

# Geoffrey J. Gilleaudeau

Assistant Professor  
George Mason University  
Department of Atmospheric, Oceanic, and Earth Sciences  
Fairfax, Virginia 22030, USA  
+1 (703) 993-3289  
ggilleau@gmu.edu

---

## EDUCATION

### **Ph.D. in Earth and Planetary Sciences** (August 2013)

University of Tennessee at Knoxville (GPA: 3.92/4.00)

DISSERTATION TITLE: Stratigraphic and geochemical investigation of the Mesoproterozoic Atar and El Mreiti groups, Mauritania: insights into carbon cycling and ocean redox stratification in a low oxygen world

PRIMARY ADVISOR: Linda C. Kah

### **B.A. in Geosciences** (May 2007)

State University of New York at Binghamton

THESIS TITLE: Sodium-magnesium variability in triple-chain silicates

PRIMARY ADVISOR: David M. Jenkins

## EMPLOYMENT

### **Assistant Professor** (August 2018-present)

George Mason University

### **Research Scientist** (March 2018-July 2018)

University of New Mexico

PRIMARY COLLABORATOR: Maya B. Elrick

### **NASA Astrobiology Postdoctoral Fellow** (February 2016-February 2018)

Arizona State University

PROPOSAL TITLE: The cycling of nitrogen and transition metals in low oxygen greenhouse oceans: evidence from redox proxies, metal abundances, and molybdenum/nitrogen isotopes

RESEARCH ADVISOR: Ariel D. Anbar

### **Carlsberg Foundation Postdoctoral Fellow** (March 2014-January 2016)

University of Copenhagen, Denmark

PROPOSAL TITLE: Chromium isotopes in Mesoproterozoic carbonates: a novel proxy for assessing the history of Earth surface oxygenation

RESEARCH ADVISOR: Robert Frei

### **Visiting Assistant Professor** (August 2013-December 2013)

Bucknell University

### **Graduate Research Assistant** (August 2012-May 2013)

University of Tennessee at Knoxville

### **Graduate Teaching Assistant** (August 2008-May 2012)

University of Tennessee at Knoxville

### **National Science Foundation (NSF) GK-12 Fellow** (August 2007-May 2008)

University of Tennessee at Knoxville

## PUBLICATIONS

14. Over, D.J., Hauf, E., Wallace, J., Chiarello, J., Over, J.S., **Gilleaudeau, G.J.**, Song, Y., Algeo, T.J., *in review (submitted 30 July 2018)*. Conodont biostratigraphy and magnetic susceptibility of Upper Devonian Chattanooga Shale, eastern United States: evidence for episodic deposition and disconformities. **Palaeogeography, Palaeoclimatology, Palaeoecology**.
13. Zheng, W., **Gilleaudeau, G.J.**, Kah, L.C., Anbar, A.D., *in press*. Mercury isotope signatures record photic zone euxinia in the Mesoproterozoic ocean. **Proceedings of the National Academy of Sciences, USA**.
12. Wei, W., Frei, R., **Gilleaudeau, G.J.**, Li, D., Wei, G.Y., Chen, X., Ling, H.F., 2018. Oxygenation variations in the atmosphere and shallow seawaters of the Yangtze Platform during the Ediacaran Period: clues from Cr-isotope and Ce-anomaly in carbonates. **Precambrian Research** 313, 78-90.
11. Zhang, F., Xiao, S., Kendall, B., Romaniello, S.J., Cui, H., Meyer, M., **Gilleaudeau, G.J.**, Kaufman, A.J., Anbar, A.D., 2018. Extensive marine anoxia during the terminal Ediacaran Period. **Science Advances** 4, ean 8983.
10. **Gilleaudeau, G.J.**, Voegelin, A.R., Thibault, N., Moreau, J., Ullmann, C.V., Kläbe, R.M., Korte, C., Frei, R., 2018. Stable isotope records across the Cretaceous-Paleogene transition, Stevns Klint, Denmark: new insights from the chromium isotope system. **Geochimica et Cosmochimica Acta** 235, 305-332.
9. Yingst, R.A., Bartley, J., Chidsey, T., Cohen, B.A., **Gilleaudeau, G.J.**, Hynek, B.M., Kah, L.C., Minniti, M.E., Williams, R.M.E., Black, S., Gemperline, J., Schaufler, R., Thomas, R.J., 2018. Testing the efficiency of rover science protocols for robotic sample selection: a GeoHeuristic Operational Strategies Test. **Acta Astronautica** 146, 300-315.
8. **Gilleaudeau, G.J.**, Sahoo, S.K., Kah, L.C., Henderson, M.A., Kaufman, A.J., 2018. Proterozoic carbonates of the Vindhyan Basin, India: chemostratigraphy and diagenesis. **Gondwana Research** 57, 10-25.
7. D'Arcy, J., **Gilleaudeau, G.J.**, Peralta, S., Gaucher, C., Frei, R., 2017. Redox fluctuations in the Early Ordovician oceans: an insight from chromium stable isotopes. **Chemical Geology** 448, 1-12.
6. Paulukat, C., **Gilleaudeau, G.J.**, Chernyavskiy, P., Frei, R., 2016. The Cr-isotope signature of surface seawater—a global perspective. **Chemical Geology** 444, 101-109.
5. **Gilleaudeau, G.J.**, Frei, R., Kaufman, A.J., Kah, L.C., Azmy, K., Bartley, J.K., Chernyavskiy, P., Knoll, A.H., 2016. Oxygenation of the mid-Proterozoic atmosphere: clues from chromium isotopes in carbonates. **Geochemical Perspectives Letters** 2, 178-187.
4. **Gilleaudeau, G.J.**, Kah, L.C., 2015. Heterogeneous redox conditions and a shallow chemocline in the Mesoproterozoic ocean: evidence from carbon-sulfur-iron relationships. **Precambrian Research** 257, 94-108.
3. **Gilleaudeau, G.J.**, Kah, L.C., 2013. Oceanic molybdenum drawdown by epeiric sea expansion in the Mesoproterozoic. **Chemical Geology** 356, 21-37.
2. **Gilleaudeau, G.J.**, Kah, L.C., 2013. Carbon isotope records in a Mesoproterozoic epicratonic sea: carbon cycling in a low-oxygen world. **Precambrian Research** 228, 85-101.
1. Jenkins, D.M., **Gilleaudeau, G.J.**, Kawa, C., Dibiase, J.M., Fokin, M., 2012. Compositional limits and analogs of monoclinic triple-chain silicates. **Contributions to Mineralogy and Petrology** 164, 229-244.

## GRANTS AND AWARDS

**Co-PI on NASA Exobiology Program Element grant** (submitted for review): \$133,300 to GMU

**NASA Postdoctoral Program Fellowship** (February 2016-February 2018): ~\$140,000

**Carlsberg Foundation Postdoctoral Fellowship** (March 2015-January 2016): 1.1 million Danish kroner

Graduate Student Research Grants (2007-2009): > \$10,000

- Society for Sedimentary Geology (SEPM)
- Geological Society of America (GSA)
- American Association of Petroleum Geologists (AAPG)
- Evolving Earth Foundation
- Barringer Family Fund for Meteorite Impact Research

Student Awards (2007-2011)

- Best Student Presentation in Earth and Planetary Sciences
- Graduate Student Teaching Award
- Professional Promise Award in Earth and Planetary Sciences
- Best Student Proposal, GSA Sedimentary Geology Division
- Glenn G. Bartle Undergraduate Award in Geology

## TEACHING

**Sedimentary Geology** (GEOL 304), George Mason University (coming Fall 2019)

**Great Events in Earth History**, George Mason University (coming Spring 2019)

**Isotopes** (GLG 494/581), Arizona State University: Guest lecture (September 2016)

**Core to Crust**, University of Copenhagen: Guest lectures (December 2015)

**Principles of Geochemistry**, University of Copenhagen: Guest lectures (December 2015)

**Evolution of the Earth** (GEOL 104), Bucknell University: Lectures, labs, and 14 field trips (Fall 2013)

**Sedimentology and Stratigraphy** (GEOL 340), University of Tennessee at Knoxville: Guest lectures, labs, and field trips (3 semesters from 2011-2012)

**Earth, Life, and Time** (GEOL 102), University of Tennessee at Knoxville: Guest lectures and labs (4 semesters from 2009-2012)

**Structural Geology** (GEOL 370), University of Tennessee at Knoxville: Labs and grading (Fall 2008)

Heritage Middle School (**NSF GK-12 Program**): Seventh grade classroom scientist

## INVITED LECTURES

**Carnegie Institution for Science**, October 2018 (Washington D.C., USA)

LECTURE TITLE: Probing the Proterozoic and Paleozoic record of Earth surface oxygenation: lessons from metal isotope geochemistry

**Goldschmidt Conference**, August 2017 (Paris, France)

SESSION TITLE: What do Precambrian minerals record about Hadean to Proterozoic lithosphere-hydrosphere evolution?

LECTURE TITLE: Deciphering the carbonate record of Mesoproterozoic biospheric oxygenation: insights from chromium and uranium isotopes

**Chinese Academy of Geological Sciences**, July 2016 (Beijing, China)

LECTURE TITLE: Chemical state of the ancient ocean/atmosphere system—what can Cr-isotopes in carbonates tell us?

**East Tennessee Geological Society**, May 2011 (Knoxville, Tennessee, USA)

LECTURE TITLE: Carbon, sulfur, and iron in the Mesoproterozoic Tourist Formation, Mauritania: implications for environmental redox

**Wintershall Holding GmbH**, Taoudeni Basin workshop, September 2010 (Kassel, Germany)

LECTURE TITLE: Using carbon isotopes to refine intrabasinal correlations: results from the Taoudeni Basin, northwest Africa

## CONTRIBUTED ABSTRACTS

25. 2018, **Gilleaudeau, G.J.**, Elrick, M., Romaniello, S.J., Morford, J., Cheng, K., Algeo, T.J. Onset of major ocean oxygenation during the early Middle Devonian Period recorded by uranium isotopes in marine limestones from the western USA. GSA Abstracts with Programs (Indianapolis, Indiana, USA) (oral presentation).
24. 2018, Charles, M.P., **Gilleaudeau, G.J.**, Elrick, M. Teaching the NGSS and combining real-world Earth science concepts that can result in a new mindset for the next generation of scientists. GSA Abstracts with Programs (Indianapolis, Indiana, USA) (poster).
23. 2018, Cheng, K., Elrick, M., Romaniello, S.J., **Gilleaudeau, G.J.**, Jiang, G. Early Mississippian ocean anoxia driving climate cooling and increased glaciation: testing the hypothesis using uranium isotopes in marine carbonates. GSA Abstracts with Programs (Indianapolis, Indiana, USA) (poster).
22. 2018, Song, Y., **Gilleaudeau, G.J.**, Algeo, T.J., Over, D.J., Anbar, A.D., Xie, S. Biomarker evidence of Late Devonian marine algal-microbial community changes driven by riverine nutrient inputs (Chattanooga Shale, Tennessee, USA). GSA Abstracts with Programs (Indianapolis, Indiana, USA) (poster).
21. 2017, **Gilleaudeau, G.J.**, Kaufman, A.J., Luo, G., Romaniello, S.J., Zhang, F., Kah, L.C., Azmy, K., Bartley, J.K., Sahoo, S.K., Knoll, A.H., Anbar, A.D. Constraining the redox landscape of the mid-Proterozoic oceans: new insights from the carbonate uranium isotope record. American Geophysical Union Conference (New Orleans, Louisiana, USA).
20. 2017, Zheng, W., **Gilleaudeau, G.J.**, Kah, L.C., Anbar, A.D. Mercury stable isotopes as a novel proxy for photic zone euxinia. GSA Abstracts with Programs (Seattle, Washington, USA) (oral presentation).
19. 2017, **Gilleaudeau, G.J.**, Junium, C.K., Kah, L.C., Zolotova, N., Anbar, A.D. No evidence for alternative nitrogenase expression in a Mesoproterozoic molybdenum-limited environment: constraints from nitrogen isotopes at 1.1 Ga. GSA Abstracts with Programs (Seattle, Washington, USA) (oral presentation).
18. 2017, **Gilleaudeau, G.J.**, Frei, R., Kaufman, A.J., Luo, G., Romaniello, S.J., Zhang, F., Kläbe, R.M., Sahoo, S.K., Kah, L.C., Azmy, K., Bartley, J.K., Chernyavskiy, P., Knoll, A.H., Anbar, A.D. Deciphering the carbonate record of Mesoproterozoic biospheric oxygenation: insights from chromium and uranium isotopes. Goldschmidt Conference (Paris, France) (oral presentation).
17. 2017, Sahoo, S.K., **Gilleaudeau, G.J.**, Owens, J.D., Poulton, S.W., Lyons, T.W. Iron-rich conditions and molybdenum enrichment in a Mesoproterozoic shelf setting: a snapshot from the Vindhyan Basin, India. Goldschmidt Conference (Paris, France) (poster).
16. 2017, Yingst, R.A., Bartley, J., Chidsey, T., Cohen, B.A., **Gilleaudeau, G.J.**, Hynek, B.M., Kah, L.C., Minniti, M.E., Williams, R.M.E., Black, S., Gemperline, J., Schaufler, R., Thomas,

- R.J. Determining efficient rover science protocols for robotic sample selection: a geoheuristic operational strategies test in greater Canyonlands, Utah, US. GSA Abstracts with Programs (Honolulu, Hawaii, USA) (oral presentation).
15. 2017, **Gilleaudeau, G.J.**, Kah, L.C., Anbar, A.D. Constraints on the Mesoproterozoic nitrogen cycle from nitrogen isotopes in 1.1 billion-year-old black shale. Southern California Geobiology Symposium (Los Angeles, California, USA) (poster).
  14. 2017, Yingst, R.A., Bartley, J., Chidsey, T., Cohen, B.A., **Gilleaudeau, G.J.**, Hynek, B.M., Kah, L.C., Minnitti, M.E., Williams, R.M.E., Black, S., Gemperline, J., Helsius, R., Schaufler, R. Determining efficient rover science protocols for robotic sample selection. Lunar and Planetary Science Conference (Houston, Texas, USA) (oral presentation).
  13. 2016, **Gilleaudeau, G.J.**, Voegelin, A.R., Thibault, B., Moreau, J., Ullmann, C.V., Korte, C., Frei, R. Oceanographic change in the late Cretaceous Chalk Sea (Denmark): clues from chromium isotopes. Goldschmidt Conference (Yokohama, Japan) (oral presentation).
  12. 2015, **Gilleaudeau, G.J.**, Frei, R., Kaufman, A.J., Kah, L.C., Azmy, K., Bartley, J.K., Chernyavskiy, P., Knoll, A.H. Chromium isotopes in carbonate rocks: new insights into Proterozoic atmospheric oxygenation. American Geophysical Union Conference (San Francisco, California, USA) (poster).
  11. 2015, **Gilleaudeau, G.J.**, Frei, R., Kaufman, A.J., Kah, L.C., Azmy, K., Bartley, J.K., Knoll, A.H. Chromium isotopes in carbonates constrain Mesoproterozoic atmospheric  $pO_2$  levels. Goldschmidt Conference (Prague, Czech Republic) (oral presentation).
  10. 2015, D'Arcy, J.M., Frei, R., **Gilleaudeau, G.J.**, Peralta, S., Kah, L.C., Gaucher, C. The chromium isotopic composition of an Early to Middle Ordovician marine carbonate platform, eastern Precordillera, San Juan, Argentina. Goldschmidt Conference (Prague, Czech Republic) (poster).
  9. 2014, **Gilleaudeau, G.J.**, Sahoo, S.K., Kah, L.C., Henderson, M.A., Frei, R., Kaufman, A.J. Integrated chemostratigraphy of Upper Vindhyan Sequence carbonates, central India: implications for depositional age and global correlations. GSA Abstracts with Programs 46, 223 (Vancouver, Canada) (oral presentation).
  8. 2013, **Gilleaudeau, G.J.**, Kah, L.C. Tracking the chemocline in ancient oceans: an example from the Mesoproterozoic of Mauritania. GSA Abstracts with Programs 45, 628 (Denver, Colorado, USA) (oral presentation).
  7. 2013, Pewitt, M.L., Kah, L.C., **Gilleaudeau, G.J.** Redox structure of Mesoproterozoic shale derived from sulfide minerals and mineral texture. GSA Abstracts with Programs 45, 114 (Denver, Colorado, USA) (poster).
  6. 2012, **Gilleaudeau, G.J.**, Kah, L.C. Influence of global sea level on the Proterozoic oceanic molybdenum inventory. GSA Abstracts with Programs 44, 459 (Charlotte, North Carolina, USA) (oral presentation).
  5. 2011, **Gilleaudeau, G.J.**, Kah, L.C. Considerations on the use of iron, carbon, and sulfur paleoredox proxies in low sulfate Proterozoic oceans: an example from the Mesoproterozoic Tourist Formation, Mauritania. GSA Abstracts with Programs 43, 656 (Minneapolis, Minnesota, USA) (oral presentation).
  4. 2010, **Gilleaudeau, G.J.**, Kah, L.C. Molar-tooth crack formation and the Proterozoic marine substrate: insights from the Belt Supergroup, Montana and the Atar Group, Mauritania. GSA Abstracts with Programs 42, 137 (Denver, Colorado, USA) (oral presentation).
  3. 2010, Aden, D.J., Milam, K.A., Kah, L.C., **Gilleaudeau, G.J.** Determining a formational mechanism for a Mauritanian Mesoproterozoic (1.1 Ga) breccia. GSA Abstracts with Programs 42, 92 (Branson, Missouri, USA) (oral presentation).

2. 2009, Aden, D.J., Milam, K.A., Kah, L.C., **Gilleaudeau, G.J.** An anomalous breccia in the Mesoproterozoic (~1.1 Ga) Atar Group, Mauritania: potential evidence for an impact-generated tsunami. Lunar and Planetary Science Conference (Houston, Texas, USA) (poster).
1. 2008, **Gilleaudeau, G.J.**, Demicco, R.V., Chernyavskiy, P. Carbonate shrubs in travertines of Tivoli, Italy: can morphology be used to distinguish between biotic and abiotic precipitates? GSA Abstracts with Programs 40, 9 (Charlotte, North Carolina, USA) (poster).

## FIELD WORK AND SAMPLE COLLECTION

- Devonian carbonate rocks of the Great Basin: **Antelope Range, Nevada, USA** (June 2018)
- Canyon Lake (modern ferruginous lake): **Upper Peninsula, Michigan, USA** (May 2018)
- Joana Limestone and Limestone X (Early Mississippian): **south-central Nevada, USA** (March 2018)
- Bylot Supergroup (late Mesoproterozoic): **Baffin Island, arctic Canada** (July 2017)
- Jixian Group (early Mesoproterozoic): **north China** (July 2016)
- Cleveland and Sunbury shales (Late Devonian-Early Mississippian): geological surveys of **Ohio, Kentucky, and Tennessee, USA** (May 2016)
- NASA GHOST terrestrial analogue research team: **Canyonlands, Utah, USA** (April 2016)
- Paleoproterozoic and Mesoproterozoic carbonate rocks: Botanical Museum collections, **Harvard University** (January 2014, March 2016)
- Chalk Group (Cretaceous-Paleogene): **Stevns Klint, Denmark** (March 2015) and Hunstrup, **northern Jutland, Denmark** (October 2015)
- Vindhyan Supergroup (Mesoproterozoic): **north-central India** (January 2012)
- Holston Limestone (Ordovician): **east Tennessee, USA** (October 2010)
- Atar Group, Mauritania (late Mesoproterozoic): Repsol S.A. core facility, **Daganzo de Arriba, Spain** (May 2010)
- El Mreiti Group, Mauritania (late Mesoproterozoic): Wintershall Holding GmbH core facility, **Barnstorf, Germany** (January 2010)
- Alamo impact breccia (Late Devonian): **south-central Nevada, USA** (March 2009)
- Indiana University field mapping course (IUGFS): **western Montana, USA** (July-August 2008)
- La Silla and San Juan formations (Ordovician) and Laguna Negra (high-altitude hypersaline lake): **high Andes, Argentina** (May 2008)

## LABORATORY AND ANALYTICAL EXPERIENCE

- Sedimentary petrography (plane light, cross-polarized light, and cathodoluminescence)
- Trace metal clean laboratory protocols
- Chemical separation techniques for: **carbon, oxygen, and nitrogen isotopes; iron speciation** (sequential extraction); **pyrite sulfur isotopes** (chromium reduction); **major, trace, and rare-earth element concentrations** (total acid digestion); **chromium and uranium isotopes** (column chemistry)
- Inductively coupled plasma optical emission and mass spectrometry (ICP-OES and ICP-MS)
- Thermal ionization mass spectrometry (TIMS)
- Neptune Plus multi-collector ICP-MS

## SERVICE

November 2018: **Session Chair**, GSA Annual Meeting: Evolving perspectives of the Precambrian world: using combined theoretical and applied approaches to tackle problems at the intersection of geology, geobiology, and geochemistry

2013-present: **Frequent journal referee**: Geology; Nature Scientific Reports; Proceedings of the National Academy of Sciences, USA; Geochimica et Cosmochimica Acta; Precambrian Research; Paleogeography, Paleoclimatology, Paleoecology; Science Advances; Nature Geoscience; Chemical Geology; American Journal of Science; Geochemical Perspectives Letters; GSA Bulletin; Geoscience Frontiers

May 2018: **External examiner**, Ph.D. dissertation of Timothy M. Gibson (advisor: Galen P. Halverson), McGill University. Title: Characterizing eukaryotic evolutionary environments across the Mesoproterozoic-Neoproterozoic boundary.

May 2018: **Invited reviewer**, Lewis and Clark Fund in Astrobiology program

September 2017: **External examiner**, MSc thesis of Alexander Charest Bisnaire (advisor: Karem Azmy), Memorial University of Newfoundland. Title: Oceanic redox conditions across the Cambrian-Ordovician boundary.

August 2017: **Session Chair**, Goldschmidt Conference: The not so boring billion—emerging insights into life and the Earth system in the Mesoproterozoic

March 2016: **Invited judge**, NASA Astrobiology Speech Competition

February 2016: **Executive Secretary**, NASA PSTAR proposal panel review (Glendale, Arizona, USA)

October 2013: **Invited Session Chair**, GSA Annual Meeting: Precambrian geology

October 2010: **Invited Session Chair**, GSA Annual Meeting: Carbonate sediments—from microbes to sequences, insights into processes governing carbonate deposition

## OUTREACH

February 2011: Science outreach volunteer, Walland Elementary School, east Tennessee, USA

2008-2009: Teaching volunteer, McClung Museum, University of Tennessee at Knoxville

October 2008: Invited research outreach presentation, O'Conner Senior Center, Knoxville, Tennessee, USA

August 2007-May 2008: 15 hours/week hands-on science activities with seventh grade students, Heritage Middle School, east Tennessee, USA (**NSF GK-12 Program**)

## PROFESSIONAL AFFILIATIONS

- Geological Society of America
- European Association of Geochemistry
- American Geophysical Union