

# RYAN M. POLLYEA

Associate Professor  
Department of Geosciences  
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## EDUCATION

Ph.D. University of Idaho, Geology, May 2012.

*Implications of fracture heterogeneity for geologic carbon sequestration in reactive basalt aquifers*

Jerry P. Fairley (chair)

B.S. University of Dayton, Environmental Geology, December 1999.

## ACADEMIC APPOINTMENTS

2022 – present: **Affiliate Associate Professor**, Virginia Polytechnic Institute and State University, Department of Mining & Minerals Engineering, Blacksburg, Virginia.

2022 – present: **Faculty Affiliate**, Virginia Polytechnic Institute and State University, Virginia Center for Coal & Energy Research, Blacksburg, Virginia.

2021 – present: **Associate Professor**, Virginia Polytechnic Institute and State University, Department of Geosciences, Blacksburg, Virginia.

2019 – present: **Faculty Affiliate**, Virginia Polytechnic Institute and State University, Center for Coastal Studies, Blacksburg, Virginia.

2019: **Visiting Professor of GeoEnergy**, University of Strathclyde, Department of Civil and Environmental Engineering, Glasgow, Scotland, UK (3 - 16 Nov).

2015 – 2021: **Assistant Professor**, Virginia Polytechnic Institute and State University, Department of Geosciences, Blacksburg, Virginia.

2015 – 2018: **Graduate Faculty Scholar**, Northern Illinois University, DeKalb, Illinois.

2012 – 2015: **Assistant Professor**, Northern Illinois University, Department of Geology and Environmental Geosciences, DeKalb, Illinois.

## PROFESSIONAL EMPLOYMENT HISTORY

2002 – 2010: **Staff Geologist**, Shaw Environmental Inc., Federal Technical Services, Sacramento, California.

2001 – 2002: **Water Use Analyst**, California Department of Water Resources, Office of Water Use Efficiency, Sacramento, California.

2000 – 2001: **Staff Geologist**, Geotechnology, Inc., St. Louis, Missouri.

## PROFESSIONAL AFFILIATIONS

- 2015 – present: **American Association for the Advancement of Science**
- 2012 – present: **Geological Society of America**
- 2012 – present: **Sigma Gamma Epsilon**, Associate Member
- 2011 – present: **Sigma Xi**, Full Member
- 2008 – present: **American Geophysical Union**

## PEER-REVIEWED PUBLICATIONS & PROCEEDINGS

†Denotes student co-author.

- 34. **Pollyea, R.M.**, Chapman, M.C., †Chambers, C.R., †Conley, E.W., Holt, M., Holloway, D., & Heisig-Mitchell, J. 2022. Introducing the Hampton Roads Seismic Network: Minimizing the Risk of Injection-Induced Seismicity in Virginia. *In Proceedings, OCEANS Conference and Exposition, IEEE Oceanic Engineering Society and Marine Technology Society*, 17 - 20 Oct. (*In Press*)
- 33. †Conley, E.W., †Chambers, C.R., Heisig-Mitchell, J., Holloway, D., & **Pollyea, R.M.**. 2022. Utilizing Numerical Simulation to Understand the Implications of Injection-Induced Seismicity for Managed Aquifer Recharge in Coastal Virginia. *In Proceedings, OCEANS Conference and Exposition, IEEE Oceanic Engineering Society and Marine Technology Society*, 17 - 20 Oct. (*In Press*)
- 32. †Koehn, L.K., Romans, B., & **Pollyea, R.M.**. 2022. Developing a representative model for offshore CO<sub>2</sub> storage in the Gulf of Mexico. *In Proceedings, Second International Meeting for Applied Geosciences & Energy (IMAGE'22)*. Society of Exploration Geophysicists and American Association of Exploration Geologists, Houston, TX, p. 547–551, 28 Aug - 1 Sept. doi:10.1190/image2022-3749099.1.
- 31. Vishal, V., Pradhan, S.P., Krishnamoorti, R., **Pollyea, R.M.**, & A.K., Singh. 2022. Reservoir processes and global practices in geologic carbon sequestration. *FRONTIERS IN CLIMATE*, April. doi:10.3389/fclim.2022.875388.
- 30. †Wu, H., †Jayne, R.S., Bodnar, R.J. & **Pollyea, R.M.** 2021. Simulation of CO<sub>2</sub> mineral trapping and permeability alteration in fractured basalt: Implications for geologic carbon sequestration in mafic reservoirs. *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*, Vol. 109, Article #103383, July. doi:10.1016/j.ijggc.2021.103383.
- 29. †Wu, H., Lubbers, N., Viswanathan, H. & **Pollyea, R.M.** 2021. A multi-dimensional parametric study of variability in multi-phase flow dynamics during geologic CO<sub>2</sub> sequestration accelerated with machine learning, *APPLIED ENERGY*, Vol. 287. Article #116580. doi:10.1016/j.apenergy.2021.116580.
- 28. **Pollyea, R.M.**, †Konzen, G.L., †Chambers, C.R., †Pritchard, J.A., †Wu, H., & †Jayne, R.S. 2020. A new perspective on the hydraulics of oilfield wastewater disposal: How PTX conditions affect fluid pressure transients that cause earthquakes, *ENERGY & ENVIRONMENTAL SCIENCE*, Vol. 13, p. 3014–3031, Sept. doi:10.1039/d0ee01864c.
- 27. †Dahshan, M., Polys, N.F., †Jayne, R.S., & **Pollyea, R.M.** 2020. Making sense of scientific simulation ensembles with semantic interaction, *COMPUTER GRAPHICS FORUM*, Vol. 30, No. 6, p. 325–343, September. doi:10.1111/cgf.14029.

26. **Pollyea, R.M.** 2020. Explaining long-range fluid pressure transients caused by oil-field wastewater disposal using the hydrogeologic principle of superposition, *HYDROGEOLOGY JOURNAL*, Vol. 28, p. 795-803, March. Available online 27 Nov. 2019. [10.1007/s10040-019-02067-z](https://doi.org/10.1007/s10040-019-02067-z).
25. †Jayne, R.S., †Wu, H., & **Pollyea, R.M.** 2019. A probabilistic assessment of geomechanical reservoir integrity during CO<sub>2</sub> sequestration in flood basalt formations, *GREENHOUSE GASES: SCIENCE & TECHNOLOGY*, Vol. 9, No. 5, p. 979–998, October. doi:10.1002/ghg.1914.
24. Laubach, S., Lander, R.H., Criscenti, L., Anovitz, L., Urai, J., **Pollyea, R.M.**, Hooker, J., Narr, W., Evans, M., Kerisit, S., Olson, J., Dewers, T., Fisher, D., Bodnar, R.J., Evans, B., Dove, P., Bonnel, L., Marder, M., & Pyrak-Nolte, L. 2019. The role of chemistry in fracture pattern development and opportunities to advance interpretations of geologic materials, *REVIEWS OF GEOPHYSICS*, Vol. 57, No. 3, p. 1065–1111, September. doi:10.1029/2019RG000671.
23. **Pollyea, R.M.**, Chapman, M.C., †Jayne, R.S., & †Wu, H. 2019. High density oilfield wastewater disposal causes deeper, stronger, and more persistent earthquakes, *NATURE COMMUNICATIONS*, Vol. 10, July. doi:10.1038/s41467-019-11029-8.
22. †Jayne, R.S., Zhang, Y., and **Pollyea, R.M.** 2019. Using heat as a predictor of CO<sub>2</sub> breakthrough in highly heterogeneous reservoirs, *GEOPHYSICAL RESEARCH LETTERS*, Vol 46, p. 5879-5888, June. doi:10.1029/2019GL083362.
21. †Jayne, R.S., †Wu, H., and **Pollyea, R.M.** 2019. Geologic CO<sub>2</sub> sequestration and permeability uncertainty in a highly heterogeneous reservoir, *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*, Vol. 83, p. 128–139, April. doi:10.1016/j.ijggc.2019.02.001.
20. White, M., Johnson, T., Fu, P., Wu, H., Ghassemi, A., Lu, J., Huang, H., Neupane, H., Oldenburg, C., Doughty, C., Johnston, B., Winterfeld, P., **Pollyea, R.M.**, †Jayne, R., Hawkins, A., Zhang, Y., and the EGS Collab Team. 2019. The Necessity for Iteration in the Application of Numerical Simulation to EGS: Examples from the EGS Collab Test Bed 1. *In Proceedings, 44th Workshop on Geothermal Reservoir Engineering*, Stanford, California, February 11–13.
19. †Wu, H., †Jayne, R.S., and **Pollyea, R.M.** 2018. A parametric analysis of capillary pressure effects during geologic carbon sequestration in a sandstone reservoir, *GREENHOUSE GASES: SCIENCE & TECHNOLOGY*, Vol. 8, No. 6, p. 1039–1052, December. doi:10.1002/ghg.1815.
18. †Jayne, R.S., †Wu, H., and **Pollyea, R.M.** 2018. Geologic CO<sub>2</sub> sequestration in a basalt reservoir: Constraining permeability uncertainty within the Columbia River. *In Proceedings, TOUGH Symposium 2018*, Ed. Oldenburg, C. Berkeley, California, October 8 - 10.
17. **Pollyea, R.M.**, †Jayne, R.S., and †Wu, H. 2018. The effects of fluid density variations during oilfield wastewater disposal. *In Proceedings, TOUGH Symposium 2018*, Ed. Oldenburg, C. Berkeley, California, October 8 - 10.

16. †Jayne, R.S. and **Pollyea, R.M.** 2018. Permeability correlation structure of the Columbia River Plateau and implications for fluid system architecture in continental large igneous provinces. *GEOLOGY*, Vol. 46, No. 8, p. 715–718, July. doi:10.1130/G45001.1.
15. †Canova, D.P., Fischer, M.P., †Jayne, R.S., and **Pollyea, R.M.** 2018. Advective heat transport and the salt chimney effect: A numerical analysis. *GEOFLUIDS*, Vol. 2018, July. doi:10.1155/2018/2378710.
14. **Pollyea, R.M.**, Mohammadi, N., Taylor, J.E., and Chapman, M.C. 2018. Geospatial analysis of Oklahoma earthquakes (2011 - 2016): Quantifying the limits of regional-scale earthquake mitigation measures. *GEOLOGY*, Vol. 46, No. 3, p. 215–218, March. doi:10.1130/G39945.1.
13. †Hanke, J.R., Fischer, M.P., and **Pollyea, R.M.** 2018. Directional semivariogram analysis to identify and rank controls on the spatial variability of fracture networks. *JOURNAL OF STRUCTURAL GEOLOGY*, Vol. 108, p. 34–51, March. doi:10.1016/j.jsg.2017.012.
12. †Gierzynski, A.O. and **Pollyea, R.M.** 2017. Three-phase CO<sub>2</sub> flow in a basalt fracture network. *WATER RESOURCES RESEARCH*, Vol. 53, No. 11, p. 8980–8998, November. doi:10.1002/2017WR021126.
11. **Pollyea, R.M.** and Rimstidt, J.D. 2017. Rate equations for modeling carbon dioxide sequestration in basalt. *APPLIED GEOCHEMISTRY*, Vol. 81, p. 53–62, June. doi:10.1016/j.apgeochem.2017.03.020.
10. Jung, Y., Pau, G.S.H., Finsterle, S., and **Pollyea, R.M.** 2017. TOUGH3: A new efficient version of the TOUGH suite of multiphase flow and transport simulators. *COMPUTERS & GEOSCIENCES*, Vol. 108, p. 2–7, November. Available online 23 September 2016. doi:10.1016/j.cageo.2016.09.009.
9. Mohammadi, N., Taylor, J.E., and **Pollyea, R.M.** 2017. Spatiotemporal dynamics of public response to human-induced seismic perturbations. *In Proceedings, 14<sup>th</sup> International Conference on Information Systems for Crisis Response and Management (ISCRAM)*, Eds. Comes, T., Bénaben, F., Hanacho, C., and Lauras, M. Albi, France. p. 666–672, May 21–24. ISSN:2411-3387.
8. †Jayne, R.S., **Pollyea, R.M.**, Dodd, J.P., †Olson, E.J., and Swanson, S.K. 2016. Spatial and temporal constraints on regional-scale groundwater flow in the Pampa del Tamarugal Basin, Atacama Desert, Chile. *HYDROGEOLOGY JOURNAL*, Vol. 24, No. 8, p. 1921–1937, December. doi:10.1007/s10040-016-1454-3.
7. **Pollyea, R.M.** 2016. Influence of relative permeability on injection pressure and plume configuration during CO<sub>2</sub> injections in a mafic reservoir. *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*, Vol. 46, p. 7–17, March. doi:10.1016/j.ijggc.2015.12.025.
6. **Pollyea, R.M.**, †Van Dusen, E.W., and Fischer, M.P. 2015. Topographically driven fluid flow within orogenic wedges: Effects of taper angle and depth-dependent permeability. *GEOSPHERE*, Vol. 11, No. 5, p. 1427–1437, October. doi:10.1130/GES01120.1.

5. **Pollyea, R.M.**, Fairley, J.P., Podgorney, R.K. and McLing, T.L. 2014. Physical constraints on geologic CO<sub>2</sub> sequestration in low volume basalt formations. *GEOLOGICAL SOCIETY OF AMERICA BULLETIN*, Vol. 126, No. 3/4, p. 344–351, March/April. doi:10.1130/B30874.1.
4. **Pollyea, R.M.**, Fairley, J.P., Podgorney, R.K. and McLing, T.L. 2013. A field sampling strategy for semivariogram inference of fractures in rock outcrops. *STOCHASTIC ENVIRONMENTAL RESEARCH AND RISK ASSESSMENT*, Vol. 27, No. 7, p. 1735–1740, October. doi:10.1007/s00477-013-0710-5.
3. **Pollyea, R.M.** and Fairley, J.P. 2012. Implications of spatial reservoir uncertainty for CO<sub>2</sub> sequestration in the east Snake River Plain, Idaho (USA). *HYDROGEOLOGY JOURNAL*, Vol. 20, No. 4, p. 689–699, April. doi:10.1007/s10040-012-0487-1.
2. **Pollyea, R.M.** and Fairley, J.P. 2012. Experimental evaluation of terrestrial LiDAR-based surface roughness estimates. *GEOSPHERE*, Vol. 8, No. 1, p. 1–7, February. doi:10.1130/GES00733.1.
1. **Pollyea, R.M.** and Fairley, J.P. 2011. Estimating surface roughness of terrestrial laser scan data using orthogonal distance regression. *GEOLOGY*, Vol. 39, No. 7, p. 623–626, July. doi:10.1130/G32078.1.

## TECHNICAL REPORTS

3. Koehn, L., **Pollyea, R.M.**, Romans, B., & Ripepi, N. 2022. SECARB Offshore Topical Report: Preliminary Results for Task 4.2.5 – Adapting Ensemble Simulation Methods and Uncertainty Assessment for Offshore CO<sub>2</sub> Storage. Submitted to U.S. Office of Fossil Energy & Carbon Management via Southern States Energy Board, June 15.
2. **Pollyea, R.M.** 2020. The hydrogeology of saltwater disposal: How fluid density variations affect fluid pressure transients in the seismogenic zone, submitted to United States Geological Survey, Earthquake Hazards Program, 31 August, Virginia Tech, Blacksburg, Virginia.
1. **Pollyea, R.M.** and Benson, S.M. 2018. Final Scientific Report: Assessing the Geomechanical Response of CO<sub>2</sub> Disposal in Flood Basalt Reservoirs, submitted to National Energy Technology Laboratory (Report #DE-VT-FE0023381), 30 November, Virginia Tech, Blacksburg, Virginia.

## EXTERNAL RESEARCH FUNDING

10. Monecke, T. (PI), **Pollyea, R.M. (co-PI)**, Pfaff, K. (co-PI), & Westman, E.W. (co-PI). Block modeling of the carbonation potential of ore deposits using cutting edge core scanning technology and advanced machine learning algorithms. DOE Advanced Research Projects Agency for Energy (ARPA-E), \$1,159,337: 1 Jan 2023 – 31 Dec 2025. (\$392,755 to Pollyea)
9. Karmis, M.E. (PI), Ripepi, N.S. (co-PI), Schlosser, C.S. (co-PI) & **Pollyea, R.M. (co-PI)**. *Supplement to* Southeast Regional Carbon Storage Partnership (SECARB): Phase IV. Southern States Energy Board. \$461,000: 1 Oct 2022 – 30 Sept 2024. Grant #SSEB-SECARBUSA-931-VAT-2020 (\$200,000 to Pollyea).

8. **Pollyea, R.M.** (Lead PI) & Chapman, M.C. (co-PI). Seismic monitoring & earthquake hazard assessment for managed aquifer recharge operations in southeast Virginia. Hampton Roads Sanitation District – Sustainable Water Initiative for Tomorrow (SWIFT). \$832,182: 1 Aug 2021 – July 31 2024.
7. Ripepi, N. (PI), Karmis, M. (co-PI), Schlosser, C.S. (co-PI) & **Pollyea, R.M. (co-PI)**. SECARB Offshore: CO<sub>2</sub>-USA Risk Assessment. Southern States Energy Board. \$468,193: Apr 2018 – Mar 2023. (\$109,743 to Pollyea: Jul 2021 – Mar 2023). Grant #SEOFFS-921-VAT-2018.
6. **Pollyea, R.M.** (Lead PI), House, L. (co-PI), Polys, N. (co-PI) & Gramacy, R. (co-PI). Integrating sequential simulation and visual ensemble analytics for applications in the mining sector. Center for Advanced Subsurface Earth Resource Models (NSF I/UCRC). \$123,631: 1 Aug 2020 – 31 Jul 2022.
5. Karmis, M.E. (PI), Ripepi, N.S. (co-PI), Schlosser, C.S. (co-PI) & **Pollyea, R.M. (co-PI)**. Southeast Regional Carbon Storage Partnership (SECARB): Phase IV. Southern States Energy Board. \$715,640: 1 Oct 2019 – 30 Sept 2022. Grant #SSEB-SECARBUSA-931-VAT-2020 (\$79,145 to Pollyea).
4. **Pollyea, R.M.** (Sole PI). Quantifying the extent of fluid pressure propagation from managed aquifer recharge operations in southeast Virginia. Sustainable Water Initiative for Tomorrow. \$30,258: 1 May 2020 – 31 Jul 2021.
3. **Pollyea, R.M.** (Sole PI). The hydrogeology of saltwater disposal: How fluid density variations affect pressure transients in the seismogenic zone. U.S. Geological Survey, Earthquake Hazards Program. \$96,930: 1 Jan 2019 – 31 May 2020. Grant #G19AP00011.
2. **Pollyea, R.M.** (Lead PI) & Benson, Sally M. (co-PI). Assessing the geomechanical influence of CO<sub>2</sub> sequestration in flood basalt reservoirs. U.S. Department of Energy National Energy Technology Laboratory: Research for Safe and Permanent Geologic Storage of CO<sub>2</sub> (DE-FOA-0001037). \$433,497: 1 Jan 2015 – 31 Aug 2018. Grant #DE-FE0023381.
1. **Pollyea, R.M.**, Experimental evaluation of least-squares methods for quantifying surface roughness from LIDAR-derived datasets, **Sigma Xi Grants-in-Aid of Research**, 2011. \$685.

## INTERNAL RESEARCH FUNDING

5. **Pollyea, R.M.** and Pytharouli, S. Building a Strathclyde-VT partnership in geoenergy science and engineering, sponsored by University of Strathclyde Global Engagements Fund and the Virginia Center for Coal and Energy Research, Aug - Dec 2019. \$6,150.
4. **Pollyea, R.M.** (PI). Evaluating the potential for injection-induced seismicity at the SWIFT injection site, Virginia. Seed funds granted by the NSF-funded NRT program in Coastal Resilience. May 2019. \$5,000.
3. **Pollyea, R.M.** (Travel Grant) 2016 Mentoring Project for New Faculty Members, sponsored by the Virginia Tech Office of the Executive Vice President at Provost, awarded 10 December 2015. \$1,500.

2. **Pollyea, R.M.** (PI). Evaluating the minimum threshold for CO<sub>2</sub> leak detection at geologic carbon sequestration sites. Northern Illinois University Research & Artistry 2012-2013. \$15,000. Awarded 21 March 2013.
1. **Pollyea, R.M.** (Travel Grant) Multi-physics Objected Oriented Simulation Environment (MOOSE) workshop, Center for Advanced Energy Studies, June 4–8, 2012. \$1,000.

## COURSES

\*Denotes graduate section. †As Academic Visitor at Univ. of Strathclyde

2015 – Present: Virginia Tech, Department of Geosciences

2012 – 2015: Northern Illinois University, Department of Geology & Env. Geosciences

2007 – 2011: University of Idaho, Department of Geological Sciences

Short Course <sup>†</sup>	Introduction to Geostatistics (F19)
GEOS5984*	Geostatistics (S19)
GEOS4984	Engineering Geology (S18, S19, S20)
GEOS4804/5804G*	Groundwater Hydrology (S17, F17, F18, F19, F20, F21)
GEOS5975*	Special Topics: Enhanced Geothermal Systems (F16)
GEOS6604*	Reactive Transport Modeling (S16)
GEOL447/547*	Quantitative Techniques in Geology (S15)
GEOL390	Introduction to Groundwater (F14)
GEOL490/590*	Hydrogeology (S14)
GEOL670*	Computational Geoscience as directed study (S14)
GEOL630*	Groundwater Modeling (F13)
GEOL477/577*	Environmental Field Camp (Su13, Su14)
GEOL637*	Contaminant Hydrogeology (S13)
GEOL670*	Geostatistics as directed study (S13)
GEOL120	Introductory Geology (F12, S13, F13, S14, S15)
GEOL410	Field Techniques of Groundwater Investigation (F09)

## PROFESSIONAL SERVICE

Invited Panelist:	Roundtable on Foundational Science for Carbon Dioxide Removal Technologies, U.S. Department of Energy, Basic Energy Sciences (2022)
Guest Associate Editor :	Frontiers in Climate, CCS Special Issue (2020 – 2021)
Associate Editor:	<i>Hydrogeology Journal</i> (2013 – 2017)
Peer Reviewer:	<i>Nature Communications</i> ×4
	<i>Water Resources Research</i> ×4
	<i>Hydrogeology Journal</i> ×4
	<i>Journal of Geophysical Research: Solid Earth</i> ×3
	<i>Geophysical Research Letters</i> ×2
	<i>Intl. J. Greenhouse Gas Control</i> ×2
	<i>Journal of Structural Geology</i>

*Greenhouse Gases Science & Technology*  
*Environmental Engineering Science*  
*Hydrological Processes*  
*Hydrological Sciences Journal*  
*IEEE Trans. on Geoscience and Remote Sensing*  
*Journal of Arid Environments*  
*Journal of Applied Geophysics*  
*Environmental Earth Sciences*  
NSF Integrated Earth Systems ×2  
NSF REU Program ×2

## DEPARTMENTAL SERVICE

2021 Search Committee, Earth & Planetary Data Analytics  
2020 – 2021: Search Committee, Coastal Hazards & Disasters  
2020 Judge, Graduate Student Research Symposium  
2019 – 2020: Search Committee, Environmental Geosciences  
2019 – 2020: Chair, Working Group on Env. & Engineering Geosciences Curriculum  
2019 – present: Undergraduate Student Advisory Committee  
2019 Judge, Graduate Student Research Symposium  
2018 – present: Dept. Organizer ExxonMobil Recruiting  
2018 – 2019: Personnel Committee  
2017 – 2019: Diversity Committee  
2017 – 2018: Search Committee, Geochemistry  
2015 – 2018: Graduate Student Affairs Committee  
2015 – 2017: High Performance Computing Committee  
2013 – 2014: Search Committee, NIU Department Chair in Geology & Env. Geosciences  
2012 – 2015: Faculty Advisor, Sigma Gamma Epsilon, NIU Eta Phi Chapter  
2012 – 2015: Graduate Student Committee, NIU Dept. Geology & Env. Geosci.  
2011 Student Research Judge, *Sigma Xi Award Panel*, University of Idaho College of Science Research Expo. 28 October.  
2009 – 2010: Technical Support, video well logging on behalf of the *Palouse Basin Aquifer Committee* (an interstate NGO managing groundwater in the Palouse Basin).

## GRADUATE STUDENT ADVISING

†Northern Illinois University.

Ph.D. Advisor: Lars Koehn (in progress)  
Ethan Conley (in progress)  
Wu Hao (Aug 2020, now at Los Alamos National Laboratory)  
Richard Jayne (Sept 2019, now at Sandia National Laboratory)

MS Thesis Advisor: John Ogunleye (in progress)  
Grayden Konzen (May 2020, now at Golder Associates)  
Alec Gierzynski (Dec 2016, now at Fehr Graham)  
Richard Jayne† (Dec 2015, now at Sandia National Laboratory)  
Ann Shillaber† (Aug 2014, now at Fehr Graham)

MS Thesis Co-Advisor: Sarah Brokus† (Aug 2014)

Ph.D. Committee:	Faisal Adams (in progress)
	Sonia Zehsaz (in progress)
	Jonathan Prouty (in progress)
	Priyanka Bose (in progress)
	Kirkland Broadwell (Apr 2020)
	Matthew Sublett (Dec 2019)
	Chao Fang (May 2019)
	Kannikha Kolandaivelu (Dec 2018)
	Elizabeth Olson <sup>†</sup> (Dec 2018)
	MS Thesis Committee:
	Nigel Groce-Wright (June 2021)
	Cathleen Humm (May 2021)
	Joshua Benton (May 2020)
	Stacey Law (May 2019)
	David Canova <sup>†</sup> (Aug 2017)
	Joshua Zodarecky <sup>†</sup> (Dec 2016)
	Ellen Raimondi <sup>†</sup> (Aug 2015)
	John Hanke <sup>†</sup> (May 2015)
	Matt Flemming <sup>†</sup> (May 2015)
	Erik Van Dusen <sup>†</sup> (May 2014)
	David Mills <sup>†</sup> (Jul 2013)
	Kasey Todd <sup>†</sup> (Jul 2013)

## PROFESSIONAL DEVELOPMENT

- 2021 GEOS5154: Strong Motion Seismology by M.C. Chapman.
- 2021 Microseismic Data Acquisition – Unite System Operator Training, Sercel, Inc.
- 2018 GEOS5744: Fluid Inclusion Techniques by R.J. Bodnar.
- 2017 GEOS6604: Geochemical Kinetics taught by J.D. Rimstidt.
- 2016 TREATMECH Training Course, Lawrence Berkeley National Laboratory, Berkeley, California, 7–9 November.
- 2016 Proposal Development Institute, sponsored by the Virginia Tech Office of the Vice President for Research; selection is competitive.
- 2014 TOUGHREACT Training Course, Lawrence Berkeley National Laboratory, Berkeley, California, 17–19 September.
- 2014 PetraSim Training Course: A Graphical Front-End for the TOUGH2 Flow Simulators, University of California Berkeley, Berkeley, California, 16–17 September.
- 2013 NIU PI Academy, sponsored by the NIU Division of Research and Graduate Studies; selection is competitive.

## INVITED RESEARCH TALKS

- 33. **Pollyea, R.M.**, & Koehn, L.K. 2022. Developing a representative model of the central Gulf of Mexico for testing offshore CO<sub>2</sub> storage scenarios. SECARB Offshore &

GoMCarb Joint CCS Conference, 16 – 20 May, New Orleans, LA.

32. **Pollyea, R.M.** 2022. Geologic carbon sequestration primer. Appalachian State University, 5 April.
31. **Pollyea, R.M.**, House, L., Polys, N. & Gramacy, R. 2022. Integrating sequential simulation and visual ensemble analytics for applications in the mining sector. Center for Advanced Subsurface Earth Resource Models (NSF I/UCRC). 14 March, Virtual Format.
30. **Pollyea, R.M.** 2021. Carbon Storage Beyond the Basin: Opportunities & Challenges for CCS in Basalt Formations, Department of Geological & Environmental Geosciences, Appalachian State University, 12 November, Boone, NC.
29. **Pollyea, R.M.** 2021. Carbon Storage Beyond the Basin: Opportunities & Challenges for CCS in Basalt Formations, Department of Geosciences & Energy Institute, Colorado State University, 28 October, Virtual Format.
28. **Pollyea, R.M.**, House, L., Polys, N. & Gramacy, R. 2021. Integrating sequential simulation and visual ensemble analytics for applications in the mining sector. Center for Advanced Subsurface Earth Resource Models (NSF I/UCRC). 21 March, Virtual Format
27. **Pollyea, R.M.** & Chambers, C.R. 2020. Regional-scale fluid injection modeling to optimize seismic monitoring, Sustainable Water Initiative for Tomorrow (SWIFT), 9 September, Virtual format.
26. **Pollyea, R.M.**, House, L., Gramacy, B., Polys, N. 2020. Integrating sequential simulation methods with visual ensemble analytics for applications in the mining sector, Center for Advanced Subsurface Earth Resource Models, 12 March, Blacksburg, Virginia.
25. **Pollyea, R.M.** 2019. The hydrogeology of injection-induced earthquakes, Sustainable Water Initiative for Tomorrow (SWIFT), 16 December, Hampton Roads, Virginia.
24. **Pollyea, R.M.** 2019. Carbon storage beyond the basin: Opportunities & challenges for CCS in basalt formations, Department of Civil & Environmental Engineering, University of Strathclyde, 11 November, Glasgow, Scotland, UK.
23. **Pollyea, R.M.** 2019. A new perspective on the hydraulics of injection-induced earthquakes. Department of Civil & Environmental Engineering, University of Strathclyde, 6 November, Glasgow, Scotland, UK.
22. **Pollyea, R.M.** 2019. A new perspective on the hydraulics of injection-induced earthquakes. Graduate student seminar series, Department of Mining & Minerals Engineering, Virginia Tech, 10 October, Blacksburg, Virginia.
21. **Pollyea, R.M.** 2019. The hydrogeology of injection-induced earthquakes. Department of Geosciences, Virginia Tech, 1 February, Blacksburg, Virginia.
20. **Pollyea, R.M.** 2018. Man-Made Earthquakes. FaculTea Residential College Research Series, Virginia Tech, 12 November, Blacksburg, Virginia.

19. **Pollyea, R.M.** and Polys, N. 2018. Interpreting thermal fluid signatures with ensemble simulation and visual data analytics. Center for Advanced Subsurface Resource Models (NSF I/UCRC), 8 – 9 November, Golden, Colorado.
18. **Pollyea, R.M.** 2018. The hydrogeology of injection-induced earthquakes. Network Dynamics Lab, School of Civil and Environmental Engineering, Georgia Tech, 29 October, Atlanta, Georgia.
17. **Pollyea, R.M.**, Chapman, M.C., Mohammadi, N., and Taylor, J.E. 2018. Geospatial analysis of Oklahoma earthquakes and oilfield wastewater injection: 2011–2017. Oklahoma Seismicity Workshop 2018, 21–22 February, Norman, Oklahoma.
16. **Pollyea, R.M.** 2017. Scaling fracture-controlled permeability to large rock volumes. Center for Advanced Subsurface Resource Models (NSF I/UCRC), 14 – 15 September, Golden, Colorado.
15. **Pollyea, R.M.**, Benson, S.M., and Gran, M. 2017. A probabilistic assessment of the geomechanical response to CO<sub>2</sub> injections in large igneous provinces. Mastering the Subsurface through Technology Innovation, Partnerships and Collaboration: Carbon Storage and Oil and Natural Gas Technologies Review Meeting sponsored by U.S. Department of Energy Office of Fossil Energy, National Energy Technology Laboratory, 1–3 August, Pittsburgh, Pennsylvania.
14. **Pollyea, R.M.** 2017. Geologic carbon sequestration in basalt reservoirs: Modeling and simulation studies. High Performance Computing Day sponsored by Virginia Tech Advanced Research Computing, 24 March, Blacksburg, VA.
13. **Pollyea, R.M.** and Benson, S.M., 2016. A probabilistic assessment of the geomechanical response to CO<sub>2</sub> injections in large igneous provinces. Mastering the Subsurface through Technology Innovation and Collaboration: Carbon Storage and Oil and Natural Gas Technologies Review Meeting sponsored by U.S. Department of Energy Office of Fossil Energy, National Energy Technology Laboratory, 16–18 August, Pittsburgh, Pennsylvania.
12. **Pollyea, R.M.**, 2016. Field-scale perspective on thermal-hydro-mechanical-chemical modeling in fractured geologic media. Workshop on fracture mechanics and fracture pattern evolution in deep, hydrothermal and reactive environments, sponsored by U.S. Department of Energy Basic Energy Sciences, National Conference Center, 8–10 May, Leesburg, Virginia.
11. **Pollyea, R.M.** and Benson, S.M., 2015. A probabilistic assessment of the geomechanical response to CO<sub>2</sub> injections in large igneous provinces. Carbon Storage R&D Project Review Meeting: Transforming Technology Through Integration and Collaboration sponsored by U.S. Department of Energy Office of Fossil Energy National Energy Technology Laboratory, 18–20 August, Pittsburgh, Pennsylvania.
10. **Pollyea, R.M.** and Benson, S.M. 2014. A probabilistic assessment of the geomechanical response to CO<sub>2</sub> injections in large igneous provinces. DE-FOA0001037 Kick-Off Meeting, National Energy Technology Laboratory, 13 November, Pittsburgh, Pennsylvania.

9. **Pollyea, R.M.** 2014. Physical constraints on CO<sub>2</sub> sequestration in low-volume basalt reservoirs. Illinois Groundwater Association Annual Meeting, 28 October, Elgin, Illinois.
8. **Pollyea, R.M.** 2014. Geomechanical implications of geologic CO<sub>2</sub> sequestration in low-volume basalt reservoirs. Department of Geology, University of Kansas, 10 April, Lawrence, Kansas.
7. **Pollyea, R.M.** 2013. Understanding the geomechanical implications of CO<sub>2</sub> sequestration in low-volume basalt reservoirs. Department of Geology, University of Dayton, 8 November, Dayton, Ohio.
6. **Pollyea, R.M.** 2013. Physical constraints on geologic CO<sub>2</sub> sequestration in low-volume basalt reservoirs. Department of Geology, Portland State University, 22 April, Portland, Oregon.
5. **Pollyea, R.M.** 2013. Physical constraints on geologic CO<sub>2</sub> sequestration in low-volume basalt reservoirs. Department of Earth and Planetary Sciences, Northwestern University, 25 January, Evanston, Illinois.
4. **Pollyea, R.M.** 2012. Exploring the influence of reservoir heterogeneity for geologic CO<sub>2</sub> sequestration in fractured basalts. Illinois State Geological Survey, 29 October, University of Illinois Urbana-Champaign.
3. **Pollyea, R.M.** 2012. Implications of spatial reservoir uncertainty for geologic CO<sub>2</sub> sequestration in low-volume basalt aquifers. Center for Advanced Energy Studies, 18 April, Idaho Falls, Idaho.
2. **Pollyea, R.M.** 2011. Modeling Geologic Carbon Sequestration in East Snake River Plain Basalts. Idaho National Laboratory, 28 July, Idaho Falls, Idaho.
1. **Pollyea, R.M.**, and Fairley, J.P. 2010. Simulating fracture distributions in low-volume basalts for reservoir modeling. Center for Advanced Energy Studies, 26 August, Idaho Falls, Idaho.

## CONFERENCE ABSTRACTS

<sup>†</sup>Denotes student co-author.

45. <sup>†</sup>Hao, W., Viswanathan, H.S., Lubbers, N., and **Pollyea, R.M.** 2020. The application of machine learning to a parametric analysis of fluid migration during geological carbon sequestration in a sandstone reservoir, American Geophysical Union Fall Meeting, December, Virtual Conference.
44. <sup>†</sup>Chambers, C.R., Mitchell, J., and **Pollyea, R.M.** 2020. Modeling fluid pressure propagation into deep basement rocks from managed aquifer recharge: A case study of the Virginia SWIFT project, Abstract 254-19, Geological Society of America Annual Meeting, 26–30 October, Virtual Conference.
43. <sup>†</sup>Voisin, V., Dodd, J.P., **Pollyea, R.M.**, and <sup>†</sup>Jayne, R.S. 2019. Model-based estimates of the timing of brine water flux into the Victoria Land Basin from the McMurdo Dry Valleys, Antarctica, Abstract H53I-1869, American Geophysical Union Fall Meeting, 9–13 December, San Francisco, California.

42. †Hao, W., †Jayne, R.S., **Pollyea, R.M.** 2019. Modeling CO<sub>2</sub>-water-basalt reactions in a basalt fracture network, Abstract H41H-1787, American Geophysical Union Fall Meeting, 9–13 December, San Francisco, California.
41. **Pollyea, R.M.**, Chapman, M.S., †Jayne, R.S., †Wu, H., and †Konzen, G. 2019. Fluid composition affects injection-induced earthquake occurrence, persistence & hazard, Abstract 333475, Geological Society of America Annual Meeting, 22–25 September, Phoenix, Arizona.
40. †Konzen, G., †Jayne, R.S., †Wu, H., and **Pollyea, R.M.** 2019. A GIS-based workflow for building a 3-D aquifer model from geologic data, Abstract 333677, Geological Society of America Annual Meeting, 22–25 September, Phoenix, Arizona.
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37. †Jayne, R.S., **Pollyea, R.M.**, and Zhang, Y. 2018. Non-isothermal effects of a CO<sub>2</sub> injection into a geologic reservoir, Abstract MR53A-2760, American Geophysical Union Fall Meeting, 10–14 December, Washington D.C.
36. †Wu, H., †Jayne, R.S., and **Pollyea, R.M.** 2018. Quantifying permeability alteration effects to CO<sub>2</sub> storage potential in a basalt fracture network, Abstract S51F-1615, American Geophysical Union Fall Meeting, 10–14 December, Washington D.C.
35. †Wu, H., †Jayne, R.S., †Konzen, G., and **Pollyea, R.M.** 2018. Understanding the processes controlling engineered geological fluid systems, Virginia Tech HBCU/MSI Research Summit, 14 October, Blacksburg, Virginia.
34. **Pollyea, R.M.**, Mohammadi, N., and Taylor, J.E. 2017. Geospatial cross-correlation analysis of Oklahoma earthquakes and saltwater disposal volume 2011 – 2016, Abstract S23C-0819, American Geophysical Union Fall Meeting, 11–15 December, New Orleans, Louisiana.
33. Gran, M., Zahasky, C., Garing, C., **Pollyea, R.M.**, and Benson, S.M. 2017. Core-flooding experiments combined with X-rays and micro-PET imaging as a tool to calculate fluid saturations in a fracture, American Geophysical Union Fall Meeting, Abstract H21C-1466, 11–15 December, New Orleans, Louisiana.
32. †Wu, H. and **Pollyea, R.M.** 2017. Influence of capillary force and buoyancy on CO<sub>2</sub> migration during CO<sub>2</sub> injection in a sandstone reservoir, Abstract H41B-1437, American Geophysical Union Fall Meeting, 11–15 December, New Orleans, Louisiana.
31. †Jayne, R.S. and **Pollyea, R.M.** 2017. A spatial correlation model of permeability on the Columbia River Plateau, Abstract H34C-07, American Geophysical Union Fall Meeting, 11–15 December, New Orleans, Louisiana.
30. †Wu, H. and **Pollyea, R.M.** 2017. A parametric analysis of capillary pressure effects during the carbon sequestration injection process in a sandstone reservoir, Geologi-

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29. Gran, M., Zahasky, C., Garing, C., **Pollyea, R.M.**, and Benson, S.M. 2017. Experimental study of relative permeability and saturation variations in a fractured basalt core. 9<sup>th</sup> International Conference on Porous Media & Annual Meeting (InterPore), 8–11 May, Rotterdam, Netherlands.
  28. **Pollyea, R.M.** and Rimstidt, J.D. 2016. A kinetic rate model for crystalline basalt dissolution at temperature and pressure conditions relevant for geologic CO<sub>2</sub> sequestration, Abstract H51C-1486. American Geophysical Union Fall Meeting, 12–16 December, San Francisco, California.
  27. †Wu, H. and **Pollyea, R.M.** 2016. A parametric analysis of capillary pressure effects during the carbon sequestration injection process in a sandstone reservoir, Abstract GC41C-1108. American Geophysical Union Fall Meeting, 12–16 December, San Francisco, California.
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  24. †Gierzynski and **Pollyea, R.M.** 2016. Quantifying the effects of spatial uncertainty in fracture permeability on CO<sub>2</sub> leakage through cap rocks during geologic CO<sub>2</sub> storage in continental flood basalts. Geological Society of America Annual Meeting, 25–28 September, Denver, Colorado.
  23. †Canova, D., Fischer, M.P., **Pollyea, R.M.**, and †Jayne, R.S. 2016. Advective heat transport and the salt chimney effect: A numerical analysis. Geological Society of America Annual Meeting, 25–28 September, Denver, Colorado.
  22. †Canova, D., Fischer, M.P., **Pollyea, R.M.**, and †Jayne, R.S. 2016. Advective heat transport and the salt chimney effect: A numerical analysis. Annual Meeting of the Salt Sediment Interaction Research Consortium, 24–26 May, Cortez, Colorado.
  21. **Pollyea, R.M.** 2015. System response as a function of relative permeability in geologic CO<sub>2</sub> sequestration, Abstract H52F-05. American Geophysical Union Fall Meeting, 14–18 December, San Francisco, California.
  20. †Jayne, R.S., and **Pollyea, R.M.**, Dodd, J.P., †Olson, E.J., and Swanson, S.K. 2015. Assessing groundwater recharge mechanisms in the Pampa del Tamarugal Basin of northern Chile. American Geophysical Union Fall Meeting, 14–18 December, San Francisco, California.
  19. **Pollyea, R.M.**, †Van Dusen, E.W., and Fischer, M.P. 2014. Groundwater flow within a sub-aerial orogenic wedge subject to depth-dependent permeability structure, Ab-

stract H31P-03. American Geophysical Union Fall Meeting, 15–19 December, San Francisco, California.

18. Dodd, J.P. and **Pollyea, R.M.** 2014. Combining numerical modeling and stable isotopes to quantify groundwater circulation from the Chilean Andes to the Pampa del Tamarugal Basin, Atacama Desert, northern Chile. American Geophysical Union Fall Meeting, 15–19 December, San Francisco, California.
17. †VanDusen, E.W., **Pollyea, R.M.**, and Fischer, M.P. 2013. Understanding the influence of taper angle on fluid system evolution in an orogenic wedge. Geological Society of America Annual Meeting, 27–30 October, Denver, Colorado.
16. †Shillaber, A.S. and **Pollyea, R.M.** 2013. Using soil CO<sub>2</sub> gradients to identify CCS reservoir leakage. Geological Society of America Annual Meeting, 27–30 October, Denver, Colorado.
15. †VanDusen, E.W., Fischer, M.P., **Pollyea, R.M.**, and Dodd, J.P. 2013. The role of geometry and internal structure on fluid system evolution in narrowly tapering orogenic wedges. American Association of Petroleum Geologists and Society of Exploration Geophysicists Annual Student Expo, 16–17 September, Houston, Texas.
14. **Pollyea, R.M.**, Fairley, J.P., Podgorney, R.K., and McLing, T.L. 2012. Numerical modeling experiment reveals opportunities and challenges for CO<sub>2</sub> sequestration in low-volume basalt formations. Geological Society of America Annual Meeting, 4–7 November, Charlotte, North Carolina.
13. **Pollyea, R.M.** and Fairley, J.P. 2011. Implications of reservoir uncertainty for geologic carbon sequestration in low-volume basalt. American Geophysical Union Fall Meeting, 5–9 December, San Francisco, California.
12. **Pollyea, R.M.** and Fairley, J.P. 2011. Evaluating errors in least-squares based surface roughness models for analyzing terrestrial LiDAR data. Geological Society of America Annual Meeting, 9–12 October, Minneapolis, Minnesota.
11. Kelsay, T.E., Fairley, J.P., Hinds, J.J., **Pollyea, R.M.**, Osterloh, J.J., and Wagner, A.W. 2011. Evaluating the geothermal potential of the Rio Grande Rift using spatial-statistical methods. Geological Society of America Rocky Mountain and Cordilleran Joint Section Meeting, 18-20 May, Logan, Utah.
10. Kelsay, T. E., Osterloh, J.J., **Pollyea, R.M.**, Hinds, J.J., and Fairley, J.P. 2011. Reducing uncertainty in geothermal exploration of the Rio Grande Rift valley using spatial-statistical methods. Geothermal Resource Council annual meeting 35, San Diego, California.
9. **Pollyea, R.M.** and Fairley, J.P. 2011. Characterizing fracture distributions using minimum error estimates of surface roughness from terrestrial LiDAR data. Idaho Geothermal Workshop, Center for Advanced Energy Studies, 21 April, Idaho Falls, Idaho.
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Grande Rift. Idaho Geothermal Workshop, Center for Advanced Energy Studies, 21 April, Idaho Falls, Idaho.

7. **Pollyea, R.M.**, Fairley, J.P., Podgorney, R.K., and McLing, T.L. 2011. Characterizing analog mid-ocean ridge basalts for CO<sub>2</sub> injection modeling. Proceedings of the Conference on Geological Carbon Capture & Storage in Mafic and Ultramafic Rocks, 8-10 January, Muscat, Sultanate of Oman.
6. **Pollyea, R.M.**, Fairley, J.P., Podgorney, R.K., and McLing, T.L. 2010. Developing fracture density models using terrestrial laser scan data. American Geophysical Union Fall Meeting, 13–17 December, San Francisco, California.
5. **Pollyea, R.M.**, Fairley, J.P., Podgorney, R.K., McLing, T.L., and Smith, R. 2009. Testing CO<sub>2</sub> isolation with synthetic models of heterogeneous layered basalt. Fifth Trondheim Conference on CO<sub>2</sub> Capture, Transport, and Storage, Trondheim, Norway.
4. **Pollyea, R.M.**, Fairley, J.P., Podgorney, R.K., and McLing, T.L. 2009. Simulating heterogeneous property distributions for carbon dioxide injection modeling in fractured basalts. Geological Society of America Annual Meeting, 18–21 October, Portland, Oregon.
3. **Pollyea, R.M.** and Fairley, J.P. 2008. Using geostatistical methods to inform field sampling of heterogeneous fractured media. American Geophysical Union Fall Meeting, 15–19 December, San Francisco, California.
2. **Pollyea, R.M.** 2008. Assessing data needs for geologic carbon sequestration. University of Idaho Spring Research Expo, 25 April, Moscow, Idaho.
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