ANNE HOLLAND MENEFEE

Assistant Professor | Energy and Mineral Engineering, Pennsylvania State University
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EDUCATION

University of Michigan, Dept. of Civil and Environmental Engineering — Ann Arbor, MI
Dissertation: Carbon Mineralization in Fractured Basalt
Ph.D., Environmental Engineering — 2020
M.S.E., Environmental Engineering — 2016
University of Virginia, School of Engineering and Applied Science — Charlottesville, VA
B.S., Civil & Environmental Engineering | Minor, Global Sustainability | Highest Distinction — 2015

RESEARCH POSITIONS

Assistant Professor	**Dept. of Energy and Mineral Engineering, Penn State University**
Aug 2021 – Present	*Co-funded by the Institutes of Energy and the Environment*
Director's Postdoctoral Fellow	**Los Alamos National Laboratory**
Aug 2020 – Aug 2021	*Project: Geochemical-Geomechanical Feedback in Stressed Fracture Systems*
Graduate Research Assistant	**University of Michigan Dept. of Civil & Environmental Engineering**
Aug 2015-2020	*Integrating high-pressure experiments and reactive transport modeling to*
Advisor: Dr. Brian Ellis	*evaluate geochemical controls on CO_2 mineralization in fractured basalts.*
Graduate Research Fellow	**Los Alamos National Laboratory**
Jan-May 2019	*Conducted triaxial shear experiments to evaluate how fractures generated*
Advisor: Dr. Bill Carey	*under subsurface stress conditions respond to penetration of reactive fluids.*
Research Assistant	**Virginia Environmentally Sustainable Technologies lab (UVa)**
May 2015-July 2015	*Applied life cycle assessment and techno-economic analysis to evaluate*
Advisor: Dr. Andres Clarens	*the sustainability of systems-level carbon management strategies.*

Select publications (Google scholar: 244 total citations; h-index 8; i10-index 8)

1. Schwartz, B.S.; **Menefee, A.H.** Techno-economic analysis of coupling wind-powered green hydrogen production with geologic storage. *Geological Society of London (Special Issue – Enabling Secure Subsurface Storage in Future Energy System)* **2023**, 528(1).

2. Welch, N. J.; Carey, J. W.; Frash, L. P.; Hyman, J. D.; Hicks, W.; Meng, M.; Li, W.; **Menefee, A. H.** Effect of Shear Displacement and Stress Changes on Fracture Hydraulic Aperture and Flow Anisotropy. *Transp Porous Med* **2022**, *141* (1), 17–47.

3. **Menefee, A.H.**; Ellis, B.R. Carbon mineralization in reactive silicate zones. *ACS Environmental Science and Technology - Engineering* 2021, 1(8), 1193-1204.

4. **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. *Journal of Geophysical Research: Solid Earth* **2020,** *125*(6).

5. **Menefee, A.H.**; Ellis, B.R. Regional-scale greenhouse gas utilization strategies for enhanced shale oil recovery and carbon management. *Energy & Fuels* **2020,** *34*(5), 6136-6147.

6. **Menefee, A.H.**; Ellis, B.R. Wastewater management strategies for sustained shale gas production. *Environ. Res. Lett.* **2020,** *15* (2), 024001.

7. **Menefee, A.H.;** Giammar, D.E.; Ellis, B.R. Permanent CO_2 trapping through localized and chemical gradient-driven basalt carbonation. *Environmental Science & Technology* **2018**, *52* (15), 8954–8964.

8. **Menefee, A.H.**; Li, P.; Giammar, D.E.; Ellis, B.R. Roles of transport limitations and mineral heterogeneity in carbonation of fractured basalts. *Environmental Science & Technology* **2017**, *51* (16), 9352–9362.

9. Adeoye, J.T.; **Menefee, A.H.;** Xiong, W.; Wells, R.K.; Skemer, P.; Giammar, D.E.; Ellis, B.R. Effect of transport limitations and fluid properties on reaction products in fractures of unaltered and serpentinized basalt exposed to high P_{CO2} fluids. *International Journal of Greenhouse Gas Control* **2017**, *63*, 310–320.

10. Wilkins, R.; **Menefee, A.H.**; Clarens, A.F. Environmental life cycle analysis of water and CO_2-based fracturing fluids used in unconventional gas production. *Environmental Science & Technology* **2016**, *50*(23), 13134-13141.

Select conference proceedings

1. **Menefee, A.H.**; Schwartz, B.S. Carbon Mineralization to Enable Negative Emissions Technologies. *Proceedings of the 16th International Conference on Greenhouse Gas Control Technologies (GHGT-16)*, Lyon, France, **2022**.

2. **Menefee, A. H.**; Frash, L. P.; Hicks, W.; Carey, J. W. Coupled Geochemical-Geomechanical Alterations in Shale Fracture Systems. Proceedings of the American Rock Mechanics Association, U.S. Rock Mechanics/Geomechanics Symposium, Santa Fe, NM, USA, 2022.

3. Carey, J.W.; Frash, L. P.; Hicks, W.; **Menefee, A. H**. An experimental study of fracture-induced chemical reactions. Proceedings of the American Rock Mechanics Association, U.S. Rock Mechanics/Geomechanics Symposium, Santa Fe, NM, USA, 2022.

TEACHING EXPERIENCE

Instructor, EME 597 (Negative Emissions Technologies) 2022-Present

- Graduate level course covering technologies for carbon removal or capture and sequestration, with a focus on integrated systems capable of achieving net-negative emissions.

Instructor, PNG 405/406 (Rock and Fluid Properties) 2021-Present

- Fundamental course introducing students to reservoir rock properties and mechanics; fluid behavior; and fluid-rock interactions, including both lecture (405) and lab (406) components.

Co-instructor, CEE 501 (*Subsurface Energy Systems*) Winter 2020

- Co-developed and co-taught (with Dr. Brian Ellis) a course on fundamentals of reservoir geology, fluid-rock interactions, and reactive transport modeling in the context of subsurface energy.

Graduate student instructor, CEE 265 (*Sustainable Engineering Principles*) Fall 2017 & 2018

- Developed homework assignments and exams; held weekly office hours; managed team of graders; helped with developing course content and covered lectures during instructor absences

Teaching assistant, CE 2100 (*Intro to Environmental Engineering*) Spring 2014 & 2015

AWARDS AND HONORS

ProQuest Distinguished Dissertation Award, University of Michigan 2021

- Recognize highly accomplished graduate students who have produced exceptional dissertations of outstanding scholarly quality" (10 selected from >800 dissertations submitted each year)

Director's Postdoctoral Fellowship, Los Alamos National Laboratory 2020

- Selected based on strength of accomplishments, proposed research, and potential impact at LANL

Department of Energy Office of Science Graduate Student Research Award 2018

- Received funding to work under Dr. Bill Carey at Los Alamos National Lab (appointment Jan-May 2019)
- Proposal title: "Reaction-driven changes in fracture permeability and geomechanical stability"

National Science Foundation Graduate Research Fellowship 2017

Rader Award, UVa Dept. of Civil and Environmental Engineering 2015

- Awarded annually to "fourth-year students who have excelled academically, demonstrated a capacity for hard work, and who have shown a willingness and ability to get along with their colleagues."

PROFESSIONAL SERVICE

American Geophysical Union, member 2016-present

- Co-chair, Session H55I – Reactive Transport and Chemomechanical Processes in Porous Media (2022)

AEESP Conference Student Delegate Co-Chair Jan-June 2017

- Led the student delegation involved in planning and facilitating the 2017 AEESP (Association of Environmental Engineering and Science Professors) biennial meeting with 700+ attendees

Journal reviewer 2017-Present

- *Environmental Science and Technology, Environ. Sci. Technol. Letters, Intl. J. of Greenhouse Gas Control, Applied Geochemistry, Geochemica et Cosmochemica Acta, Energy & Fuels, Water Resources Research*