



2015-2016 RESEARCH & SCHOLARSHIP REPORT



ST. FRANCIS XAVIER
UNIVERSITY

DR. DAVID RISK, ASSOCIATE PROFESSOR

[journal article] Hurry J**, **Risk D**, Lavoie M, Brooks B-G, Phillips C & Goeckede M. (2016). Atmospheric monitoring and detection of fugitive emissions for Enhanced Oil Recovery. *International Journal of Greenhouse Gas Control*, 45, 1-8.

[journal article] Kim Y, Park S-J, Lee B-Y & **Risk D**. (2016). Continuous measurement of soil carbon efflux with Forced Diffusion (FD) chambers in a tundra ecosystem of Alaska. *Science of the Total Environment*, 566–567, 175–184. Retrieved from https://ac.els-cdn.com/S0048969716309834/1-s2.0-S0048969716309834-main.pdf?tid=275501a0-ff80-11e7-892e-0000aabb0f27&acdnat=1516631334_36b8549f0c70bfd6c4c940e1cfac02af

[journal article] Liang L, Riveros-Iregui D & **Risk D**. (2016). Spatial and seasonal variabilities of the stable carbon isotope composition of soil CO₂ concentration and flux in complex terrain. *Journal of Geophysical Research: Biogeosciences*, 121, 2328–2339. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/2015JG003193/pdf>

[journal article] Sizmur T, McArthur G, **Risk D**, Tordon R & O’Driscoll NJ. (2016). Gaseous mercury flux from salt marshes is mediated by solar radiation and temperature. *Atmospheric Environment*, 153, 117-125. Retrieved from <https://www.sciencedirect.com/science/article/pii/S1352231017300249>

[journal article] Webb E, Schuur E, Natali S, Oken K, Bracho R, Krapek J, **Risk D** & Nickerson N. (2016). Increased wintertime CO₂ loss as a result of sustained tundra warming. *Journal of Geophysical Research: Biogeosciences*, 121, 249–265. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/2014JG002795/full>

[journal article] Latimer R* & **Risk D**. (2015). An inversion approach for determining production depth and temperature sensitivity of soil respiration. *Biogeosciences*, 13(7), 2111-2122. Retrieved from <https://www.biogeosciences.net/13/2111/2016/bg-13-2111-2016.pdf>

[industry report] **Risk D**. *Fugitive and vented emission surveying at Apache’s Midale EOR Field*. Prepared for Apache Corporation, November 2016. (23 pages)

[industry report] **Risk D**. *G2210-i beta test report*. Prepared for Picarro Inc. and submitted 30 August 2016. (27 pages)

[industry report] **Risk D**. *Fugitive and vented emissions surveying at the Weyburn CO₂-EOR site*. Prepared for Cenovus Energy Inc. and submitted July 2016. (19 pages)

[industry report] **Risk D**. *Survey of Vermont Gas natural gas system*. Prepared for Vermont Gas and submitted July 2016. (37 pages)

[industry report] **Risk D**. *An analysis of atmospheric gas concentrations in relation to industrial facilities associated with Shell Quest carbon capture and storage project*. Prepared for Shell and submitted June 2016. (22 pages)

[industry report] **Risk D**. *Aquistore project summary report II*. Prepared for Petroleum Technology Research Center and submitted March 2016. (49 pages)

[industry report] **Risk D**. *Gas migration at the Christina Lake project summary report*. Prepared for MEG Energy and submitted March 2016. (9 slides)

[industry report] **Risk D**. *Differentiating between hydrocarbon-derived carbon dioxide from native soil-derived carbon dioxide in the development of a new metric of hydrocarbon degradation effectiveness*. Prepared for Federated Co-operatives Limited, November 2015. (16 pages)

[industry report] **Risk D**. *Aquistore project summary report 1*. Prepared for Petroleum Technology Research Center and submitted September 2015. (45 pages)

[government report] **Risk D**. *Saskatchewan Research Council final report, 2016*. Prepared for Saskatchewan Ministry of the Economy (data from August 2016) and submitted September 2016. (30 pages)

[industry report] **Risk D.** *Aquistore project summary report IV.* Prepared for Petroleum Technology Research Center (data from August 2016) and submitted March 2017. (25 pages)

[internal report] **Risk D.** *An analysis of atmospheric gas concentrations and the implications of abandoned oil and gas infrastructure at the Stoney Creek oilfield, New Brunswick.* Prepared for FluxLab and submitted June 2016. (19 pages)

[supervisor] Bhatia S. (2016). *Fibre optic applications for dissolved carbon dioxide monitoring of marine geologic sequestration sites* (Unpublished PhD dissertation). Department of Earth Sciences, Dalhousie University, Halifax, NS.

[supervisor] Graham L. (2016). *Controls on terrestrial CO₂ emissions from seasonally snow-covered ecosystems* [Unpublished MSc thesis]. Department of Earth Sciences, St. Francis Xavier University, Antigonish, NS. [Recipient of Canada Graduate Scholarship-Master's Award, Natural Sciences and Engineering Research Council of Canada, 2015-2016 (\$17,500).]

[supervisor] MacIntyre, C. (2016). *Patterns and process driving soil CO₂ variability in the McMurdo Dry Valleys, Antarctica* [Unpublished MSc thesis]. Department of Earth Sciences, St. Francis Xavier University, Antigonish, NS. [Recipient of Canada Graduate Scholarship-Master's Award, Natural Sciences and Engineering Research Council of Canada, 2015-2016 (\$17,500).]

[supervisor] Latimer R. (2015). *An inversion approach for determining production depth and temperature sensitivity of soil respiration* [Unpublished BSc honours thesis]. Department of Physics, St. Francis Xavier University, Antigonish, NS.

[research grant] **Risk D.** *Vehicle based fugitive emission detection and attribution within Alberta energy developments.* Petroleum Technology Alliance Canada, 2016-2017 (\$85,000).

[research grant] **Risk D.** *Developing large-footprint leak detection strategies for Enhanced Oil recovery.* Collaborative Research & Development, Natural Sciences and Engineering Research Council of Canada, 2015-2017 (\$87,000).

[research grant] **Risk D.** *Vehicle based measurement of fugitive and vented emissions on Apache's Midale enhanced oil recovery field.* Engage Grant, Natural Sciences and Engineering Research Council of Canada, 2015-2016 (\$25,000).

[research grant] **Risk D.** *Cost reduction for a new multi-scale fugitive gas detection tool.* Idea to Innovation Grant, Natural Sciences and Engineering Research Council of Canada, 2015-2016 (\$120,882).

[research grant] **Risk D.** *Engaging US oil & gas industry.* Innovation Mobilization Fund, Springboard Atlantic, 2015-2016 (\$15,000).

[research grant] **Risk D.** *Fugitive gas detection.* Springboard Atlantic, 2015-2016 (\$5,000).

[research grant] **Risk D.** *Addressing the problem of methane release from unconventional energy sites.* Discovery Grant, Natural Sciences and Engineering Research Council of Canada, 2014-2019 (\$185,000).

[research grant] **Risk D.** *Differentiating between hydrocarbon-derived carbon dioxide from native soil-derived carbon dioxide in the development of a new metric of hydrocarbon degradation effectiveness.* Engage Grant, Natural Sciences and Engineering Research Council of Canada, 2014-2015 (\$25,000).

[research grant] **Risk D.** *Fugitive gas detection technology and procedure for enhanced oil recovery (Leak Detection Technology-LDT).* Innovation Mobilization Fund, Springboard Atlantic, 2014-2015 (\$22,883).

[research grant] **Risk D.** *Engaging UK oil and gas industry, UK government regulators and academics in field demonstrations of gas detection equipment for shale gas, EOR, o shore O&G infrastructure applications in the UK.* Innovation Mobilization Fund, Springboard Atlantic, 2014-2015 (\$10,000).

- [research grant] **Risk D.** *Surface containment monitoring for carbon capture and storage.* Natural Resources Canada, ecoENERGY Innovation Initiative, 2012-2015 (\$756,000).
- [research grant] Beltrami H (principal investigator); Ferguson G, Kellman L, O'Driscoll N, **Risk D**, Sushama L, Tarasov L & Ziegler S (co-applicants). *NSERC CREATE Program in Training strategies to meet the challenges imposed by a changing climate: Preparing for societal impacts and adaptation.* Collaborative Research and Training Experience Grant, Natural Sciences and Engineering Research Council of Canada, 2010-2016 (\$1,400,000).
- [research contract] **Risk D.** *Fugitive emissions surveying for the energy sector.* Atlantic Canada Opportunities Agency, Atlantic Innovation Fund, 2016-2019 (\$1,993,448).
- [research contract] **Risk D.** *Emissions attribution via computational techniques (ExACT).* Early Stage Commercialization Fund, Innovacorp, 2016-2017 (\$47,900).
- [research contract] Woods N (principal investigator), **Risk D** (co-applicant) et al. *Winter respiration in the Arctic: Constraining current and future estimates of CO₂ emissions during the non-growing season.* NASA Arctic Boreal Vulnerability Experiment (ABoVE), 2015-2019 (\$100,000 [Risk portion]).
- [research contribution agreement] **Risk D.** *Atmospheric leak detection as a tool for bitumen steam chamber and well integrity risk analysis.* ecoENERGY Innovation Initiative, Natural Resources Canada, 2015-2016 (\$451,024).
- [technical services agreement] **Risk D.** *Leak survey mapping, VGS natural gas lines in St. Albans, VT.* Vermont Gas, 2016 (\$12,500).
- [technical services agreement] **Risk D.** *Advancing permafrost carbon climate feedback – improvements and evaluations of the Norwegian Earth System Model with observations.* Uni Reseach Klima, 2015-2018 (\$75,000).
- [technical services agreement] **Risk D.** *Montney natural gas study.* David Suzuki Foundation, 2015-2016 (\$68,418).
- [technical services agreement] **Risk D.** *Bakken fugitive and vented emissions study.* Environment Canada, 2015- 2016 (\$15,000).
- [technical services agreement] **Risk D.** *NASA Arctic Boreal Vulnerability Experiment (ABoVE).* Woods Hole Research Centre, 2015 (\$98,700).
- [technical services agreement] **Risk D** & Kellman L. *Surface measurement, monitoring, and verification research at the Aquistore Carbon Capture and Storage Site, Saskatchewan.* Petroleum Technology Research Centre, 2014-2017 (\$151,000).
- [market analysis funding] **Risk D.** *Market analysis and commercialization plan.* Commercialization Consulting and Mentoring (CCM) Program, Learnsphere, 2015-2016 (\$16,750).
- [conference paper] Klapstein S**, **Risk D**, Ziegler S & O'Driscoll N. (2016, June 9). *Dissolved organic matter controls mercury photoreactions in freshwater lakes.* Paper presented at the Canadian Society of Chemistry 99th Canadian Chemistry Conference and Exhibition, Halifax NS.
- [conference paper] **Risk D** & Egan J**. (2016, April 12). *Using radiocarbon –CO₂o assess the utility as a proxy for bioremediation effectiveness.* Paper presented at Saskatchewan Environment Industry and Managers Association Sustain Tech 2016, Saskatoon, SK.
- [conference paper] Minions C*, **Risk D** & Graham L**. (2016, March). *Measuring CO₂ flux through a snow pack using an automated sampling method, Cape Breton Highlands, Nova Scotia.* Paper presented at Science Atlantic, Fredericton, NB.
- [conference paper] MacIntyre C**, **Risk D**, Lee C & Cary C. (2015, December). *Role of biotic and abiotic processes on soil CO₂ dynamics in the McMurdo Dry Valleys, Antarctica.* Paper presented at the Arctic Net Annual Meeting, Vancouver, BC.

[conference paper] Marshall A, **Risk D**, Lavoie M, Brooks B-G, MacIntyre C**, Baillie J, Laybolt W**, Williams J**, Goeckede M & Phillips C. (2015, December). *Mobile detection of fugitive emissions using computationally optimized geochemical methods*. Paper presented at the American Geophysical Union, San Francisco, CA.

[conference paper] **Risk D**, Lavoie M, Marshall A, Ballie J, Atherton E** & Laybolt W**. (2015, December). *Time series signal processing for enhanced mobile surveys: Learning from field studies*. Paper presented at the American Geophysical Union, San Francisco, CA.

[conference paper] Atherton E**, **Risk D**, Lavoie M, Marshall A, Baillie J & Williams J**. (2015, December). *Fugitive emissions from conventional and hydraulically fractured natural gas developments in Western Canada*. Paper presented at the American Geophysical Union, San Francisco, CA.

[conference paper] Baillie J, **Risk D**, Lavoie M & Williams J**. (2015, December). *Mapping fugitive Gas Emission Sources and Severity across Southeastern Saskatchewan*. Paper presented at the American Geophysical Union, San Francisco, CA.

[conference paper] Egan J**, Natali S, Alexander H, Loranty M, **Risk D** & Spawn S. (2015, December). *Long-term impacts of fire on permafrost vulnerability and C loss in Siberian larch forests*. Paper presented at the American Geophysical Union Fall Meeting, San Francisco, CA.

[conference paper] Graham L**, Natali S, Rastetter E, Shaver G, **Risk D**, Loranty M & Jastrow J. (2015, December). *Long-term nutrient fertilization decreases CO₂ loss in Arctic tundra*. Paper presented at the American Geophysical Union, San Francisco, CA.

[conference paper] MacKay K**, **Risk D**, Hurry J**, MacIntyre C** & Lavoie M. (2015, November). *A mobile-based approach to monitoring fugitive emissions at the Weyburn CO₂-EOR site*. Paper presented at the Carbon Management Technology Conference, Sugarland, TX.

[conference paper] Klapstein S**, **Risk D**, Ziegler S & O'Driscoll N. (2015, November). *Monitoring of methylmercury and DOM over 3 years: Implications for mercury contamination in Kejimikujik National Park*. Paper presented at the Mersey Tobeatic Research Institute Conservation Science Meeting, Caledonia, NS.

[conference paper] Klapstein S**, **Risk D**, Ziegler S & O'Driscoll N. (2015, November). *Monitoring of methylmercury and DOM over 3 years: Implications for mercury contamination in Kejimikujik National Park*. Paper presented at the Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting, Salt Lake City, UT.

[conference paper] Klapstein S**, **Risk D**, Ziegler S & O'Driscoll N. (2015, November). *Quantifying methylmercury photodemethylation rates in freshwater temperate lakes*. Paper presented at the Society of Environmental Toxicology and Chemistry North America 36th Annual Meeting, Salt Lake City, UT.

[conference paper] Klapstein S**, **Risk D**, Ziegler S & O'Driscoll N. (2015, June). *Seasonal shifts in water quality may have implications for mercury photodemethylation*. Paper presented at the International Conference on Mercury as a Global Pollutant, Jeju, South Korea.

[conference paper] Laybolt W**, **Risk D**, Lavoie M, Hurry J**, MacIntyre C** & O'Connell E. (2015, June). *Identification of surface leaks by combining vehicle-based observation, excess ratios, and signal amplification algorithms*. Paper presented at the IEAGHG Monitoring Meeting, Berkeley, CA.

[conference paper] Klapstein S**, **Risk D**, Ziegler SE & O'Driscoll NJ. (2015, March). *Influences of solar radiation on mercury in Kejimikujik National park lakes*. Paper presented at the Science Atlantic Environment Conference, Saint Mary's University, Halifax, NS.

[supervised conference paper] O'Connell E. (2016, June). *Upstream fugitive emissions detection and attribution*. Paper presented at the Petroleum Technology Alliance of Canada, Technology for Emissions Reduction and Ecoefficiency committee, Calgary, AB.

[supervised conference paper] O'Connell E & Laybolt W**. (2016, June). *Mapping gas variability for energy development monitoring*. Paper presented at the Atlantic Research Institute for Sustainable Energy meeting, Halifax, NS.

[supervised conference paper] O'Connell E. (2016, April). *Fugitive emission surveying on Apache's Midale Field*. Apache field office, Saskatchewan.

[invited keynote lecture] **Risk D.** *Soil greenhouse gas production in the cold*. (2016, June 2). Paper presented at the Canadian Geophysical Union and Canadian Meteorological and Oceanographic Society Joint Meeting, Fredericton, NB.

[invited lecture] **Risk D.** *Soil greenhouse gas production in the cold*. (2016, February 12). Paper presented to Faculty of Agriculture, Dalhousie University, Truro, NS.

[invited lecture] **Risk D.** (2015, November 6). *Mapping fugitive gas emission sources and severity across southeastern Saskatchewan*. Paper presented to Dalhousie Physics and Atmospheric Science, Halifax, NS.

[invited lecture] **Risk D.** (2015, September 24). *Mapping gas leaks from the Canadian energy sector*. Paper presented to Dalhousie Earth Sciences, Halifax, NS.

[invited lecture] **Risk D.** (2015, June 8). *Geochemical attribution at carbon capture and storage sites*. Paper presented at the International Energy Agency Greenhouse Gas Monitoring Meeting, Berkeley, CA.

[invited presentation] **Risk D.** (2016, June 17). *Engaging industry on carbon capture and storage*. Paper presented at Natural Resources Canada Carbon Sequestration Leadership Forum, London, UK.

[award] Best Innovation of 2016 Runner up, *Natural Resources Magazine*, 31 December 2015.

[media report] Investing in innovation at St.FX. *The Casket*, 18 August 2016. Retrieved from <http://www.thecasket.ca/archives/51922>

[media report] Canada: Government of Canada Invests in Innovation at St.FX. *High Beam Research*, 11 August 2016. Retrieved from <https://www.highbeam.com/doc/1G1-462411199.html>

[media report] Government of Canada invests in innovation at St.FX. *Canada Business News*, 9 August 2016. Retrieved from <http://www.business-support-network.org/canbiz/category/persons/page/6/>

[media report] *Gas detection campaigns launching*. CBC Radio (Main Street), CTV Television (Breakfast Television with Heidi Petracek), September 2015.

[media release] *StFX master's student receives prestigious Alexander Graham Bell Canada Graduate Scholarship*. St. Francis Xavier University, Antigonish, NS, 23 August 2016. Retrieved from <https://www.stfx.ca/about/news/emmaline-atherton-graham-bell-scholarship>

[media release] *Government of Canada invests in innovation at StFX*. Government of Canada, 9 August 2016. Retrieved from <http://news.gc.ca/web/article-en.do?nid=1109299>

[media release] *Government of Canada invests in innovation at St. FX*. Atlantic Canada Opportunities Agency, 9 August 2016. Retrieved from <http://www.acoa-apeca.gc.ca/eng/Agency/mediaroom/NewsReleases/Pages/4876.aspx>

[media release] *Dr. Dave Risk and Flux Lab team receive \$1.8 million for gas leak detection technology*. St. Francis Xavier University, Antigonish, NS, 9 August 2016. Retrieved from <https://www.stfx.ca/about/news/dr-david-risk-and-flux-lab-team-receive-18-million-gas-leak-detection-technology>

[media release] *Eight StFX graduate students awarded Nova Scotia Graduate Scholarships for innovative research*. Springboard Atlantic, 17 May 2016. Retrieved from <http://springboardatlantic.ca/news/story/eight-stfx-graduate-students-awarded-nova-scotia-graduate-scholarships-for>

[media release] *StFX environmental science students shine at Science Atlantic conference*. St. Francis Xavier University, Antigonish, NS, 22 March 2016. Retrieved from <https://www.stfx.ca/about/news/stfx-environmental-science-students-shine-science-atlantic-conference>

[media release] *Thesis work turns into paper accepted in a leading international scientific publication for StFX physics student*. St. Francis Xavier University, Antigonish, NS, 12 February 2016. Retrieved from <https://www.stfrancisxavieruniversity.ca/about/news/thesis-work-turns-paper-accepted-leading-international-scientific-publication-stfx>

[media release] *StFX grad wins Emerging Professional Award, two other award nominees at 2015 Discovery Awards*. St. Francis Xavier University, Antigonish, NS, 23 November 2015. Retrieved from <https://www.stfx.ca/about/news/stfx-grad-wins-emerging-professional-award-two-other-award-nominees-2015-discovery-awards>

Engineering

DR. FRANK COMEAU, ASSISTANT PROFESSOR

[research grant] **Comeau F.** *Early development of wireless fitness device. Industrial Research Assistance Program for Small and Medium Enterprise*, National Research Council of Canada, 2015-2016 (\$5,000)

[research contract] **Comeau F.** *Contract with SHM Canada Consulting Ltd. for development and implementation project for digital sensor interface (DSI) module designed specifically for structural health monitoring applications*. Productivity and Innovation Voucher Program, Innovacorp, 2015-2016 (\$5,000).

[research contract] **Comeau F.** *Drone bridge inspection system contract with SHM Canada Consulting Ltd.* Productivity and Innovation Voucher Program, Innovacorp, 2014-2015 (\$15,000).

[conference paper] Alomari A, Aslam N, Phillips W & **Comeau F.** (2016, July). *Using the DV-Hop technique to increase the localization ratio in static path planning models in wireless sensor network*. Paper presented at the 10th International Symposium on Communication Systems, Networks and Digital Signal Processing, Prague, Czech Republic.

DR. SHAH RAZUL, PART-TIME FACULTY

[media release] *StFX students receive ACEnet Research Fellowships, look forward to exciting opportunity of summer research*. St. Francis Xavier University, Antigonish, NS, 7 April 2016. Retrieved from <https://www.stfx.ca/about/news/stfx-students-receive-acenet-research-fellowships-look-forward-exciting-opportunity>

Human Kinetics

DR. AMANDA CASEY, ASSOCIATE PROFESSOR

[online resource] *This is How I Walk Campaign* (collaboration with Adapted Sport Society and National Collaborating Centre for Determinants of Health), Antigonish, NS, 2015-present. Retrieved from <https://vimeo.com/161953153>

[community grant] **Casey AF.** *Motor activities with X*. Goodlife Kids Foundation Grant, 2016 (\$8,865).

[conference poster] **Casey AF** & Garagan C. (2016, May). *The strolling preschooler: Should I stay or should I go?* Paper presented at the International Congress on Obesity, Vancouver, BC.