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Research Interests

My general research interest is to explore climate and environmental proxies, their underlying mechanisms, and apply them to reconstruct the paleoclimate and paleoenvironment. My recent projects focus on the kinetics and atomistic mechanism of carbonate clumped isotope (Δ_{47}) bond reordering, and applications in basin thermal history and paleoclimate reconstruction based on experiments and physical-chemical modeling. Future research interests include (1) Mesozoic terrestrial climate; (2) early Ordovician climate and seawater $\delta^{18}O$ evolution; (3) the potential applications of organic clumped isotopologues in the reconstruction of paleoclimate and reaction pathways.

Education

2017 — 2024 (Expected)
Ph.D. in Geology
Department of Geology and Geophysics, Texas A&M University
Thesis: Carbonate clumped isotope reordering from atomic approach: heating experiment, kinetic modeling and application.
Advisor: Ethan Grossman

2013 — 2017
B.S. in Geology | *Honor of Outstanding Graduate*
School of Earth Sciences and Engineering, Nanjing University
Thesis: The geochemical features of carbonates from Gaoyuzhuang Formation and Tieling Formation of North China: Implications for the redox conditions of paleo-ocean.
Advisor: Hong-Fei Lin

Professional Experience

2017 — 2020
Graduate Assistantship Research in Clumped Isotope Geochemistry
Department of Geology and Geophysics, Texas A&M University
Advisor: Ethan Grossman
Co-advisor: William Defliese

2016
Research Internship in Geochemistry
The Department of Earth and Planetary Sciences, Yale University
Advisor: Noah Planavsky
Co-advisor: Xiangli Wang

Scholarship, Fellowship & Awards

[1] **ConcocoPhillips/HEEP Endowed Graduate Fellowship (2022)**
Department of Geology and Geophysics, TAMU

[2] **Petroleum and Sedimentary Systems Scholarship (2018)**
Berg-Hughes Center, TAMU

Publications (*Denotes equal contribution)

Accepted & Published

[1] **Sun, Z.***, Perez-Beltran, S.*, Zaheer, W.*, Defliese, W. F., Banerjee, S., and Grossman, E. L.: Clumped isotope reordering kinetics in strontianite and witherite: experiments and first-principles simulations, *Earth and Planetry Science Letters* 624, p. 118467, 2023. DOI: 10.1016/j.epsl.2023.118467.

[2] Perez-Beltran, S.*, Zaheer, W.*, **Sun, Z.***, Defliese, W. F., Banerjee, S., and Grossman, E. L.: Density functional theory and ab initio molecular dynamics reveal atomistic mechanisms for carbonate clumped isotope reordering, *Science Advances* 9, eadf1701, 2023. DOI: 10.1126/sciadv.adf1701.

[3] **Sun, Z.**, Wang, X., and Planavsky, N.: Cr isotope systematics in the Connecticut River estuary, *Chemical Geology* 506, pp. 29–39, 2019. DOI: 10.1016/j.chemgeo.2018.12.034.

Presentations

Conference submissions

[1] **Sun, Z.**, Maupin, C. R., Perez-Beltran, S., Zaheer, W., Defliese, W. F., Banerjee, S., and Grossman, E. L.: The role of internal water in carbonate clumped isotope resetting, Oral, in: *GSA Connects 2023 Meeting*, Pittsburgh, PA, USA, Oct. 2023.

[2] **Sun, Z.**, Defliese, W. F., and Grossman, E. L.: The kinetics of clumped isotope reordering of synthetic inorganic carbonates, Poster, in: *AGU Fall Meeting*, New Orleans LA, USA, Dec. 2021.

[3] **Sun, Z.**, Defliese, W. F., and Grossman, E. L.: The kinetics of clumped isotope reordering of synthetic inorganic carbonates, Poster, in: *GSA Connects 2021 Meeting*, Portland, OR, USA, Oct. 2021.

[4] **Sun, Z.**, Defliese, W. F., and Grossman, E. L.: The kinetics of clumped isotope reordering of synthetic inorganic carbonates, Flash Talk, in: *Goldschmidt*, Lyon, France (Virtual), July 2021.

[5] **Sun, Z.**, Defliese, W. F., and Grossman, E. L.: Reconstructing thermal histories of the Oklahoma, Illinois and Moscow basins using clumped isotopes of mid-Carboniferous brachiopods, Poster, in: *International Clumped Isotope Workshop*, Los Angeles, CA, USA, Jan. 2019.

Professional Development Courses

[1] **CHEM 648 Principles of Quantum Mechanics (Fall 2019)**
Daniel Tabor, Department of Chemistry, TAMU

[2] **OCNG 641 Inorganic Aquatic Geochemistry (Spring 2019)**
Jessica Fitzsimmons, Department of Oceanography, TAMU

[3] **GEOL 648 Stable Isotope Geology (Fall 2018)**
Ethan Grossman, Department of Geology and Geophysics, TAMU

[4] **CHEM 621 Chemical Kinetics (Spring 2018)**
Simon North, Department of Chemistry, TAMU

[5] **GEOL 658 Earth Systems Through Deep Time: Global Change, Paleoclimate and Life (Spring 2018)**
Ethan Grossman, Department of Geology and Geophysics, TAMU

[6] **OCNG 689 Cenozoic Paleoclimate (Spring 2018)**
Yige Zhang, Department of Oceanography, TAMU

[7] **OCNG 655 Experimental Design and Analysis in Oceanography (Fall 2017)**
Henry Potter, Department of Oceanography, TAMU

[8] **OCNG 640 Chemical Oceanography (Fall 2017)**
Piers Chapman, Department of Oceanography, TAMU

[9] **GEOL 681 Stable Isotope Methods and Research: Clumped Isotopes (Fall 2017)**
Ethan Grossman, Department of Geology and Geophysics, TAMU

Teaching Experience

Teaching Assistant

[1] Preparing and organizing class and lab materials, meeting with students to address their questions, guiding students in experimental design and instrument operation, tutoring students in data analysis and visualization with Julia language, and offering support for project presentations.

Course: GEOL 450 Geology Senior Project & GEOS 405 Environmental Geosciences (Spring, 2023)
Project: Impact of gas stove usage on indoor air quality and health.
Institution: Texas A&M University

[2] Preparing the lab session handout, explaining the principle of IRMS and carbonate device for clumped isotope measurement, and guiding students in performing carbonate clumped isotope analysis.

Course: GEOL 648 Stable Isotope Geology (Spring 2022 & Fall 2018)
Institution: Texas A&M University

Professional Engagement & Activities

Outreach

[1] Ions@WORK Mass Spectrometry Symposium (2019)
[2] Mass Spectrometry for Isotopic Analysis Subunit Open House (2018)
[3] Chemistry Open House (2018)

Field Trips

[1] Permian Reef Complex & Guadalupe Mountain, USA (2018)
[2] Late Ordovician Outcrops, Cincinnati Arch region, USA (2018)

Peer Reviewer

[1] *Science Advances, Chemical Geology* (2023)

Skills

Instrument Technique

Including operation, troubleshooting, maintenance & training

[1] Thermo Scientific 253Plus IRMS
[2] Thermo Scientific Kiel IV Carbonate Device with customized PPQ Trap
[3] Field Emission SEM
[4] Cathodoluminescence Microscope
[5] Manual Glass Vacuum Line

Scientific Computation & Programming	Julia, Python, MATLAB & Arch Linux