

# Schedule

## May 28<sup>th</sup>, 2019

5:30 PM – 7:00 PM	Registration – Crush Space, Federation Hall
6:00 PM – 9:00 PM	Welcome reception – Columbia A & B

## May 29<sup>th</sup>, 2019

7:30 AM – 8:30 AM	Registration – Crush Space, Federation Hall	
8:30 AM – 9:00 AM	<b>Welcome Address: David Rudolph (University of Waterloo), Jim Butler (Kansas Geological Survey), &amp; Peter Dietrich (UFZ – Helmholtz Centre for Environmental Research)</b>	
9:00 AM – 9:45 AM	<b>Keynote Speaker: Jay Famiglietti, University of Saskatchewan</b> <i>The Global Groundwater Crisis as Revealed from Space: Implications for Human Security</i>	
9:45 AM – 10:15 AM	<b>Coffee break, exhibitor &amp; poster viewings</b>	
	<b>Session 1: Multiscale monitoring in fracture rock environments I</b> <b>Chair: Beth Parker</b>	<b>Session 2: Geophysical Methods I</b> <b>Chair: Lee Slater</b>
10:15 AM – 10:35 AM	Recent advances in Flexible Liner methods ( <i>Carl Keller; Ian Sharp</i> )	Modeling root processes along a successional forest transect using a coupled hydrogeophysical inversion approach ( <i>Alexandria S. Kuhl; Anthony D. Kendall; Remke L. Van Dam; David W. Hyndman</i> )
10:35 AM – 10:55 AM	High resolution time-elevation-head profiles from temporary deployed sensors in boreholes for assessing variable flow conditions in fractured rock aquifers ( <i>Peeter Pehme; Beth Parker and Jessica Meyer</i> )	Is an inversion always the most efficient solution? ( <i>Stefan Klingler; Carsten Leven; Peter Dietrich</i> )
10:55 AM – 11:15 AM	A geological approach for locating petroleum facilities appropriately to protect subsurface resources ( <i>Elfatih A. Farah; Fathelrahman A. Bireir</i> )	Estimation of the minimum level of the residual saturation of LNAPL in unsaturated soil by GPR ( <i>Aseel Dawrea; Richard G. Zytner; John Donald</i> )
11:25 AM – 11:55 AM	<b>Invited Speaker: Jessica Meyer, University of Iowa</b> <i>Hydraulically Calibrated Stratigraphy: A Framework for Improved Monitoring, Modeling, and Management of Fractured Rock Aquifers</i>	
11:55 AM – 12:50 PM	<b>Lunch break, exhibitor &amp; poster viewings</b>	
12:50 PM – 1:20 PM	<b>Invited Speaker: Lee Slater, Rutgers University</b> <i>Assessing Geophysical Techniques for Geolocating and Characterizing Anoxic Groundwater Discharges Along the River Corridor</i>	
	<b>Session 3: Advances in groundwater – surface water interaction I</b> <b>Chair: Walter Illman</b>	<b>Session 4: Emerging sensor technologies for subsurface characterization I</b> <b>Chair: David Hyndman</b>
1:30 PM – 1:50 PM	Site characterization, monitoring, and numerical modelling to determine public supply well vulnerability to depression focused recharge and a losing stream reach during large-magnitude hydrological events ( <i>Andrew J. Wiebe; David L. Rudolph</i> )	Introducing a new concept for the reliable and efficient in-situ capturing and visualization of tracer distribution and spread in highly heterogeneous sedimentary deposits ( <i>Thomas Vienken; Peter Huggenberger; Emanuel Huber; Manuel Kreck; Marco Pohle; Peter Dietrich and Ulrike Werban</i> )

1:50 PM – 2:10 PM	An approach to estimate groundwater-surface water interaction ( <i>Moulshree Tripathi; Marc Walther; P.K Yadav; R. Liedl; B. R. Chahar and P. Dietrich</i> )	Determination of vertical hydraulic gradient in clay till using a MiHPT advanced direct-push technology ( <i>Louise Rosenberg; Mette M. Broholm; Nina Tuxen; Ida Henriette Kern-Jespersen; Gro Lilbæk; Poul L. Bjerg</i> )
2:10 PM – 2:30 PM	Flood management and modeling method to assess flood-hazard areas in small ungauged basins. A case study of Tangier's basins, Northwestern Morocco ( <i>Iliasse Khaddor; Adil Hafidi Alaoui</i> )	Rapid DNAPL source zone characterization with Dye-Enhanced Laser Induced Fluorescence ( <i>Robert J. Stuetzle; Rick R. Wenzel; Nicklaus Welty; Mark Klemmer; Randy St. Germain</i> )
2:30 PM – 3:00 PM	<b>Coffee break, exhibitor &amp; poster viewings</b>	
	<b>Session 5: Big Data Synthesis and Real Time Monitoring I Chair: Colby Steelman</b>	<b>Session 6: Emerging sensor technologies – Groundwater Flow Measurement Methods I Chair: Jim Butler</b>
3:00 PM – 3:20 PM	Using High Resolution Site Characterization for Real Time Data Acquisition and Decision Making ( <i>O'Neill, Patrick</i> )	Comparison of groundwater velocity profiles by different methods with other profiles of hydrogeologic and hydrogeophysical properties ( <i>Chin Man W. Mok; John F. Devlin; Trevor C. Osorno; Bryan R. Heyer; Amado Guzman; Stephen R. Richardson; Barbara A. Carrera; Justin A. Long; Michael S. Schofield</i> )
3:20 PM – 3:40 PM	Real-Time data collection and visualization technologies for emergency spill response projects ( <i>Murray, Dan</i> )	Development of a downhole trichloroethene diffusion test for fractured sedimentary rock matrix ( <i>Richelle M. Allen-King; Matthew Buzzeo; Rory Dishman; and Rebecca Kiekhaefer</i> )
3:40 PM – 4:00 PM	Synchrotron X-ray Microtomography at Sirius; the Brazilian Light Source – in situ; time-resolved and multiscale experiments for subsurface characterization ( <i>Nathaly Lopes Archilha; Paola Rodrigues Rangel Rosa; Gabriel Schubert Ruiz Costa</i> )	Well Flow Dynamics During Groundwater Sampling: Comparison of Purge and Passive Sampling Approaches ( <i>Sanford L. Britt. PG, CHG</i> )
4:00 PM – 6:30 PM	<b>Poster presentations &amp; reception</b>	

## May 30<sup>th</sup>, 2019

8:30 AM – 9:15 AM	<b>Exhibitor Introductions</b>	
9:15 AM – 9:30 AM	<b>Coffee break, exhibitor &amp; poster viewings</b>	
9:30 AM – 10:00 AM	<b>Invited Speaker: Bruno Basso, Michigan State University</b> <i>Big-Data Analytics to Enhance Sustainability of Agricultural Systems</i>	
	<b>Session 7: Advances in isotope tracers for subsurface characterization and fingerprinting I Chair: David Rudolph</b>	<b>Session 8: Emerging sensor technologies for subsurface characterization II Chair: Peeter Pehme</b>
10:10 AM – 10:30 AM	Groundwater-derived <sup>90</sup> Sr in tree shallow nestlings ( <i>David R. Lee; Marilynne Stuart; R.W. Doug Killey</i> )	The benefit of using a novel CPT-based seismic tomographic system for geotechnical subsurface characterization ( <i>Uta Koedel; Lutz Karl; Peter Dietrich; Thomas Fechner</i> )
10:30 AM – 10:50 AM	Evaluating long-term stability of sites for deep storage using the δ <sup>44</sup> Ca isotope signature of calcite, fluorite, and groundwater from the Stripa Mine, Sweden ( <i>W.R.M. Makahnouk; S.K. Frape; and A.R. Blyth</i> )	Optical Image Profiler (OIP) technical advances and field experience ( <i>Thomas M. Christy; Wes McCall; Anders Christensen; Daniel A. Pipp; and Ben Jaster</i> )

10:50 AM – 11:10 AM	Subsurface leakage along abandoned oil and gas wells ( <i>Kang, Mary</i> )	Low altitude aerial thermal infrared surveys to detect groundwater discharges and thawing permafrost ( <i>Brewster Conant Jr.</i> )
11:10 AM – 11:25 AM	<b>Coffee break, exhibitor &amp; poster viewings</b>	
	<b>Session 9: Multiscale monitoring in fracture rock environments II</b> Chair: <b>Jessica Meyer</b>	<b>Session 10: Geophysical Methods II</b> Chair: <b>Peter Dietrich</b>
11:25 AM – 11:45 AM	CMT multilevel systems installed using inflatable rubber packers for small-diameter bedrock boreholes suitable for limited access field sites ( <i>Jeremy D. Fernandes; Robert Ingleton; John A. Cherry; Beth L. Parker</i> )	Understanding and managing source water in sedimentary rock aquifers using airborne electromagnetic surveys ( <i>Colby M. Steelman; Adam Smiarowski; Oliver Conway-White; Hernan Ugalde; Emmanuelle Arnaud; Anthony L. Endres; Beth L. Parker</i> )
11:45 AM – 12:05 PM	Use of digital outcrop photogrammetry to inform fracture network characteristics for discrete fracture network modelling of a sandstone aquifer ( <i>Christopher Morgan; Jessica Meyer; Beth Parker</i> )	Advancing magnetic resonance geophysical methods to characterize groundwater systems ( <i>Elliot Grunewald; David Walsh</i> )
12:05 PM – 12:25 PM	How shall we be characterizing; monitoring and modeling groundwater flow and transport through fractured rocks? ( <i>Walter A. Illman</i> )	High resolution characterization of time-lapse tracer experiments using crosshole GPR full-waveform inversion: A synthetic study ( <i>P. Haruzi; A. Klotzsche; Z. Zhou; J. Vanderborgh; H. Vereecken; J. van der Kruk</i> )
12:25 PM – 1:20 PM	<b>Lunch break, exhibitor &amp; poster viewings</b>	
1:20 PM – 1:50 PM	<b>Exhibitor Introductions</b>	
1:50 PM – 2:10 PM	<b>Walk/bus to Columbia Field for Field Demonstration</b>	
2:10 PM – 5:00 PM	<b>Field demonstrations</b>	
5:00 PM – 6:00 PM	<b>Break</b>	
6:00 PM – 6:30 PM	<b>Banquet reception, Exhibitor &amp; poster viewings</b>	
6:30 PM – 9:00 PM	<b>Conference Banquet</b> <b>Keynote Speaker: John Cherry, G360 Institute for Groundwater Research</b> <i>Groundwater Contamination: Past, Present, and Examples of Confusion and Ignorance</i>	

## May 31<sup>st</sup>, 2019

8:30 AM – 9:15 AM	<b>Keynote Speaker: Rosemary Knight, Stanford University</b> <i>Advancing the Use of the Airborne Electromagnetic Method for Mapping Groundwater Systems</i>	
9:15 AM – 9:30 AM	<b>Coffee break, exhibitor &amp; poster viewings</b>	
	<b>Session 11: Multiscale monitoring in fracture rock environments III</b> Chair: <b>Jim Butler</b>	<b>Session 12: Big data synthesis and real-time monitoring II</b> Chair: <b>David Hyndman</b>
9:30 AM – 9:50 AM	Water level responses to natural signals at multiple temporal scales ( <i>Jonathan Kennel; Beth Parker</i> )	Visual analytics and information management for comprehensive geothermal reservoir characterization ( <i>A. Linsel; K. Bär; J. Hornung and M. Hinderer</i> )
9:50 AM – 10:10 AM	Establishing a baseline groundwater monitoring network in the Transboundary Liard Basin ( <i>Nathan H. Glas; Amanda A. Pierce; Colby M. Steelman; Beth L. Parker</i> )	Applying innovative digital technologies to communicate complex subsurface features ( <i>Jody Vaillancourt; Kristen Todtz</i> )

10:10 AM – 10:30 AM	The development of multi-test, straddle packer testing equipment and procedures to improve high-resolution transmissivity measurements ( <i>Pat Quinn; Beth Parker; John Cherry</i> )	Tomographic characterization of hydraulic parameters using groundwater extraction/injection operational and monitoring data ( <i>Barbara A. Carrera; Chin Man W. Mok; and Iason Papaioannou</i> )
10:30 – 10:45 AM	<b>Coffee break, exhibitor &amp; poster viewings</b>	
	<b>Session 13: Advances in groundwater – surface water interaction II</b> <b>Chair: Brewster Conant Jr.</b>	<b>Session 14: Emerging sensor technologies – Groundwater Flow Measurement Methods II</b> <b>Chair: Rick Devlin</b>
10:45 AM – 11:05 AM	'Urban Karst' – Investigation and monitoring of an urban till aquitard groundwater system ( <i>Nick Schmidt; Martin Shepley</i> )	Recent advances using fibre optic Active Distributed Temperature Sensing (A-DTS) to measure natural gradient flow in fractured bedrock aquifers ( <i>Jonathan D. Munn; Carlos H. Maldaner; Thomas I. Coleman and Beth L. Parker</i> )
11:05 AM – 11:25 AM	Application of hydraulic tomography for subsurface heterogeneity characterization using long-term water-supply pumping/injection records: Numerical experiments and a field application ( <i>Ning Luo; Walter A. Illman; Yuanyuan Zha; Xin Tong; and Steven J. Berg</i> )	High-resolution characterization and geostatistical analysis of aquifer structure using direct groundwater velocity measurements ( <i>Osorno; T.C.; Devlin; J.F.; Bohling; G.C.</i> )
11:25 AM – 11:45 PM	Climate change effects on coastal groundwater in Yemen during 1981 to 2016 ( <i>Afrah Saad Al-Mahfadi</i> )	Use of steady-state hydraulic tomography to inform the design of a chaotic advection system ( <i>Michelle S. Cho; Neil R. Thomson; Zhanfeng Zhao; Walter A. Illman</i> )
11:45 AM – 12:40 PM	<b>Lunch break, exhibitor &amp; poster viewings</b>	
12:40 PM – 1:10 PM	<b>Invited Speaker: Rick Devlin, University of Kansas</b> <i>Past and Future Directions for the Family of Point Velocity Probe (PVP) Instruments</i>	
	<b>Session 15: Methods for Assessing Contaminated Sites I</b> <b>Chair: Murray Einarson</b>	<b>Session 16: Geophysical Methods III</b> <b>Chair: Peter Dietrich</b>
1:20 PM – 1:40 PM	Field methods for developing a general conceptual model for organic contaminant plume transport & attenuation in fractured rock ( <i>Beth L. Parker</i> )	Exploring the subsurface: Monitoring below-ground colloid fate and transport using spectral induced polarization (SIP) ( <i>Adrian Mellage; Christina Smeaton; Andrew Holmes; Alex Furman; Frank Gu; Fereidoun Rezanezhad and Philippe Van Cappellen</i> )
1:40 PM – 2:00 PM	Assessment of sources and transformation of nitrate in Sabkha environment by using multi-tracer approach (Sabkha Matti; Saudi Arabia) ( <i>Waleed Saeed; Orfan Shouakar-Stash; André Unger; and Warren W. Wood</i> )	Revealing the hydrostratigraphic architecture of a buried bedrock valley through a comparison of helicopter-borne FDEM and multiple surface geophysical techniques ( <i>Oliver Conway-White; Colby M. Steelman; Hernan Ugalde; Adam Smiarowski; Emmanuelle Arnaud; and Beth L. Parker</i> )
2:00 PM – 2:20 PM	Using virtual data sets to evaluate approaches for conceptual site model development and remediation design at DNAPL-impacted sites ( <i>Michael Kavanaugh; David Reynolds; Silvia Mancini; Bernard Kueper; Kevin G. Mumford; Sean Bryck</i> )	Mapping permafrost continuity in the Central Mackenzie Valley using electrical geophysical methods ( <i>Maxime Salman; David L. Rudolph; Colby M. Steelman</i> )
2:20 PM – 2:45 PM	<b>Closing remarks and farewell:</b> <b>David Rudolph (University of Waterloo), David Hyndman (Michigan State University), Peter Dietrich (UFZ – Helmholtz Centre for Environmental Research)</b>	

# Poster Presentations

No.	Authors	Title
1	Steven G. Shikaze; Daron G. Abbey; Dan Puddephatt; Gaelen Merritt; Jessi Meyer; Paul J Martin; Beth Parker	Integration of high-resolution hydraulic head data with equivalent porous media numerical modeling
2	H. Townsend; F. Rezanezhad; P. Van Cappellen and M. Macrae	Understanding the influence of ice barrier on the mobility of carbon; nitrogen and phosphorus in agricultural soils
3	Brittney K. Glass; David L. Rudolph; Claude R. Duguay	Identifying groundwater discharge zones in Northern Canada using remotely sensed optical and thermal imagery
4	Thomas Vienken; Manuel Kreck and Peter Dietrich	Assessing the impact of intensive shallow geothermal energy use on groundwater temperatures in a residential neighborhood
5	James Hommersen; Beth L. Parker; Jacqueline Harman; Peeter Pehme; Jon Clark; Alicja Jazwiec; Daniel Banks	Assessing the hydrological properties influencing nitrate distribution in a shallow unconfined fractured bedrock aquifer
6	Jacqueline Peters; Patricija Marjan; Mark Servos; David Rudolph; John Giesy	Comparing the transport of Environmental DNA and Free DNA in a fluvial system
7	Konrad Krogstad; Grant Jensen; Laura Hug; Fereidoun Rezanezhad	Investigating the effects of freeze-thaw conditions on nutrient cycling and fall fertilizer efficacy
8	Johannes Völlmer; Christoph Zielhofer; Johannes Schmidt; Peter Dietrich; Ulrike Werban; Sven Linzen; Lukas Werther; Stefanie Berg	Minimal-invasive exploration of the subsurface – direct push sensing in alluvial settings
9	Kiana Zolfaghari; Marie Hoekstra; Claude R. Duguay; David Rudolph; Ian D'Souza	Concept design of a Canadian Water Microsatellite Mission
10	Taher H. Ameen; Bakhtiar Q. Aziz	Geophysical investigations using 2D electrical resistivity imaging for the study of soil and groundwater contamination near Bazian Oil Refinery; West of Sulaymaniyah City; Iraqi Kurdistan Region
11	Andrew Wicke; David L. Rudolph and Brewster Conant Jr.	Characterization of groundwater flow dynamics in discontinuous permafrost
12	Sam Jacobson; Beth Parker; Emmanuelle Arnaud; John Cherry; Carlos Maldaner; Steven Chapman; Mike Annable; Kirk Hatfield; Robert E. Bretnall	Combining high resolution, depth discrete hydraulic and 1,4-Dioxane assessment to estimate mass discharge in a karst aquifer
13	Iwona Widurska; Steven Frey; David Rudolph	Assessing GHG movement in agricultural soils using air permeability measurements and conventional hydraulic soil characterization techniques
14	Tatjana Milojevic; Alison Mao; Auristela Bantegui; Sean Jordan; Claudia Wagner-Riddle; Fereidoun Rezanezhad; Philippe Van Cappellen	Closing the seasonal data gap: Emerging application of optodes for characterizing frozen and thawing soils
15	Jiangyue Ju; David Rudolph	Innovative method to monitor groundwater and surface water interactions
16	Serghei A. Bocaniov; Igor Markelov; Homa Kheyrollah Pour; Alice Dove; Sean M. Backus; and Philippe Van Cappellen	On the importance of groundwater in the water balance of one of the world's largest lakes (Lake Erie, USA-Canada)
17	Carlos H. Maldaner; Jonathan D. Munn; Bradley A. Green; Samuel L. Warner; Steven W. Chapman; Beth L. Parker; Andrew Ashton; Linda Daubert	Groundwater flow quantification in poorly cemented sandstone using active distributed temperature sensing

