2017-2018

Québec Géoscience Centre

Annual Report

Resources and the Environment:

Bridging two worlds

Canada

INRS
UNIVERSITÉ DE RECHERCHE
A RESEARCH UNIVERSITY

The Geological Survey of Canada (GSC-Quebec) and the Eau Terre Environnement Research Centre at the Institut national de la recherche scientifique are partners in a collaboration agreement called the **Quebec Geoscience Centre**. This partnership promotes closer ties and collaboration among scientists through research projects of common interest that address socio-economic issues in the fields of regional geology, georesources and environmental geoscience.

GSC-INRS Synergy

Regional Geology

The focus of this theme is to define the regional geological framework or to study the parameters delineating the evolution of sedimentary basins. Bedrock and surficial survey activities are concentrated in Eastern and Northern Canada. Particular emphasis is placed on defining the geological context in order to provide a solid foundation for thematic studies on resources and the environment.

Georesources

This theme involves detailed metallogenic studies, the proposal of metallotects that can be used as part of the development of economic potential and the development of guides for exploring georesources. Experts are involved in gold deposits, volcanogenic massive deposits, as well as conventional and unconventional hydrocarbons.

Environment

The activities under this theme include the characterization and dynamics of groundwater and regional aquifers, the study of geological risks, the dynamics of modern environments, the rehabilitation of contaminated sites and climate change as well as issues combining the environment and the development of natural resources, including environmental geochemistry.

Fields of Expertise

- Appalachians
- Canadian Shield
- St. Lawrence Lowlands
- Quaternary Geology
- Structural and tectonic geology
- Metamorphic and igneous petrology
- Geochemistry of igneous and sedimentary rocks
- Sedimentology, stratigraphy
- Biostratigraphy, paleogeography
- Organic petrography, diagenesis
- Marine geology and geophysics

- Metallogeny
- Metallurgy
- Mineralization-stratigraphy-structure con-nections
- Geology of organic materials and clays
- Diagenesis, hydrothermalism
- Petroligenic potential and reservoirs
- Unconventional energy resources
- Drift prospecting, geology of the Quaternary Period
- Lithogeochemical prospecting
- Physical simulations
- Interpretation and processing of geophysical data in 3D
- Deep geophysics

- Geomorphology
- Geological risks
- Geochemistry of trace elements, organic and inorganic geochemistry, isotopic geochemistry
- Dendrochronology
- Paleolimnology, limnogeology
- Sedimentary processes
- Coastal engineering
- Regional hydrogeology
- Geophysics of sub-surfaces (magnetism, electromagnetism and geoelectric tomography)
- Fluid dynamics, multi-phase flow
- Characterization, rehabilitation and environmental management

Laboratories

- **Analytical Geochemistry**
  Stéfane Prémont, INRS; Yves Michaud, GSC
  Joint INRS-GSC laboratory for the characterization of rocks, sediment and trees.

- **Applied Geoscience**
  Marc Richer-Laflèche, INRS
  Geophysical studies applied to mineral, gas and oil exploration, geotechnics and archaeology

- **Contaminant Hydrogeology**
  Richard Martel, INRS, in partnership with Defence Research and Development Canada (Valcartier)
  Study of soil and groundwater contaminants and development of *in situ* treatment processes at the intermediary level between the laboratory and the field.

- **Dendrochronology and Dendrogeochemistry**
  Christian Bégin, GSC
  Analysis of the physical and geochemical parameters of tree ring sequences.

- **Digital mapping and photogrammetry**
  Kathleen Lauzière, GSC
  Acquisition, management, analysis and dissemination of geoscientific data

- **Environmental Hydraulics**
  Damien Pham Van Bang, INRS
  Large-scale flume to simulate waves, tides and strong river currents to develop sustainable approaches to coastal management.

- **Geochemistry, Imaging and Radiography of Sediments**
  Pierre Francus, INRS
  Non-destructive radiography analyses coupled with micro-x-ray fluorescence chemical analysis of rocks, soil and sediment.

- **Geophysical Imaging and Measurements**
  Erwan Gloaguen, INRS
  Applied work mainly in the characterization of reservoirs for CO_2 sequestration, hydrogeology and oil.

- **Hydrogeology and Environmental Characterization**
  Daniel Paradis, GSC
  Field equipment for groundwater characterization and numerical modeling equipment.

- **Multidisciplinary CT-Scan**
  Pierre Francus, INRS
  Non-destructive measurements of the internal density variations on static bodies (internal structure, porosity, etc.) or dynamic phenomena, mainly in hydrology.

- **Open Geothermal Laboratory**
  Jasmin Raymond, INRS
  Research carried out to improve the understanding of heat transfer and underground flow phenomena that reduce technological risks related to geothermal energy. Access to the laboratory is open, inspired by the philosophy of free software.

- **Physical, Chemical and Mineralogical Characterization of Rocks**
  Pierre-Simon Ross, INRS
  Non-destructive, high spatial resolution measurements of the physical, mineralogical and chemical parameters of drill cores.

- **Physical, Numerical and Geophysical Simulation**
  Lyal Harris, INRS
  Targeting mining and oil prospecting efforts through the structural and tectonic interpretation of geophysical and field data as well as the simulation of geological processes.

- **Stable Isotope Geochemistry (Delta Lab)**
  Martine M. Savard, GSC
  Analysis of stable isotopes (H, C, N and O) applied to hydrogeological and environmental studies.

For more information:
inrs.ca/english/research-centres/ete/labs-facilities

INRS Research Units
inrs.ca/english/research-centres/ete/research-units

Information Management / Dissemination

- **INRS Specialized Information and Documentation Service (SDIS)**
  INRS library, including the GSC-Quebec document collection.
  sdis.inrs.ca

- **Publications and Reports at Natural Resources Canada (NRCan)**
  Web portal providing access to thematic databases.
  rncan.gc.ca/publications/1139

Regional geology and Georesources

Responsibility	Title	GSC-Q Team	INRS Team	INRS Students
Jean Bédard **GSC**	Geochemistry and Petrology of the ophiolites of Cache Creek, British Columbia	Gabriel Huot-Vézina, Annick Morin	Marc Richer-Laflèche	Anne-Sophie Corriveau (M.Sc.)
Louise Corriveau **GSC**	Migration paths and traps for metals in polymetallic metasomatic mineralized systems (U +/- Fe, Cu, Au, REE)	Francis Aucoin, Nathalie Côté, Kathleen Lauzière	Olivier Blein, Lyal Harris	
Pierre Francus **INRS** Stéphanie Larmagnat **CGC**	Development of a CT scan analysis methodology of the petrophysical properties of a heterogeneous conventional carbonate reservoir	Denis Lavoie	Louis-Frédéric Daigle, Mathieu Des Roches, Michel Malo, Jasmin Raymond	
Erwan Gloaguen **INRS**	Assimilation of geophysical data for aquifer characterization and sizing of geothermal systems	Daniel Paradis	Abderrezak Bouchedda, Maxime Claprood, Bernard Giroux, René Lefebvre	
Lyal Harris **INRS**	Development of web-based and Google Earth virtual field trips for teaching structural and tectonic geology in Quebec and France	Jean Bédard, Sébastien Castonguay	Michel Malo	
Denis Lavoie **GSC**	Geothermal energy and the environment: storage and circulation of fluids in carbonates	Stéphanie Larmagnat	Mathieu Des Roches	
Michel Malo **INRS**	Study of the public perception on mineral resources development in Quebec compared to the social acceptability of other natural resources development.	Christine Rivard	Karine Bédard	
Patrick Mercier-Langevin **GSC**	Gold through space and time at the Archean	Francis Aucoin, Valérie Bécu, Sébastien Castonguay, Benoît Dubé, Kathleen Lauzière, Nicolas Pinet, Jean-Luc Pilote	Michel Malo, Pierre-Simon Ross	Arnaud Fontaine (Ph.D.), Alexandre Krushnisky (M.Sc.), William Oswald (Ph. D.)
Patrick Mercier-Langevin **GSC**	Lithotectonic controls on Paleoproterozoic gold distribution in the Archean rocks of the Amaruq area, Nunavut	Francis Aucoin, Valérie Bécu, Sébastien Castonguay, Benoît Dubé, Kathleen Lauzière, Jean-Luc Pilote	Michel Malo	Pierre Grondin-Le Blanc (M.Sc.) Brayden St-Pierre (M.Sc.)
Marc Richer-Laflèche **INRS**	Electromagnetic and geoelectric studies applied to the exploration for deep volcanogenic massive sulfide deposits and to the spectral discrimination of various types of electric chargeability anomalies in Quebec	Patrick Mercier-Langevin		
Pierre-Simon Ross **INRS**	Controls on the distribution, style, composition and age of gold mineralization zones of the Horne Deposit	Patrick Mercier-Langevin		

Environmental Geoscience

Responsibility	Title	GSC-Q Team	INRS Team	INRS Students
Jason Ahad **CGC**	Sources of organic contaminants in the environment surrounding oil sands	Jade Bergeron, Marc R. Luzincourt, Martine M. Savard, Anna Smirnoff	Charles Gobeil, Hooshang Pakdel	
Pierre Francus **INRS** Christian Bégin **CGC**	Climate change drought risk assessment for the hydroelectric industry in central and eastern Canada	Lauriane Dinis, Joëlle Marion, Martine M. Savard		
Éric Boisvert **CGC**	Information network on groundwater and permafrost	François Létourneau, Héryk Julien, Alex Smirnoff	Harold Vigneault	
Karem Chockmani **INRS** Miroslav Nastev **CGC**	Development and application of a flood risk analysis and management tool on the cross-border Lake Champlain - Richelieu River system.	Nicolas Benoit, Éric Boisvert, Nicholas Gibb, Héryk Julien, Heather McGrath, Michel Parent, Alex Smirnoff	Monique Bernier, Yves Gauthier, Jimmy Poulin	
Erwan Gloaguen **INRS**	Integrated in situ approach by geophysical auscultation of the stabilization treatment of contaminated soils	Daniel Paradis	Jean-Marc Ballard, Bernard Giroux, René Lefebvre	
René Lefebvre **INRS**	Quebec Groundwater Network Synthesis Project (PSyRESQ)	Daniel Paradis, Xavier Malet	André St-Hilaire	
Richard Martel **INRS**	Hydrogeological characterization of Canadian military bases	Michel Parent		
Miroslav Nastev **CGC**	Seismic risk in theToronto – Saguenay corridor	Ahmad Abo-El-Ezz, Nicolas Benoit, Éric Boisvert, Nicholas Gibb, Héryk Julien, Michel Parent, Alex Smirnoff	René Lefebvre	Guillaume Légaré-Couture, (Ph.D.)
Daniel Paradis **CGC**	Technological and methodological developments for the hydrogeophysical characterization of aquifer systems (Saint-Lambert and southern Ontario)	Nicolas Benoit	Bernard Giroux, Erwan Gloaguen, René Lefebvre	
Christine Rivard **CGC** René Lefebvre **INRS**	Evaluating aquifer vulnerability to gas exploration and development activities – McCully-Elgin (NB).	Jason Ahad, Geneviève Bordeleau, Virginia Brake, Mathieu Duchesne, Denis Lavoie, Xavier Malet, Nicolas Pinet	Jean-Christophe Aznar	Pierre Ladevèze (Ph.D.) François Huchet (M.Sc.)
Alfonso Rivera **CGC**	National Aquifer and Groundwater Accounting (NAGA) Project	Francis Aucoin, François Létourneau, Daniel Paradis		Pascal Castellazzi (Ph.D.)
Martine M. Savard **CGC**	Nitrogen and nutrient cycling in Alberta forest environments	Christian Bégin, Jade Bergeron, Lauriane Dinis, Marc R. Luzincourt, Joëlle Marion, Anna Smirnoff	Charles Gobeil	

Knowledge Dissemination

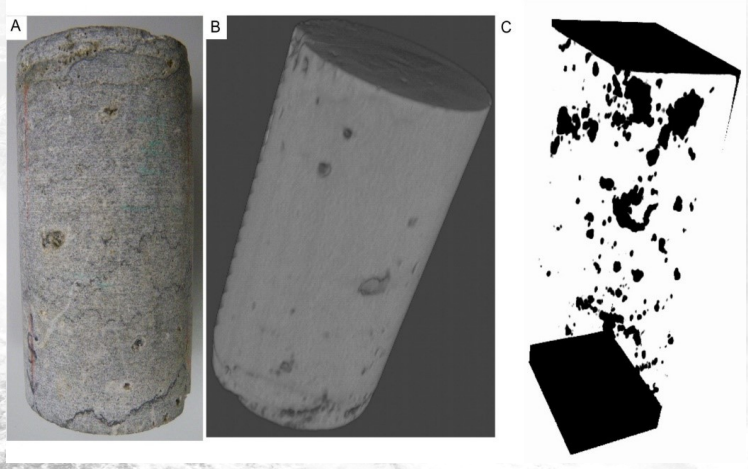
Development of a new field data acquisition tool

Work was conducted at the digital mapping laboratory to develop the basis for a new user interface to support map production and geoscience data modeling and management. The objective was to create a universal application using common technologies, such as tablets and telephones, and based on the latest open access GIS products and Microsoft Windows 10 operating system. These technological choices have been made to meet the needs of the largest number of users: researchers, professors, students and partners, and to adapt to field and office activities. The application provides fast and efficient access to a fluid data collection environment that applies to the surficial and bedrock geology, without imposing a constraining methodology and by offering maximum flexibility. When collecting data in the field, the tool provides access to corporate data models to facilitate data acquisition and interpretation and the production of maps to GSC standards. The application can also be used simply to record the spatial location of stations and take a few notes and photos without worrying about the geological component, which is of interest during short field campaigns or courses. In collaborative projects, the device can be shared by several users who can manage their own GIS datasets.

Field measurements in Newfoundland using the new Windows 10 user interface of the Geological Survey of Canada.

Computed tomography in support of geothermal energy

The characterization of carbonate reservoir rocks is a scientific challenge, as they are naturally spatially heterogeneous. This heterogeneity is explained in particular by their fossil content, their complex diagenetic evolution, which can create or block porosity, and the fact that they are often fractured naturally, which further complicates characterization. Since 2017, the QGC has been conducting research to develop a new methodology to image and quantify the porosity of carbonate rocks using a CT scan, in a continuous mode, over several metres of cores, for example. Initially, the joint project acquired about 30 reference samples corresponding to a wide range of lithologies and porosity values. Each sample was analyzed in the multidisciplinary CT-Scan laboratory at INRS. To test the validity of these measurements, the values obtained were compared with measurements from a conventional helium porosimeter, at the new open geothermal laboratory, and measurements from recognized commercial laboratories. The methodology was then applied to a regional case study, specifically on dolomitized naturally porous intervals within the Massé structure in the Lower St. Lawrence, which will also be evaluated for its low temperature geothermal potential. Ultimately, the joint project will not only provide a connected porosity value that is as reliable as conventional methods, but will also provide information on the extent of the porosity at the metric scale, and visualize the degree of connectivity between macropores, fissures or fractures in 3D. This will help to quickly identify and characterize units with favourable geothermal potential.

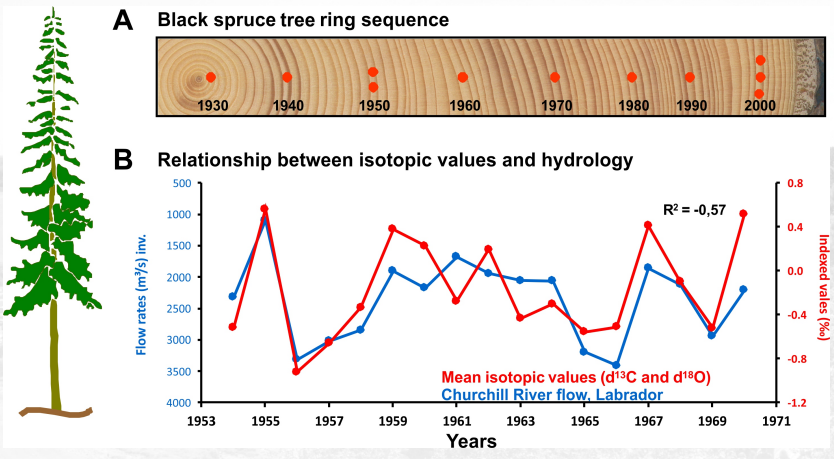


Example of a carbonate rock sample for which porosity has been evaluated by a CT-Scan (A-B). The connected pores (C) represent 1.75% of the rock.

Knowledge Dissemination (suite)

New collaboration in the study of climate change

For more than a decade, GSC researchers have been developing original and innovative expertise using stable isotopes of carbon and oxygen from tree rings to reconstruct past climatic conditions. The isotope ratios of these elements are good natural indicators of hydroclimatic conditions since the fractioning of these isotopes in trees is directly controlled by certain parameters influencing regional hydrology, including temperature. This expertise is now being applied as part of the PERSISTANCE project (Risk of persistent low hydraulicity in the hydroelectric basins of Quebec-Labrador), led by UQAM and involving the INRS and the Canadian hydroelectric industry, among others. For example, new isotope series have recently reconstructed regional summer flows in the lower Churchill River in Labrador over the past two centuries. In a multidisciplinary perspective, INRS analyzes cores of varved lake sediment from the same area using CT-Scan, X-ray micro-fluorescence and electron microscopy for hydroclimatic reconstruction. In parallel with this work conducted in eastern Canada, the team is now evaluating the potential of the dendroisotopic approach in northern Manitoba, another province heavily dependent on hydropower for its energy supply. In collaboration with the University of Winnipeg and Manitoba Hydro, this component of the research will highlight for the first time the hydrological changes of the past centuries in the Nelson and Churchill River basin based on dendroisotopes.



Since the formation of rings occurs annually (A), the resulting sequences can be precisely dated. Graph (B) illustrates the very close inverse relationship between the summer flows of the Churchill River in Labrador and the isotopic values of carbon and oxygen measured in each tree ring.

Groundwater management and protection in Quebec

INRS and the GSC are actively participating in a new four-year study funded by the ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) to develop tools to support groundwater resource management in a context of climate change. This initiative builds on projects completed between 2009 and 2015 under the Programme d'acquisition de connaissances des eaux souterraines du Québec (PACES). The PACES programme includes some new projects that will end in 2022. All PACES projects will provide a realistic and concrete portrait of the groundwater resources in the municipalities of southern Quebec in order to protect them and ensure their sustainability. The new Groundwater Network Synthesis Project (PSyRESQ) will focus on a 36,800 km2 region south of the St. Lawrence Valley, which includes 12 watersheds and data from four PACES projects (Montérégie-Est, Bécancour, Nicolet-Bas-St-François, Estrie). Work conducted by UQAM, Université Laval, INRS and the GSC will contribute to meeting the objectives of the program. For their part, INRS and GSC will focus on monitoring groundwater levels, hydrological modelling of aquifer systems and the definition of indicators of water resource conditions.

Oscillatory hydraulic tomography tests between wells for the development of a new high-resolution characterization technique for aquifer systems.

Knowledge Dissemination (suite)

- **Increasing the effectiveness of exploration guides for deeply buried mineral resources**

The Targeted Geoscience Initiative (TGI) is a Natural Resources Canada program to improve knowledge on mineralized systems and mineral exploration methods, and provide training and mentoring to students to increase the highly skilled workforce for the mining industry. INRS and the GSC work closely together on projects on gold and volcanogenic systems, which have already resulted in the completion of the research projects of a large cohort of students, among other things. All of the graduate studies conducted under these projects are the result of collaborations with industry and geological surveys in Quebec, Ontario, Manitoba and Nunavut. These studies will help generate new-generation knowledge about well-known or emerging mining camps located in the ancient, deformed and metamorphosed terranes of the Canadian Shield. The research projects will help better characterize the geological settings specific to different precious metal (gold and silver) and base metal (copper, zinc, lead) mineralization, which form a significant part of Canada's mineral resources.

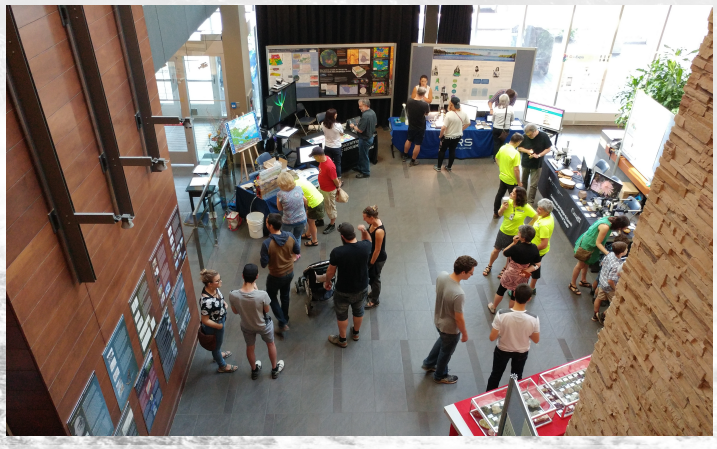
Theses and dissertations : espace.inrs.ca

- Yergeau, David (2015). Géologie du gisement synvolcanique aurifère atypique Westwood, Abitibi, Québec. Ph. D., 671 p.
- Boulerice, Alexandre (2016). Volcanology of the Lemoine member of the Waconichi formation, Abitibi subprovince, Chibougamau, Quebec. M. Sc., 231 p.
- Caté, Antoine (2016). Geology of the Paleoproterozoic Zn-Cu-Au Lalor volcanogenic massive sulphide deposit and its gold-rich lenses, Snow Lake, Manitoba. Ph. D., 430 p.
- Pelletier, Mireille (2016). The Rainy River gold deposit, Wabigoon Subprovince, western Ontario: style, geometry, timing and structural controls on ore distribution and grades. Ph. D., 404 p.
- Janvier, Vivien (2016). Géologie du gisement d'or Meadowbank encaissé dans des formations de fer rubanées, Nunavut. Ph. D., 504 p.
- Beauchamp, Anne-Marie (à venir). Géologie, minéralisation et altération de l'indice aurifère Mustang encaissé dans des méta-turbidites, ceinture d'Eastmain, province du supérieur, Québec. M. Sc.
- Fontaine, Arnaud (à venir). Géologie des minéralisations aurifères de la mine Éléonore, Eeyou Istchee Baie-James, Province du Supérieur, Québec. Ph. D.
- Oswald, William (à venir). Géologie du gisement aurifère encaissé dans des formations de fer Musselwhite, Province du Supérieur, Ontario. Ph. D.

Regional Outreach

On September 15 and 16, the GSC and INRS hosted the "Open House on Science". Since their arrival in the Saint-Roch district, it was the first time the two organizations joined forces to make the general public aware of the research taking place in the heart of Québec City. On September 15, six thematic workshops were presented to eight classes from École primaire des Berges. September 16 was targeted to the general public and thirteen information booths were set up to provide an overview of the two partner's areas of expertise, as well as the 175th anniversary of the Geological Survey of Canada. The activity reached nearly 400 visitors during the two days and was a great success. This success is based on the enthusiasm of some sixty dedicated employees and students from the two institutions who shared their passion for research and the earth sciences.

Workshop on the use of drones in the field, presented to a class from École primaire des Berges.



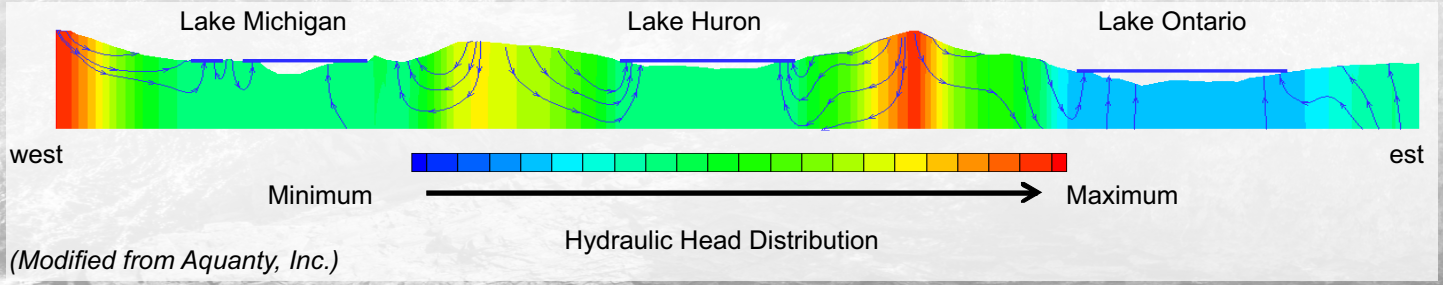
Some of the kiosks installed in the lobby of 490 rue de la Couronne, open to the general public on September 16, 2017.

International Outreach

The GSC and INRS played an active role in organizing the SGA Québec 2017 conference, the 14th biennial meeting of the Society for Geology Applied to Mineral Deposits, which was held in Québec City from August 19 to 23, 2017. The local organizing committee was chaired by Université Laval and included representatives from the Ministère de l'Énergie et des Ressources naturelles du Québec and industry partners. This international meeting was held for the first time in North America and attracted more than 600 participants from 44 countries. Building on its solid expertise in mineral resources, the QGC team developed an ambitious scientific program that included symposia, special sessions and short courses. Quebec City's strategic location, that provides easy access to the exceptional geological resources of the Canadian Shield, has also allowed them to offer a wide range of geological fieldtrips in Quebec, other Canadian provinces and even South America.

Participants in the fieldtrip "Precious and base metal deposits in the southern portion of the Abitibi greenstone belt, Superior Province, Ontario and Quebec" organized in Rouyn-Noranda during the SGA Quebec 2017 conference.

The GSC and USGS have successfully organised a workshop on April 3-5, 2018 on behalf of the Science Advisory Board's Research Coordination Committee of the International Joint Commission (IJC), to review options for a Surface and Groundwater integration model for the Great Lakes Basin. 41 attendees, including experts from Canadian and US agencies, discussed options for developing a basin-scale water model. Experts from both GSC-Québec, who manages the GSC Groundwater Geoscience Program, and INRS participated actively in the discussions through the interview process and the workshop itself. This initiative generated a consensus among scientists and managers on the development of a shared, unified model, modeling approach, and/or model framework for both Canada and the US, in order to increase opportunities for joint approaches and avoid water use conflict. This project grew from the need for US and Canadian governments to better understand groundwater resources stored in multiple aquifer systems across the Great Lakes Basin, and to support a coordinated effort for groundwater and surface water management. The final report presented to IJC commissioners summarizes the results of a literature review, a survey of science experts, workshop discussions, and an action plan for the integrated surface and groundwater modeling in the Great Lakes Basin.



(Modified from Aquanty, Inc.)

Student Portal

Interuniversity Master's and PhD programs in Earth Sciences at the INRS Eau Terre Environnement Research Centre

- Graduate Studies:
  inrs.ca/english/research-centres/ete/graduate-studies
- Research Projects:
  inrs.ca/english/graduate-studies/research-projects

Continuing training at the INRS Eau Terre Environnement Research Centre

- Program of short courses in the field or in continuing education:
  ete.inrs.ca/ete/etudier/formation-intensive

Postdoctoral Internships

- INRS postdoctoral fellowships :
  inrs.ca/english/graduate-studies/postdoctoral-fellowship
- Government of Canada postdoctoral research program:
  www.nrcan.gc.ca/careers/17880

Student Recruiting

- Summer internships at the INRS Eau Terre Environnement Research Centre:
  inrs.ca/etudier/stages/stages-ete-premier-cycle
- Federal Student Work Experience Program:
  jobs-emplois.gc.ca
- Federal Research Affiliate Program:
  jobs-emplois.gc.ca

Publications

INRS Eau Terre Environnement Research Centre

- Research reports and theses:
  espace.inrs.ca
- Scientific articles (in the professor profiles):
  ete.inrs.ca/les-professeurs/liste/3

Geological Survey of Canada

- GEOSCAN database:
  geoscan.nrcan.gc.ca
  More than 75,000 publications in Earth Sciences.
- Directory of scientists and research professionals:
  science.gc.ca

  Science.gc.ca is the official source for science and technology from the Government of Canada.

Internal Activities and Communications

GSC and INRS were present at the following geoscience conferences to present the projects, programs and online resources of the two partners.

- **August 19-23, 2017:** 14th Biennial Meeting of the Society for Geology Applied to Mineral Deposits.
- **October 18-19, 2017:** XPLOR 2017, the annual conference of the Quebec Mineral Exploration Association.
- **October 29-31, 2017:** annual conference of the Quebec Oil and Gas Association (QOGA).
- **November 5-7, 2017:** EMP 2017, Exploration, Mining and Petroleum New Brunswick.
- **November 20-23, 2017:** Quebec Mines 2017, the annual meeting of the Quebec department of energy and natural resources.

Both partners also jointly participated in the following activities:

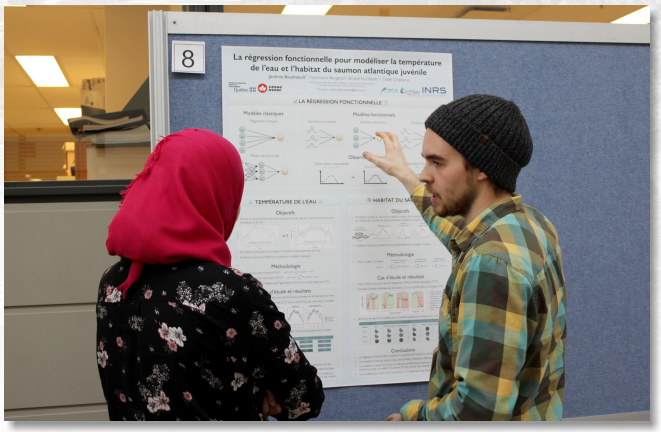
- **September 5, 2017:** Welcome Day for new students at the INRS Eau Terre Environnement Research Centre.
- **September 15-16, 2017:** Open house on research conducted at QGC for school groups and the general public to mark the 175th anniversary of the GSC.
- **March 7, 2018:** Student guided tour of the INRS Laboratories for Scientific and Technological Innovation in Environment (LISTE).
- **March 15, 2018:** Journée des sciences de la Terre et de l'environnement (JSTE). Annual symposium allowing graduate students in the joint INRS-Université Laval Earth Sciences program to present their research projects.

The year in pictures

Stéphanie Larmagnat, recipient of the GSC Alice-Wilson Fellowship, to support women in research.

Welcome Day for new students at the INRS Eau Terre Environment Research Centre.

Student guided tour of the INRS Laboratories.



Journée des sciences de la Terre et de l'environnement (JSTE). Annual symposium allowing graduate students in the joint INRS-Université Laval Earth Sciences program to present their research projects.

Participation in the Journée Découverte, the general public component of Québec Mines.

The GSC 175th anniversary was celebrated at the annual congress of the Quebec Mineral Exploration Association.

Canada

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GSC Québec

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