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## Brian R. Ellis

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### Education

**Princeton University** Princeton, New Jersey

*Ph.D.*, Civil & Environmental Engineering June 2012

*M.A.*, Civil & Environmental Engineering Jan. 2009

**University of Michigan** Ann Arbor, Michigan

*B.S.* with high distinction, Environmental Geosciences (honors) and Economics May 2006

### Appointments

2020 – Associate Professor, Civil & Environmental Engineering, University of Michigan

2016 – 2019 Faculty Research Scholar, U.S. DOE National Energy Technology Laboratory

2014 – 2020 Assistant Professor, Civil & Environmental Engineering, University of Michigan

2012 – 2017 NSF SEES Fellow

2012 – 2014 Michigan Society of Fellows Postdoctoral Scholar, Civil & Environmental Engineering,  
University of Michigan

2006 – 2012 Graduate Research Assistant and Ph.D. candidate, Princeton University

Advisor: Dr. Catherine A. Peters

Areas of Study: Geological sequestration of CO<sub>2</sub>, environmental geochemistry,  
geochemical modeling, flow in porous media

Ph.D. Thesis: “*Geologic Carbon Sequestration in Deep Saline Aquifers: Brine  
Acidification and Geochemical Alterations of Reactive Leakage Pathways*”

2004 – 2006 Undergraduate Research Assistant, University of Michigan

Advisor: Dr. M. Clara Castro

Areas of Study: Noble gas geochemistry, paleoclimate reconstruction

### Awards and Honors

2020 National Science Foundation Early CAREER award

2019 CEE Faculty Excellence Award, University of Michigan College of Engineering

2018 National Academy of Engineering US Frontiers of Engineering Symposium (participant)

2015 ASCE ExCEED Fellowship

2015 Doctoral New Investigator award, ACS Petroleum Research Fund

2014 National Academies of Science, Arab American Frontiers of Science, Engineering,  
Medicine (invited speaker and participant)

2013 ACS Certificate of Merit (in recognition of presentation given by W. Fan)

2012 NSF Science, Engineering and Education for Sustainability (SEES) Fellow

2012 Junior Fellow, Michigan Society of Fellows (8 fellows selected from 932 applicants)

2010 Freeman Fellowship, American Society of Civil Engineers (two awarded annually)

2009 NSF-AEESP Grand Challenge Student Paper Award

2009 Science, Technology & Environmental Policy Fellowship,  
 Princeton Environmental Institute (one year full funding)  
 2009 – 2011 ORISE Fellow, U.S. Department of Energy Professional Internship appointment

**Peer Reviewed Publications** (advisees: student, postdoc)

37. Menefee, A.H., Welch, N.J., Frash, L.P., Hicks, W., Carey, J.W., **Ellis, B.R.** (2020). Rapid mineral precipitation during shear fracturing of carbonate-rich shales. *Journal of Geophysical Research – Solid Earth*, 125 (6), e2019JB018864.
36. Menefee, A.H., **Ellis, B.R.** (2020). Regional-Scale Greenhouse Gas Utilization Strategies for Enhanced Shale Oil Recovery and Carbon Management. *Energy & Fuels*, 34 (5), 6136-6147.
35. Menefee, A.H., **Ellis, B.R.** (2020). Wastewater management strategies for sustained shale gas production. *Environmental Research Letters*, 15 (2), 024001.
34. Zhang, D., Jing, Y., Wu, HL, Jaworska, B., **Ellis, B.R.**, Li, V.C. (2020). Discontinuous micro-fibers as intrinsic ductile reinforcement for Engineered Cementitious Composites (ECC). *Composites Part B*, 184, 107741.
33. Adeoye, J.T., Zhang, D., Li, V.C., **Ellis, B.R.** (2020). Novel ductile wellbore cementitious composite for geologic CO<sub>2</sub> storage, *International Journal of Greenhouse Gas Control*, 94, 102896.
32. Zhang, D., Hu, WL, Li, V.C., **Ellis, B.R.** (2020). Autogenous healing of Engineered Cementitious Composites (ECC) based on MgO-fly ash binary system activated by carbonation curing. *Construction and Building Materials*, 238, 117672.
31. Zhang, D., Li, V.C., **Ellis, B.R.** (2019). Ettringite-related dimensional stability of CO<sub>2</sub>-cured Portland cement mortars. *ACS Sustainable Chemistry & Engineering*, 7 (19), 16310-16319.
30. Lim, T., **Ellis, B.R.**, Skerlos, S.J. (2019). Mitigating CO<sub>2</sub> emissions of concrete manufacturing through CO<sub>2</sub>-enabled binder reduction. *Environmental Research Letters*, 14, 114014.
29. Zhang, D., Li, V.C., **Ellis, B.R.** (2019). Ettringite-Related Dimensional Stability of CO<sub>2</sub>-Cured Portland Cement Mortars. *ACS Sustainable Chemistry & Engineering*, 7(19), 16310-16319.
28. Fazeli, H., Patel, R.A., **Ellis, B.R.**, Hellevang, H. (2019). Three-dimensional pore-scale modeling of fracture evolution in heterogeneous carbonate caprock subjected to CO<sub>2</sub>-enriched brine. *Environmental Science and Technology*, 53(8), 4630-4639.
27. Das, S., Adeoye, J., Dhiman, I., Bilheux, H., **Ellis, B.R.** (2019). Imbibition of mixed charge surfactant fluids in shale fractures. *Energy & Fuels*, 33(4), 2839-2847.
26. Adeoye, J., Beverluis, C., Murphy, A., Li, V.C., **Ellis, B.R.** (2019). Physical and chemical alterations of engineered cementitious composite under geologic CO<sub>2</sub> storage conditions. *International Journal of Greenhouse Gas Control*, 83, 282-292.
25. Zhang, D., Li, V.C, **Ellis, B.R.** (2018). Optimal pre-hydration age for CO<sub>2</sub> sequestration through Portland cement carbonation. *ACS Sustainable Chemistry & Engineering*, 6(12), 15976-15981.
24. Kim, Y., Marcano, M.C., **Ellis, B.R.**, Becker, U. (2018). Photocatalytic reduction of uranyl: Effects of organic ligands and UV light wavelengths. *American Journal of Science*, 318(9), 949-968.
23. Wu, HL., Zhang, D., **Ellis, B.R.**, Li, V.C. (2018). Development of reactive MgO-based engineered cementitious composite (ECC) through accelerated carbonation curing. *Construction and Building Materials*, 191, 23-31.

22. Fan, W., Hayes, K.F., **Ellis, B.R.** (2018). Estimating radium activity in shale gas produced brine. *Environmental Science and Technology*, 52(18), 10839-10847.
21. Menefee, A.H., Giammar, D.E., **Ellis, B.R.** (2018). Permanent CO<sub>2</sub> trapping through localized and chemical gradient-driven basalt carbonation. *Environmental Science and Technology*, 52(15), 8954-8964.
20. Chen, L., Miller, S.A., **Ellis, B.R.** (2017). Comparative human toxicity impact of electricity produced from shale gas and coal. *Environmental Science and Technology*, 51(21), 13018–13027.
19. Xiong, W., Wells, R.K., Menefee, A.H., Skemer, P., **Ellis, B.R.**, Giammar, D.E. (2017). CO<sub>2</sub> mineral trapping in fractured basalt. *International Journal of Greenhouse Gas Control*, 63, 310-320.
18. Olson, T.M., Wax, M., Yonts, J., Heidecorn, K., Haig, S.J., Yeoman, D., Hayes, Z., Raskin, L., **Ellis, B.R.** (2017). Forensic Estimates of lead release from lead service lines during the water crisis in Flint, Michigan. *Environmental Science and Technology Letters*, 4, 356–361.
17. Menefee, A.H., Li, P., Giammar, D.E., **Ellis, B.R.** (2017). The roles of transport limitations and mineral heterogeneity in carbonation of fractured basalts. *Environmental Science and Technology*, 51(16), 9352–9362.
16. Adeoye, J., Menefee, A.H., Xiong, W., Wells, R., Skemer, P., Giammar, D.E., **Ellis, B.R.** (2017). Effect of transport limitations and fluid properties on reaction products in fractures of unaltered and serpentinized basalt exposed to high P<sub>CO2</sub> fluids. *International Journal of Greenhouse Gas Control*, 63, 310-320.
15. Kim, Y., Yuan, K., **Ellis, B.R.**, Becker, U. (2017). Redox reactions of selenium as catalyzed by magnetite: Lessons learnt from using electrochemistry and spectroscopic methods. *Geochimica et Cosmochimica Acta*, 199, 304-323.
14. Jayawan, I.S., Demond, A.H., **Ellis, B.R.**, (2016). Using an Analytical Solution Approach to Permit High Volume Groundwater Withdrawals. *Environmental Science: Water Research and Technology*, 2, 942-952. (Invited submission, Emerging Investigators Series)
13. Zhou, L., Das, S., **Ellis, B.R.** (2016). Effect of surfactant adsorption on the wettability alteration of gas-bearing shales. *Environmental Engineering Science*, 33(10), 766-777.
12. Bi, Y., Zhang, H., **Ellis, B.R.**, Hayes, K.F. (2016). Removal of Radium from Brines Associated with Shale Gas Production. *Environmental Engineering Science*, 33(10), 791-798.
11. **Ellis, B.R.**, Peters, C.A. (2016). 3D calcite mapping and a demonstration of its relevance to permeability evolution in reactive fractures. *Advances in Water Resources*, 95, 246-253.
10. Wen, T., Castro, M.C., **Ellis, B.R.**, Hall, C.M., Lohmann, K.C. (2015). Assessing Compositional Variability and Migration of Natural Gas in the Antrim Shale in the Michigan Basin Using Noble Gas Geochemistry. *Chemical Geology*, 417, 356-370.
9. Burton, G.A., Basu, N., **Ellis, B.R.**, Kapo, K., Entrekin, S., Nadelhoffer, K.J. (2014). Hydraulic ‘fracking’: Are surface water impacts a concern? *Environmental Toxicology and Chemistry*, 30(8), 1679-1689.
8. Bibby, K.J., Brantley, S.L., Reible, D.D., Linden, K.G., Mouser, P.J., Gregory, K.B., **Ellis, B.R.**, Vidic, R.D. (2013). Suggested reporting parameters for research studies investigating wastewaters from unconventional shale gas extraction. *Environmental Science and Technology*, 47(23), 13220-13221.
7. Ernstoff, A.S., **Ellis, B.R.** (2013). Clearing the waters of the fracking debate. *Michigan Journal of Sustainability*, 1, 109-129. DOI: 10.3998/mjs.12333712.0001.009 (Invited Submission)

6. Deng, H., **Ellis, B.R.**, Peters, C.A., Fitts, J.P., Crandall, D., Bromhal, G.S. (2013). Modifications of carbonate fracture hydrodynamic properties by CO<sub>2</sub>-acidified brine flow. *Energy & Fuels*, 27(8), 4221-4231.
5. **Ellis, B.R.**, Fitts, J.P., Bromhal, G.S., McIntyre, D.L., Tappero, R., Peters, C.A. (2013). Dissolution-driven permeability reduction of a fractured carbonate caprock. *Environmental Engineering Science*, 30(4), 187–193. (Featured Article)
4. **Ellis, B.R.**, Peters, C.A., Fitts, J.P., Bromhal, G.S., McIntyre, D.L., Warzinski, R.P., Rosenbaum E.J. (2011), Deterioration of a fractured carbonate caprock exposed to CO<sub>2</sub>-acidified brine flow. *Greenhouse Gases: Science and Technology*, 1, 248–260.
3. **Ellis, B.R.**, Crandell, L.E., Peters, C.A. (2010), Limitations for brine acidification due to SO<sub>2</sub> co-injection in geologic carbon sequestration. *International Journal of Greenhouse Gas Control*, 4(3), 575–582.
2. Crandell, L.E., **Ellis, B.R.**, Peters, C.A. (2010), Dissolution potential of SO<sub>2</sub> co-injected with CO<sub>2</sub> in geologic sequestration. *Environmental Science and Technology*, 44(1), 349–355.
1. Castro, M.C., Hall, C.M., Patriarche, D., Goblet, P., **Ellis, B.R.** (2007), A noble gas paleoclimate record in Texas - Basic assumptions revisited. *Earth and Planetary Science Letters*, 257, 170–187.

#### **Papers submitted and under review**

1. Wu, H.L., Zhang, D., **Ellis, B.R.**, Li, V.C. (*submitted*). Mechanical behavior of carbonated MgO-based Engineered Cementitious Composite (ECC) after high temperature exposure. *Cement and Concrete Composites*

#### **Peer Reviewed Technical Reports**

1. **Ellis, B.R.** (2013). “*Hydraulic Fracturing in Michigan Integrated Assessment: Geology/Hydrogeology Technical Report*”, UM Graham Sustainability Institute Integrated Assessment Report Series, 2(3): 25 p.  
<<http://graham.umich.edu/media/files/HF-03-Geology-Hydrogeology.pdf>>

#### **Conference Proceedings**

2. J.P. Fitts, **B.R. Ellis**, H. Deng, C. A. Peters (2012). “Geochemical controls on fracture evolution in carbon sequestration” ARMA 12-549. American Rock Mechanics Association, 46th US Rock Mechanics / Geomechanics Symposium, Chicago IL June 2012. Vol. 12, p 549.
1. **Ellis, B.R.**, Bromhal, G.S., McIntyre, D.L., Peters, C.A. (2011), Changes in caprock integrity due to vertical migration of CO<sub>2</sub>-enriched brine. *Energy Procedia*, 4, 5327–5334. DOI:10.1016/j.egypro.2011.02.514

#### **Conference Presentations** (advisees: student, postdoc)

79. Menefee, A.H., Welch, N.J., Frash, L.P., Hicks, W., Carey, J.W., **Ellis, B.R.**, "Decarbonizing energy through engineered subsurface systems", AEESP Research and Education Conference, Tempe, AZ, 05/2019
78. **Ellis, B.R.**, Skerlos, S.J., Daly, S.R., "Necessary Conditions and Skills for Student Environmental Engineers to Practice Sustainable Engineering", AEESP Research and Education Conference, Tempe, AZ, 05/2019
77. Menefee, A.H., Welch, N.J., Frash, L.P., Hicks, W., Carey, J.W., **Ellis, B.R.**, “Rapid Mineral Precipitation During Shear Fracturing of Carbonate-rich Shales”, AGU Fall Meeting, San Francisco, CA, 12/2019.

76. Tomenchok, K., Thompson, E.P., **Ellis, B.R.**, “Developing an Improved Approach for Segmenting Rock Core X-ray Computed Tomography Data”, AGU Fall Meeting, San Francisco, CA, 12/2019.
75. Thompson, E.P., Wang, Z., Tomenchok, K., **Ellis, B.R.**, “Modeling Porosity-Permeability Evolution of Carbonates due to Reactive Flow using OpenFOAM”, AGU Fall Meeting, San Francisco, CA, 12/2019.
74. **Ellis, B.R.** (2019), “Influence of slickwater additives on fate of residual fracturing fluids and flowback composition in shale gas reservoirs”, ACS National Meeting, Orlando FL, March 31 - April 4. (*Invited Speaker*)
73. Adeoye, J., Li, V.C., **Ellis, B.R.** (2018). “Mechanical integrity of engineered cementitious composite during geologic carbon storage.” American Geophysical Union Fall Meeting, Washington, D.C., December 10-14.
72. Menefee, A.H., **Ellis, B. R.** (2018). “Impact of reactive silicate zones on CO2 trapping in natural basalt.” American Geophysical Union Fall Meeting, Washington, D.C., December 10-14.
71. Thompson, E.P., Marcano, M.C., Becker, U., **Ellis, B.R.** (2018). “Mapping 3D surface charge distribution in nanoporous shales.” American Geophysical Union Fall Meeting, Washington, D.C., December 10-14.
70. Menefee, A.H., Giammar, D.E., **Ellis, B.R.** (2018). “Controls on mineral carbonation reactions in basalt fracture networks.” 14th International Conference on Greenhouse Gas Control Technologies, Melbourne, Australia, October 22-25.
69. Menefee, A.H., **Ellis, B. R.** (2018). “Regional-scale GHG utilization strategies for enhanced shale oil recovery and sustained carbon management.” 14th International Conference on Greenhouse Gas Control Technologies, Melbourne, Australia, October 22-25.
68. Fan, W., Hayes, K.F., **Ellis, B.R.** (2017). “Trace element mobilization in carbonate-rich shales during hydraulic fracturing: A reactive transport modeling study,” AGU Fall Meeting, New Orleans, LA, December 11-15.
67. Menefee, A.H., Giammar, D.E., **Ellis, B.R.** (2017). “Hyper-localized carbon mineralization in diffusion-limited basalt fractures,” AGU Fall Meeting, New Orleans, LA, December 11-15.
66. Menefee, A.H., Giammar, D.E., Crandall, D., **Ellis, B.R.** (2017). “Characterization of reaction fronts associated with mineral carbonation of fractured basalts”, Goldschmidt Conference, Paris, France, August 13-18.
65. Adeoye, J., Beverluis, C., Murphy, A., Li, V.C., **Ellis, B.R.** (2017). “Self-healing and chemical alteration of engineered cementitious composites under geologic carbon sequestration conditions,” 2017 AEESP Research and Education Conference, Ann Arbor, MI, Jun 20-22.
64. Fan, W., Hayes, K.F., **Ellis, B.R.** (2017). “Toxic element leaching from shales: A reactive transport modeling study,” 2017 AEESP Research and Education Conference, Ann Arbor, MI, Jun 20-22.
63. Das, S., Adeoye, J., **Ellis B.R.** (2017). “Determining pore accessibility of mixed surfactant fracturing fluids in organic-rich shale,” 2017 AEESP Research and Education Conference, Ann Arbor, MI, Jun 20-22.
62. Jayawan, I.S., Yin, L.Y., Demond, A.H., **Ellis, B.R.** (2017). “Understanding stakeholders’ mental model regarding high volume groundwater withdrawals in the State of Michigan,” 2017 AEESP Research and Education Conference, Ann Arbor, MI, Jun 20-22.
61. Menefee, A.H., Giammar, D.E., **Ellis, B.R.** (2017). “Reaction fronts associated with mineral carbonation of fractured basalts,” 2017 AEESP Research and Education Conference, Ann Arbor, MI, Jun 20-22.
60. Fan, W., Hayes, K.F., **Ellis, B.R.** (2017). “Arsenic mobilization in carbonate-rich shales during hydraulic fracturing”, ACS Spring meeting, San Francisco CA, April 3-7. (*Invited Speaker*)
59. Das, S., **Ellis B.R.** (2017). “Mapping shale surface charge heterogeneity and surfactant adsorption via atomic force microscopy”, ACS Spring meeting, San Francisco CA, April 3-7.
58. Das, S., Adeoye, J., Anovitz, L.M., Bilheux, H., **Ellis, B.R.** (2017). “Effect of surfactant adsorption on pore accessibility and water uptake in organic-rich shales”, ACS Spring meeting, San Francisco CA, April 3-7.

57. Jayawan, I.S., Yin, L.Y., Demond, A.H, **Ellis, B.R.** (2017). “High volume water withdrawal in Michigan: Understanding experts & non-experts’ mental models on groundwater withdrawal in the State of Michigan”, Borchardt Conference, Feb 21-22, Ann Arbor, MI.
56. Jayawan, I.S., Demond, A.H, **Ellis, B.R.** (2017). “Using an analytical solution approach to permit high volume groundwater withdrawals”, Borchardt Conference, Feb 21-22, Ann Arbor, MI.
55. Fan, W., Hayes, K.F., **Ellis, B.R.** (2017), “Impact of water-rock interaction on water quality related to shale gas production”, Borchardt Conference, Feb 21-22, Ann Arbor, MI
54. **Ellis, B.R.**, Das, S. “Micron-scale Mineral Heterogeneity as a Controlling Factor for Surfactant Adsorption and Water Imbibition in Fractured Shale”, AGU Fall Meeting, San Francisco CA, December 12-16, 2016 (*Invited Speaker*)
53. Wells, R.K, Xiong, W, Adeoye, J., Menefee, A.H., **Ellis, B.R.**, Skemer, P., Giammar, D.E. (2016). “Impact of dissolution and carbonate precipitation on carbon storage in basalt.” AGU Fall Meeting, San Francisco CA, December 12-16, 2016.
52. **Ellis, B.R.**, Das, S. “Role of Mineralogy in Controlling Water Uptake in Shales Exposed to Mixed Surfactant Fracturing Fluids.” 252<sup>nd</sup> ACS National Meeting, Philadelphia, PA, August 21-25, 2016. (*Invited Speaker*)
51. **Ellis, B.R.**, Das, S. “Role of Mineralogy in Controlling Water Uptake in Shales Exposed to Mixed Surfactant Fracturing Fluids.” Gordon Research Conference: *Flow and Transport in Permeable Media*, Catalonia, Spain, July 31-August 5, 2016.
50. **Ellis, B. R.** “Managing risk in the context of emerging subsurface energy technologies.” 6<sup>th</sup> Annual meeting of the American Institute of Professional Geologists Michigan Section; Roscommon, MI, June 14-15, 2016. (*Keynote lecture*)
49. Fan, W., Hayes, K.F., **Ellis, B.R.** (2016). “Impact of Carbonate Dissolution on Arsenic Release during Shale Gas Extraction,” Goldschmidt Conference, Yokohama, Japan, June 27-July 1, 2016.
48. Adeoye, J., Menefee, A.H., Xiong, W., Wells, R., Skemer, P., Giammar, D.E., **Ellis, B.R.** (2016). “Reaction products and evolution of permeability during carbon sequestration in fractures of unaltered and serpentinized basalt,” Goldschmidt Conference, Yokohama, Japan, June 27-July 1, 2016.
47. Menefee, A.H., Li, P., Giammar, D.E., Ellis, B.R. (2016). “CO<sub>2</sub> storage in fractured basalt: Coupling experimental analyses with reactive transport modelling,” Goldschmidt Conference, Yokohama, Japan, June 27-July 1, 2016.
46. Das, S., Zhou, L., **Ellis, B.R.** (2016). “Effect of surfactant adsorption on shale wettability,” 251<sup>st</sup> ACS National Meeting, San Diego CA, March 14-18, 2016.
45. Fan, W., Hayes, K.F., **Ellis, B.R.** (2016). “Exploring the origin of Radium in shale gas produced water,” 251<sup>st</sup> ACS National Meeting, San Diego CA, March 14-18, 2016.
44. Menefee, A.H., **Ellis, B.R.** (2016). “Unconventional approaches to unconventional resources: Regional-scale waste management strategies for sustainable shale gas development,” 251<sup>st</sup> ACS National Meeting, San Diego CA, March 14-18, 2016.
43. Bi, Y., Fan, W., Yavarski, T. **Ellis, B.R.**, Hayes, K.F. (2016). “Direct Analysis of Radium-226 in Shale-Gas Wastewater Using Inductively Coupled Plasma - Mass Spectrometry,” PITTCON, Atlanta GA, March 6-10, 2016.
42. Fan, W. Hayes, K.F., **Ellis, B.R.** (2015). “Assessing Radium Activity in Shale Gas Produced Brine,” AGU Fall Meeting, San Francisco CA, December 14-18, 2015
41. Wen, T., Castro, M.C., **Ellis, B.R.**, Hall, C.M., Lohmann, K.C. and Bouvier, L. (2015), “Assessing Compositional Variability and Migration of Natural Gas in the Antrim Shale in the Michigan Basin Using Noble Gas Geochemistry,” AGU Fall Meeting, San Francisco CA, December 14-18, 2015
40. Wells, R., Xiong, W., Bae, Y., Sesti, E., Skemer, P. Giammar, D., Conradi, M., **Ellis, B.R.**, Hayes, S. (2015). “Dissolution-precipitation reactions and permeability evolution from reactions of CO<sub>2</sub>-rich aqueous solutions with fractured basalt,” AGU Fall Meeting, San Francisco CA, December 14-18, 2015.
39. W. Fan, K.F. Hayes, **B.R. Ellis**, “Assessing Radium Activity in Shale Gas Produced Brine,” 2015 AGU Fall Meeting, San Francisco CA, December 14-18, 2015

38. **B.R. Ellis**, W. Fan, M. Tang, K.F. Hayes, W. Xiong, D. E. Giammar, and P. Skemer, “Alteration of Fracture Geometries During Flow of Acidic Fluids: Implications for Subsurface Energy Technologies,” 250th ACS National Meeting, Boston MA, August 16- 20, 2015. (*Invited Speaker*)
37. Jayawan, I., Demond, A.H., **Ellis, B.R.** (2015). “Sustainable water management in the context of hydraulic fracturing,” Association of Environmental Engineering and Science Professors, New Haven, CT.
36. Wen, T., Castro, M.C., **Ellis, B.R.**, Hall, C.M., Lohmann, K.C., Bouvier, L. (2015), “Assessing the Compositional Variability and Migration of Natural Gas in Antrim Shale in the Michigan Basin Using Noble Gas Geochemistry,” AAPG ACE; 2015 May 31-June 3; Denver, CO.
35. Bi, Y., Zhang, H., Hayes, K.F., **Ellis, B.R.** “Removal of Radium from Shale Gas Wastewater Using Cation Exchange Resin,” 249th ACS National Meeting Denver, Colorado, March 22-26, 2015.
34. Jayawan, I., Demond, A.H., **Ellis, B.R.** (2014). “Assessing the Impact of Transient High-Volume Groundwater Withdrawals on Headwater Streams,” 2014 AGU Fall Meeting, San Francisco, December 15 -19, 2014.
33. Fan, W., Hayes, K.F., **Ellis, B.R.** (2014). “Investigation of Controlling Factors Impacting Water Quality in Shale Gas Produced Brine”, 2014 AGU Fall Meeting, San Francisco, December 15 -19, 2014.
32. Wen, T., Castro, M.C., **Ellis, B.R.**, Hall, C.M., Lohmann, K.C., Bouvier, L. (2014), “Noble Gas Signatures in Antrim Shale Gas in the Michigan Basin - Assessing Compositional Variability and Transport Processes”, AGU, Fall Meeting; 2014 Dec 15-19.
31. **Ellis, B.R.**, Demond, A.H., Jayawan, I. A.H. (2014). “Assessing the Assessment Tool: Developing Improved Modeling Frameworks for Evaluating Hydraulic Fracturing Water Withdrawals in Michigan,” University of Michigan Water Center Symposium, Ann Arbor, MI, December 11, 2014.
30. **Ellis, B.R.**, Hayes, K.F. and Fan, W. (2014). “Evaluating Naturally Occurring Radioactive Materials in Michigan Basin Shale Gas Produced Fluids,” at 2014 SSSA Session on "Environmental Impacts of Hydraulic Fracturing, ISR U Mining, and Alternative Energy" in Long Beach, CA, Nov. 2-5, 2014. (*Invited Speaker*)
29. Fan, W., Zhang, T., Carpenter, J., Hayes, K.F., **Ellis, B.R.** (2014). “Experimental investigations of trace metal and radionuclide leaching from shales in contact with hydraulic fracturing fluids”. Oral presentation at 2014 American Chemical Society Spring Meeting, Dallas, TX.
28. **Ellis, B.R.** (2014). “Exploring the Water Quality Challenges of Hydraulic Fracturing”. Oral presentation at 2014 Borchardt Conference, University of Michigan, Ann Arbor, MI.
27. **Ellis, B.R.**, Long, D., Manley, J. (2013). “Reducing the environmental impact of drilling, hydraulic fracturing, and production by the use of greener chemistry”. Oral presentation at the 2013 Michigan Department of Environmental Quality *greenUp* Conference, Grand Rapids, MI.
26. **Ellis, B.R.**, Hayes, K.F. (2013). “Geochemical investigations of Michigan Basin organic-rich shales in contact with hydraulic fracturing fluids”. Oral presentation at 2013 American Chemical Society Fall Meeting, Indianapolis, IN.
25. **Ellis, B.R.**, Hayes, K.F. (2013). “Water quality concerns surrounding shale gas development in the Michigan Basin”. Oral presentation at Engineering Conferences International meeting: *Overcoming the technical and community challenges of hydraulic fracturing for shale gas*. Boulder, CO.
24. **Ellis, B.R.**, Hayes, K.F. (2013). “Assessing the state of play for unconventional drilling in the Michigan Basin”. Oral presentation at 2013 meeting of the Association of Environmental Engineering and Science Professors, Golden, CO.
23. **Ellis, B.R.**, Fitts, J.P, Peters, C.A. (2012). “Mineral spatial heterogeneity constrains permeability evolution in a limestone fracture”. Poster presentation at 2012 American Geophysical Union Fall Meeting, San Francisco, CA.
22. A.F. Clarens; S. Wang; B. Liang; C.A. Peters; J.P. Fitts; H. Deng; **B.R. Ellis**, “An integrated experimental program to understanding leakage from geologic carbon sequestration sites across scales”, Abstract H14D-05 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec

21. Deng, H., **Ellis, B.R.**, Peters, C.A., “Modification of Fracture Hydraulic Properties by CO<sub>2</sub>-Acidified Brine Flow” 2012 AIChE Annual Meeting Pittsburgh, PA.
20. Fitts, J.P., **Ellis, B.R.**, Deng H., Tappero, R., Peters, C.A. “Calcite dissolution and caprock fracture surface deterioration at high P/T: dependence on reactive fluid velocity and mineral spatial heterogeneity” NSF CMMI Engineering Research and Innovation Conference, Program Area: Geomechanics and Geomaterials, C133, Boston, MA July 2012. (Poster)
19. Fitts, J.P., **Ellis, B.R.**, Deng H., Tappero, R., Peters, C.A. "Geochemical controls on fracture evolution in carbon sequestration" American Rock Mechanics Association Annual Meeting (ARMA), Chicago, IL, June 25, 2012. Oral Presentation & Conference Proceeding
18. **Ellis, B.R.**, Peters, C.A., Fitts, J.P., Noguez, J., Celia, M.A., Dobossy, M., Janzen, A. (2011), “Alteration of caprock fracture geometries during flow of CO<sub>2</sub>-acidified brine: Informing basin-scale leakage models from pore-scale modeling and core-scale experiments”. Oral presentation at 2011 American Geophysical Union Fall Meeting, San Francisco, CA.
17. Deng H., Crandall, D., King, S., **Ellis, B.R.**, Bromhal, G., Fitts, J.P., Peters, C.A. “Change in fracture permeability after the flow-through of CO<sub>2</sub>-acidified brine” AGU Fall Meeting, San Francisco, CA, December 2011.
16. **Ellis, B.R.**, Peters, C.A., Fitts, J.P., Bromhal, G.S., McIntyre, D.L., Warzinski, R.P. (2011), “Geochemical alteration of fracture geometry during leakage of CO<sub>2</sub>”. Oral presentation at the 2011 Goldschmidt Conference, Prague, Czech Republic.
15. **Ellis, B.R.**, Peters, C.A., Fitts, J.P., Bromhal, G.S., McIntyre, D.L., Warzinski, R.P. (2011), “Investigation of caprock fracture evolution after CO<sub>2</sub>-brine flow”. Poster presentation at 2011 meeting of the Association of Environmental Engineering and Science Professors, Tampa, FL.
14. Peters, C.A., Clarens, A.F., Fitts, J.P., Oldenburg, C.M., Dobson, P.F., Wang, J.S.Y., Guglielmi, Y., **Ellis, B.R.**, Wang, S. “Safe and Effective Geologic Sequestration of CO<sub>2</sub>: Partnerships for MultiScaled Experimental Studies” AEESP, USF, Jul. 10-12, 2011. (Abstract)
13. **Ellis, B.R.**, Peters, C.A., Fitts, J.P., Bromhal, G.S., McIntyre, D.L., Warzinski, R.P. (2011), “Investigation of caprock fracture evolution after CO<sub>2</sub>-brine flow”. Oral presentation at 10<sup>th</sup> Annual Conference on Carbon Capture & Sequestration, Pittsburgh, PA.
12. **Ellis, B.R.**, Fitts, J.P., Bromhal, G.S., McIntyre, D.L., Warzinski, R.P., Rosenbaum, E., Peters, C.A. (2010), “Computed tomography analysis of alterations in fractured caprock resulting from CO<sub>2</sub>-acidified brine”. Poster presentation at the Geological Society of America 2010 conference, Denver, CO.
11. **Ellis, B.R.**, Bromhal, G.S., McIntyre, D.L, Peters, C.A. (2010), “Changes in caprock integrity due to vertical leakage of CO<sub>2</sub>-enriched brine”. Poster presentation at the Greenhouse Gas Control Technologies 10 conference, Amsterdam, Netherlands.
10. **Ellis, B.R.**, Hui, W.C.E., Peters, C.A., Fitts, J.P., Bhatt, V. (2010), “Potential benefits of retrofitting power plants with combined CO<sub>2</sub>-SO<sub>2</sub> emission control for co-injection in geologic carbon sequestration”. Oral presentation at Ninth Annual Conference on Carbon Capture & Sequestration, Pittsburgh, PA.
9. **Ellis, B.R.**, Crandell, L.E., Peters, C.A. (2009), "Limitations for brine acidification due to SO<sub>2</sub> co-injection in geologic carbon sequestration". Student paper award, oral presentation at the 2009 meeting of the Association of Environmental Engineering and Science Professors, Iowa City, IA.
8. **Ellis, B.R.**, Crandell, L.E., Peters, C.A. (2008), "Co-injection of SO<sub>2</sub> with CO<sub>2</sub> in geologic sequestration: Potential for acidification of formation brines". Poster presentation at 2008 American Geophysical Union Fall Meeting, San Francisco, CA.
7. Crandell, L E, B R Ellis, C A Peters, (2008). “Solubility and Diffusivity of SO<sub>2</sub> for Co-injection with CO<sub>2</sub> in Geological Sequestration”, Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abstract H23D-0995.
6. Crandell, L.E., B. R. Ellis, J. Cheung, C. A. Peters. “Injection of CO<sub>2</sub> and co-contaminant gases: Are separation costs justifiable?”, Seventh Annual Conference on Carbon Capture & Sequestration, Pittsburgh, PA. May 2008.



5. **Ellis, B. R.**, Peters, C. A., Buschkuehle, M. 2007. "Formation Buffering Potential Pertaining to Geological Storage of Carbon Dioxide", EOS Trans. AGU, 88(52) Fall Meet. Suppl. Abstract U43C-1378.
4. Castro M.C., Hall, C.M., Patriarche D., Goblet P., and **Ellis, B.R.** (2007), A New Noble Gas Paleoclimate Record from Texas: Perils and Promise Explained, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abstract U13B-1147
3. **Ellis, B.R.**, Bowman, K.M., Peters, C.A., Buschkuehle, M. "Consideration of formation buffering potential and reactive mineral availability pertaining to geological storage of carbon dioxide" Goldschmidt 2007. *Geochim. Cosmochim. Acta* 71 (15): A255-A255 Suppl. S, AUG 2007
2. Peters, C.A., Bowman, K.M., **Ellis, B.R.** (2007). "Imaging Viking Sandstones for Quantification of Reactive Minerals and Surfaces", 2007 AEESP Conference: Interactions at the Interface – Making the Connections Between Environments, Disciplines and Nations, Virginia Tech.
1. Hall C.M., Castro, M. C., Patriarche, D., Goblet, P., **Ellis, B.R.** (2007), A New Noble Gas Paleoclimate Record from Texas: One Swallow Does Not a Summer, or Ice Age, Make, 4th Mini Conference on Noble Gases in Hydrology and in Natural Gas Reservoirs, GFZ Potsdam, Germany

#### **Invited Presentations / Panel Discussions**

- 2019** Presentation, (10/24/19), "Secure Storage of CO<sub>2</sub> Emissions Through Carbon Mineralization", Cornell University, Ithaca, NY, Department of Civil and Environmental Engineering, Environmental Processes Seminar Series.
- Presentation, (09/20/19), "Secure Storage of CO<sub>2</sub> Emissions Through Carbon Mineralization", Auburn University, Auburn, AL, Department of Civil Engineering, Center for CO<sub>2</sub> Utilization and Storage Seminar Series.
- 2018** Presentation, (4/20/18), "Modeling reactive transport in basalt fractures," CarbonSAFE Cascadia: Pre-Feasibility Study of Offshore Carbon Storage (project meeting), Columbia University, New York, NY.
- Presentation, (3/21/18), "Toxic element mobilization in gas-bearing shale," Youngstown State University's Energy and the Environment Skype Lecture Series.
- Presentation, (1/18/18), "CO<sub>2</sub> storage in fractured basalt: Coupling bench-scale experiments and reactive transport modeling to identify controls on mineral carbonation," University of Michigan CEE Geotechnical Engineering Seminar Series, Ann Arbor, MI.
- 2017** Presentation, (3/31/17), "Permitting groundwater withdrawals and improving water use efficiency during shale gas hydraulic fracturing," Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Champaign, IL
- 2016** Presentation, (3/22/16). "Assessing the Sustainability Challenges of Shale Gas Extraction," Multidisciplinary Applied Geochemistry Network (MAGNET), Webinar.

- 2015** Presentation, (4/10/15). “Alterations of Caprock Fracture Geometries During Flow of CO<sub>2</sub>-acidified Brine,” Department of Energy, Environmental, and Chemical Engineering, Washington University in St. Louis, St. Louis, MO.
- Presentation, (4/2/15). “Alterations of Caprock Fracture Geometries During Flow of CO<sub>2</sub>-acidified Brine,” Department of Earth Sciences, Wright State University, Dayton, OH
- 2014** Smith Lecture Series Presentation: (3/28/14). “Evaluating the Environmental Impact of Hydraulic Fracturing: Michigan as a Case Study”. Department of Earth and Environmental Sciences, University of Michigan, Ann Arbor, MI.
- Presentation: (03/17/14). “Moving beyond your Ph.D.: Strategic planning to pursue new research directions”. Younger Chemists Committee division of the American Chemical Society. 2014 spring meeting of the American Chemical Society, Dallas, TX.
- Presentation: (03/13/14). “Hydraulic fracturing 101: Clearing the waters of the fracking debate”. Osher Lifelong Learning Institute, Energy and the Environment Seminar Series, Ann Arbor, MI.
- 2013** Panelist: (11/20/13). *Science café: The future of fracking in Michigan*. University of Michigan Natural History Museum, Ann Arbor, MI.
- Presentation: (11/14/13). “Evaluating the Environmental Impact of Hydraulic Fracturing: Michigan as a Case Study”. Department of Earth and Atmospheric Sciences, Central Michigan University, Mt. Pleasant, MI.
- Presentation: (10/19/13). “Hydraulic fracturing 101: Clearing the waters of the fracking debate”. University of Michigan Saturday Morning Physics lecture series, Ann Arbor, MI.
- Panelist: (06/19/13). *Reducing the environmental impact of drilling, hydraulic fracturing, and production by the use of greener chemistry*. ACS 17<sup>th</sup> Annual Green Chemistry and Engineering Conference, Bethesda, MD.
- Panelist: (04/16/13). *Fracktopia: A town hall meeting on the future of fracking*. MI Radio (NPR) and the University of Michigan College of Engineering, Ann Arbor, MI.
- Presentation: (01/25/13). “Evaluating the Impact of Hydraulic Fracturing: Michigan as a Case Study”. Environmental and Water Resources Engineering seminar series, UM CEE department, Ann Arbor, MI.

### **Funded Research**

2020-2024	NSF	CBET, “ <i>CAREER: Carbon Negative Subsurface Energy Technologies</i> ”, PI, \$506,393
2020-2023	Sloan	Sloan Foundation, “ <i>CO<sub>2</sub> Utilization for Geothermal Energy Production and Renewable Energy Storage</i> ”, PI (co-PIs: J.M. Bielicki, J.X. Johnson), \$613,144 (\$309,289 to Ellis)
2019-2021	DOE	SBIR, “ <i>CO<sub>2</sub> Plume Geothermal (CPG™) – Innovative, dispatchable geothermal power production using non-water working fluids</i> ”, co-PI (PI, TerraCOH, Inc.), \$1M (\$37,962 to Ellis)
2017-2020	DOE	NETL, “ <i>Storing CO<sub>2</sub> in built infrastructure: CO<sub>2</sub> carbonation of precast concrete products</i> ”, PI, (co-PIs: V.C. Li, S.J. Skerlos), \$1M (\$671,907 to Ellis)
2015-2017	UM	M-Cubed, “ <i>Radium removal from shale-gas (“fracking”) flow-back water</i> ”, co-PI, (w/ U. Becker, K.F. Hayes), \$60,000

2015-2017	ACS	Petroleum Research Fund, “ <i>Investigating the Role of Wettability in Enhancing Shale Gas Production</i> ”, PI, \$110,000
2014-2017	DOE	NETL, “ <i>Impact of Microstructure on the Containment and Migration of CO<sub>2</sub> in Fractured Basalts</i> ”, co-PI (w/ D. Giammar (PI), M. Conradi, S. Hayes, P. Skemer), \$1.28M (\$393k to Ellis)
2014-2015	UM	Water Center, “ <i>Assessing the Assessment Tool: Developing Improved Modeling Frameworks for Evaluating Hydraulic Fracturing Water Withdrawals in Michigan</i> ”, PI, (co-PI: A.H. Demond), \$49,813
2013	UM	Graham Sustainability Institute, “ <i>Hydraulic Fracturing in Michigan Integrated Assessment (Phase 2): Integrated Assessment Report</i> ”, PI, \$6,000
2013-2016	NSF	CBET, “ <i>Extraction of Radioactive and Toxic Element Contaminants From Organic-rich Shales in Contact with Hydraulic Fracturing Fluids</i> ”, PI, (co-PI: K.F. Hayes), \$353,590
2013	UM	Graham Sustainability Institute, “ <i>Michigan Hydraulic Fracturing Flowback Fluid and Produced Gas Field Sampling Campaign</i> ”, PI, \$15,000
2012-2014	UM	M-Cubed, “ <i>Hydraulic Fracturing of Shales: Water Contamination Risks, Treatment Options, and Fate of Fracking Fluids</i> ”, PI, (co-PI: M.C. Castro, A.H. Demond, K.F. Hayes, K.C. Lohmann, S.A. Miller), \$120,000
2012	UM	Graham Sustainability Institute, “ <i>Hydraulic Fracturing in Michigan Integrated Assessment (Phase 1): Geology/Hydrogeology Technical Report</i> ”, PI, \$6,000
2012-2016	NSF	CBET, “ <i>SEES Fellows: Sustainable Development of Shale-gas Resources in Pennsylvania - Bridging Science, Policy and Economics of Hydraulic Fracturing</i> ”, PI, \$332,769

### **Teaching Experience**

#### *Instructor (UM):*

CEE 265	Sustainable Engineering Principles
CEE 481/581	Aquatic Chemistry
CEE 501	Subsurface Energy Systems

#### *Guest Lecturer:*

CEE 200	Introduction to Civil and Environmental Engineering
CEE 564	Greenhouse Gas Control
CEE 567	Energy Infrastructure Systems
EES 219	Introduction to Environmental Science
EES 284	Environmental Geology
ENG 110	The Engineering Profession

#### *Teaching Assistant (Princeton):*

W-2009	CEE 477	Engineering Design for Sustainable Development (Green Building Design)
2008-2009	EGR 450/451	Engineering Projects in Community Service

### **Professional Service and Membership**

Co-convener, (T154) *Imaging the Rock and Fluid Interactions of Geologic Carbon Sequestration* at 2017 meeting of the Geological Society of America (Seattle, WA), October 2017

- Session Chair, 2014 ASCE Shale Energy Engineering Conference (Pittsburgh, PA);  
*Water Resources Management in Shale Oil & Gas Development: Groundwater Protection*
- co-Convener, 2014 ACS Spring Meeting (Dallas, TX); ENVR: *Water Quality Stewardship in Pursuit of Unconventional Oil and Natural Gas Reservoirs* (w/ K.F. Hayes)
- Moderator, NSF-sponsored workshop on Hydraulic Fracturing (University of Arkansas, Little Rock, AR); Session: *Characteristics and behavior of fracturing fluids and green alternatives*
- Reviewer, Journals: *Science; Environmental Science and Technology; Environmental Science and Technology Letters; Water Resources Research; Geophysical Research Letters; Green Chemistry, International Journal of Greenhouse Gas Control; Chemical Geology; Energy and Fuels; Journal of Geophysical Research – Solid Earth; Greenhouse Gases: Science and Technology; Environmental Engineering Science; Energy Technology;*  
Proposals: NSF CBET; NSF CMMI; SUNY 4E Network of Excellence; Alfred P. Sloan Foundation; ORNL and SSRL user proposals
- Member, American Chemical Society
- Member, Association of Environmental Engineering & Science Professors
- Member, American Geophysical Union
- Member, Geochemical Society