanying Wang, Zengqiang Han, Huan Song</p>
14:40-15:00	<p><b>Laboratory investigation of hydraulic fracturing of granite under true triaxial stress state using different injection schemes – Part 1. Permeability enhancement</b> Li Zhuang, Kwang Yeom Kim, Sung Gyu Jung, Melvin Diaz, Hannes Hofmann, Ki-Bok Min, Arno Zang, Günter Zimmermann, Ove Stephansson, JeoungSeok Yoon</p>	<p><b>Use of a continuum-based model to analyse coupled processes in fractured rocks: some verification studies</b> Bruno Figueiredo, Chin-Fu Tsang, Jonny Rutqvist, Auli Niemi</p>	<p><b>The influence of flaw infilling materials on the failure process in hard rock</b> Shu-Ting Miao, Peng-Zhi Pan, Zhen-Hua Wu</p>
15:00-15:20	<p><b>Stress induced mechanical and transport property change in low-permeability brittle rock: from pre- to postpeak triaxial compression</b> Zaobao Liu, Jianfu Shao, Wenhua Zha, Shouyi Xie</p>	<p><b>Evolution of fracture permeability in sand injectite intrusions by coupled hydro-mechanical modelling</b> Quan Gan, Derek Elsworth, Yixin Zhao</p>	<p><b>Stress-induced fracturing process of hard Basalt in underground powerhouse under high geostress condition: In-situ observation and numerical back analysis</b> Quan Jiang, Yinen Shi, Fei Yan, Dingping Xu</p>
15:20-15:40	<p><b>Original talk cancelled Call for last-minute talk</b></p>	<p><b>Hydromechanical interaction effects on fluid flow in growing three-dimensional fracture networks</b> Adriana Paluszny, Robin N. Thomas, Robert W. Zimmerman</p>	<p><b>A new approach of core discing mitigation to improve in-situ stress measurement in deep rock mass [Invited Talk]</b> Shaojun Li, Minzong Zheng, Zou Yao</p>



## CouFrac 2018 Technical Program

**Tuesday, November 13, 2018**

Time	Track A: Session 5-2	Track B: Session 1-3	Track C: Session 2-2
	Thermal-Hydro-Mechanical Processes: Numerical Modeling and Experiments (II)	Flow in Fractures	Computational Methods in THMC: Continuum-Based Models (II)
	Session Chairs: Sheng-Qi Yang & Jonny Rutqvist	Session Chairs: Carl Steefel & Liangchao Zou	Session Chairs: Bruno Figueiredo & QuanGan
9:45-10:05	Degradation characteristics for heterogeneous rock with coupled thermo-mechanical conditions Lei Weng, Zhijun Wu, Quansheng Liu	On complex flow and transport behaviors in a rough-walled rock fracture [Invited talk] Lanru Jing	Fluid-driven fracture in geological carbon storage Pania Newell, Mario J Martinez
10:05-10:25	How can the borehole three-dimensional displacement data help improving in situ stress estimation across a fault reactivated by fluid injections? Maria Kakurina, Yves Guglielmi, Christophe Nussbaum and Benoît Valley	Numerical study on the mechanism of fluid flow through rough fractures Ge Zhang, Aiguo Xu, Guangcai Zhang, Yingjun Li, Xiaomian Hu	A new 3D numerical model to simulate complex propagation of multiple fractures during fluid injection Lei Zhou, Honglian Li, Xiaopeng Su, Yiyu Lu, Zhenyu Zhang
10:25-10:45	Shear behavior of granite fractures undergoing thermal treatments Zihao Dou, Zhihong Zhao, Jingru Cheng*	Modeling of fluid flow and water pressure distribution in rough rock fracture under normal stress Yuedu Chen, WeiguoLiang,A.P.S. Selvadurai	A general preconditioning framework for coupled poromechanics in fractured media Massimiliano Ferronato, Andrea Franceschini, Nicola Castelletto, Hamdi A. Tchelepi
10:45-11:05	Thermal over-closure of rougher joint sets – consequences for HLW disposal strategies and HTM modelling [Distinguished Invited talk] Nick Barton	A universal visco-inertial flow model in geologic porous media [Invited Talk] Jia-Qing Zhou, Yi-Feng Chen, Lichun Wang, Lichun Wang, M. Bayani Cardenas	



## CouFrac 2018 Technical Program

**Tuesday, November 13, 2018**

Time	Track A: Session 1-4	Track B: Session 2-3	Track C: Session 4-2
	Modeling of THM Processes in the Subsurface	Computational Methods in THMC: Discontinuum-Based Models	Induced Seismicity (II) – Theory and Observations
	Session Chairs: Hideaki Yasuhara & Hang Deng	Session Chairs: JeoungSeok Yoon & Daniel Vogler	Session Chairs: Luca Urpi & Qi Li
14:20-14:40	<b>Impact of fracture propagation on uranium release in a hypothetical uranium-rich reservoir under geologic carbon storage conditions</b> Liwei Zhang, Yan Wang, Xiuxiu Miao, Manguang Gan, Xiaochun Li	<b>Stress induced anomalous transport in natural fracture networks</b> Peter Kang, Qinghua Lei*, Marco Dentz, Ruben Juanes	<b>Seismic radiation in anisotropic media based on general dislocation source Model</b> Yi Yao, Yibo Wang, Qingfeng Xue, Xu Chang
14:40-15:00	<b>Impact of normal stress caused closure on fluid flow and solute retention in rock fractures</b> Liangchao Zou, Vladimir Cvetkovic, Lanru Jing, Diego Mas Ivars	<b>Fluid-structure interaction with a parallel transfer operators to model hydro-mechanical processes in heterogeneous fractures</b> C. von Planta, D. Vogler*, X. Chen, M. Nestola, P. Zulian, M.O. Saar, R. Krause	<b>Shear rupture of a dilatant circular patch located at a pre-compressed geological interface</b> <b>A.P.S Selvadurai, P.A. Selvadurai</b>
15:00-15:20	<b>Calculation of the stability of the New Yangfeng tailings pond based on FLAC fluid-solid coupling Methods</b> Suifeng Wang, Fei Tan, Bangchuang Ma, Ping Yuan, Tao Wang	<b>Stress-induced flow heterogeneity on the bedding plane of fractured layered rock</b> Qinghua Lei, Xiaoguang Wang, Peter Kang, John-Paul Latham, Chin-Fu Tsang	<b>The dynamic characteristics of induced seismicity with epicenter rupture theory</b> Chen Yin, Furong Wu, Liting Liu
15:20-15:40	<b>Simulation of the cooling effect of geothermal reservoir induced by long-term re-injection of recycled cold water</b> Hejuan Liu, Zhengwen Zhu, Hongwei Wang	<b>Original talk cancelled</b> <b>Call for last-minute talk</b>	<b>Cyclic Soft Stimulation (CSS): a novel approach to reduce fluid-injection-induced seismic risk</b> Hannes Hofmann, Günter Zimmermann, Arno Zang, Ove Stephansson, JeoungSeok Yoon, Kwang Yeom Kim, Ki-Bok Min

## CouFrac 2018 Technical Program

Tuesday, November 13, 2018

Time	Track A: Session 1-5	Track B: Session 2-4	Track C: Session 3-1
	Coupled Processes in Clays and Fractures	Computational Methods in THMC: Hybrid Models (I)	THMC Processes in Hydraulic Fracturing
	Session Chairs: Christophe Tournassat & Carl Steefel	Session Chairs: John-Paul Latham & Qinghua Lei	Session Chairs: Adriana Paluszny & Xuhai Tang
16:10-16:30	<b>Coupled processes in fractures from <math>\mu\text{m}</math> to cm-scale</b> Tobias Kling, Da Huo, Daniel Vogler, Jens-Oliver Schwarz, Frank Wendler, Frieder Enzmann, Florian Amann, Lars Pastewka, Sally M. Benson and Philipp Blum*	<b>Recent advances in hydromechanical modelling of fractured rocks using the finite-discrete element method [Invited talk]</b> John-Paul Latham, Qinghua Lei, Asiri Obeysekara, Pan Yang, Jiansheng Xiang, Pablo Salinas, Christopher Pain	<b>Investigate the influence of the differential stress in the vicinity of natural caves using phase field method</b> Zhiyuan Liu, Pandeng Luo, Yujie Yan, Yuan Sun, Xiaoguang Wang, Xuhai Tang
16:30-16:50	<b>Coupling clay dehydration to THM processes to calculate fluid overpressures in sedimentary basins</b> Joachim Tremosa, Hélène Gailhanou, Christophe Chiaberge, ArnaultLassin, Francis Claret	<b>Zero-dimensional fracture model for fluid flow and heat transfer in discrete fracture networks</b> Mengsu Hu, Jonny Rutqvist	<b>A comprehensive study of fracture initiation and propagation characteristics for radial drilling with hydraulic fracturing</b> Shouceng Tian, Xuhai Tang, Qinglin Liu, ZhaoquanGuo, Gensheng Li
16:50-17:10	<b>From microstructure description to macro-scale properties of clay barriers</b> Christophe Tournassat, Stéphane Gaboreau, Carl Steefel	<b>Comparison of numerical codes for coupled thermo-hydro-mechanical simulations of fluid injection into fractured media</b> Ahmad Zareidarmiyani, Hossein Salarirad, Victor Vilarrasa, Kwang-II Kim, Jaewon Lee, Ki-Bok Min	<b>Modeling water flow and thermal transfer during artificial ground freezing in fractured media</b> Shibing Huang, Quansheng Liu
17:10-17:30	<b>Can we monitor the breath of sandstone during carbon dioxide flooding by optical fibers? [Invited Talk]</b> Qi Li, Chengkai Fan, Xiaying Li, Liang Xu	<b>Numerical simulation of blasting in fractured rocks using an immersed-body fluid-solid interaction model</b> Pan Yang, Qinghua Lei, Jiansheng Xiang, John-Paul Latham*, Christopher Pain	<b>Investigation of the effect of water on the fracture toughness of mudstone and its application in hydraulic fracturing</b> Jianfeng Yang, Weiguo Liang, Haojie Lian, Yuedu Chen, Li Li



## CouFrac 2018 Technical Program

**Wednesday, November 14, 2018**

Time	Track A: Session 1-6	Track B: Session 3-2	Track C: Session 4-3
	Reactive Transport in Fractures	Mechanics of Hydraulic Fracturing	Scaling Permeability
	Session Chairs: Hang Deng & Carl Steefel	Session Chairs: Fengshou Zhang & Adriana Paluszny	Session Chairs: Qi Li & Patrick Selvadurai
9:20-9:40	<b>Simulating evolution of rough fractures: from pore scale to continuum scale</b> Hang Deng, Sergi Molins, Carl Steefel	<b>DEM simulation of hydraulic fracture height growth in the layered rocks with different stiffness ratios</b> Liuke Huang, Fengshou Zhang, Jianjun Liu	<b>Laboratory investigation of hydraulic fracturing of granite under true triaxial stress state using different injection schemes – Part 2. Induced seismicity</b> Melvin Diaz, Sung Gyu Jung, Li Zhuang, Kwang Yeom Kim, Hannes Hofmann, Ki-Bok Min, Arno Zang, Günter Zimmermann, Ove Stephansson, JeoungSeok Yoon
9:40-10:00	<b>Numerical approach to reactive transport in a granitic fracture</b> Liping Qiao, Anda Huang, Zhechao Wang*, Rulei Wei, Jingchao Bi, Shen Ye	<b>Numerical investigation and implications for hydraulic fracturing stimulation of low-permeability reservoirs</b> Xiyu Chen, Xi Zhang, Jinzhou Zhao, Wenyi Yan, Yongming Li	<b>Modeling of fracture-permeability of low-permeable caprocks for CO2 geological storage</b> Takashi Fujii, Xinglin Lei
10:00-10:20	<b>Hybrid multi-scale modeling of reactive transport in fractures</b> Sergi Molins, David Trebotich, Bhavna Arora, Hang Deng*, Carl Steefel	<b>A cohesive element based Numerical Manifold Method for hydraulic fracturing modelling with Voronoigrains</b> Hao Sun, Zhijun Wu	<b>Relation between induced seismicity and fault leakage and its evolution with time: analysis of repeated controlled-injection fault reactivation experiments at Mont Terri, Switzerland</b> Pierre Jeanne, Yves Guglielmi*, Jens Birkholzer, Jonny Rutqvist, C. Nussbaum
10:20-10:40	<b>Numerical investigations on mineral precipitation in fractured porous media using lattice-Boltzmann methods</b> Mehrdad Ahkami, Andrea Parmigiani, Paolo R. Di Palma, Martin O. Saar, Xiang-Zhao Kong	<b>Original talk cancelled Call for last-minute talk</b>	<b>Fractured zone stimulation at Fenton Hill: hydroshearing vs elastic opening</b> Antonio P. Rinaldi, J. Rutqvist*



## CouFrac 2018 Technical Program

**Wednesday, November 14, 2018**

Time	Track A: Session 1-7	Track B: Session 3-3	Track C: Session 6-2
	THMC Modeling	Hydraulic Fracturing with Supercritical CO <sub>2</sub>	Underground Rock Engineering (II)
	Session Chairs: Christophe Tournassat & Tao Xu	Session Chairs: Li Zhuang & Bisheng Wu	Session Chairs: Shaojun Li & Luca Urpi
11:10-11:30	<b>Modelling of (T)HM processes in bentonite sealing barriers with pellets, blocks and inter-block gaps and model validation against EB experiment</b> Radim Blaheta, Martin Hasal, Zdenek Michalec	<b>Numerical analysis for the multistage supercritical CO<sub>2</sub> fracturing of horizontal wells in tight reservoirs considering pre-existing fractures and thermal-hydro-mechanical coupling [Invited talk]</b> Yang Ju	<b>Modelling of coal matrix deformation and swelling of coal induced by gas adsorption</b> Jili Feng, Hao Xie, Chaojun Li
11:30-11:50	<b>Coupled THMC modelling by considering damage theory and pressure dissolution for predicting permeability change in fractured rocks</b> H. Yasuhara, S. Ogata, N. Kinoshita, K. Kishida	<b>Micromechanical analysis of hydraulic fracturing in a simplified toughness dominated regime: implications to supercritical carbon dioxide fracturing</b> Mengli Li, Fengshou Zhang	<b>Hydraulic fracturing analysis on composite reservoir of coal and shale each with a sandstone interlayer</b> Yongjun Yu, Wancheng Zhu, Lianchong Li
11:50-12:10	<b>Fault reactivation modelling with the FE method-based simulator OpenGeoSys</b> Luca Urpi, Bastian Graupner, Antonio P. Rinaldi	<b>Numerical study on fracturing performance by supercritical CO<sub>2</sub> fracturing and aqueous fluids fracturing</b> Bailong Liu, Anna Suzuki, Takatoshi Ito	<b>Utilization of fracture models for geologic disposal of nuclear waste in granitic host rocks</b> Teklu Hadgu, Elena Kalinina and Yifeng Wang



## CouFrac 2018 Technical Program

**Wednesday, November 14, 2018**

	Track A: Session 2-5	Track B: Session 3-4	Track C: Session 4-4
Time	Computational Methods in THMC: Hybrid models (II)	Fracturing in Unconventional Reservoirs	Friction/Failure
	Session Chairs: Qinghua Lei & JeoungSeok Yoon	Session Chairs: Weiguo Liang & Pengzhi Pan	Session Chairs: Qi Li & Luca Urpi
14:20-14:40	<b>Numerical manifold method based on analysis-suitable T-spline for fractured rock masses modeling</b> Dengxue Liu, Youliang Zhang*, Xiuli Ding, Shuling Huang	<b>Phase-Field modelling of hydraulic fracturing in impermeable rock</b> Lin Ni, Xue Zhang, Chet Vignes, Daichao Sheng, Scott Sloan	<b>Experimental investigation of the effect of salt precipitation on the physical and mechanical properties of a tight sandstone</b> Dujie Zhang, Yili Kang, A.P.S Selvadurai, Lijun You
14:40-15:00	<b>Interactive roles of geometrical distribution and geomechanical deformation of fracture networks in fluid flow through fractured geological media</b> Qinghua Lei, Xiaoguang Wang, Ki-Bok Min, Jonny Rutqvist	<b>Slip stabilization by permeability enhancement along a hydraulically shearing fracture</b> Xi Zhang, Changrong He	<b>Experimental study of clay content on the frictional properties of simulated faults: implications for induced earthquakes</b> Mengke An, Fengshou Zhang, Lianyang Zhang
15:00-15:20	<b>Modelling excavation-induced unloading and seepage effects on a fracture network using a coupled fluid-solid approach based on the immersed body method</b> Asiri Obeysekara, Qinghua Lei, Pablo Salinas, Jiansheng Xiang, John-Paul Latham*, Christopher Pain	<b>A numerical study on permeability enhancement caused by pore-pressure driven shear dilation for oil sands development</b> Masahiro Watanabe, Takatoshi Ito, Tetsuya Tamagawa, Kazuhiko Tezuka	<b>Inverse problems for Darcy flow in heterogeneous and fractured porous media</b> Radim Blaheta, Michal Beres, Simona Domesova
15:20-15:40	<b>An integrated reservoir and well model for geothermal field</b> Zhihong Zhao, Guihong Liu*	<b>Original talk cancelled Call for last-minute talk</b>	<b>The characteristics of brittle failure under different stress conditions in the Longmaxi formation shale in southern Sichuan</b> Hai-Meng Shen, Qi Li, Xia-Ying Li, Jian-Li Ma