

## Natasha Sekhon

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### Primary Research Interests

Terrestrial climate change, speleology, karst hydrology, cave monitoring, extreme events, Holocene climate change, Quaternary climate, low-temperature stable isotopes, trace element geochemistry, environmental geology, multivariate statistical analysis, science and society, science communication, data-model comparison

### Academic Appointment

2021 – Present      *Voss Postdoctoral Research Associate & Presidential Diversity Postdoctoral Fellow*  
Department of Earth, Environmental and Planetary Sciences &  
Institute at Brown for Environment and Society  
Brown University, RI

2021 – Present      *Visiting Scientist*  
Department of Earth, Atmospheric, and Planetary Sciences  
Massachusetts Institute of Technology, MA

### Education

2021              *Ph.D.*, Geological Sciences, Department of Geological Sciences, Jackson of Geosciences, University of Texas at Austin, TX

2016              *M.S.*, Geological Sciences, Institute of Geophysics, Jackson of Geosciences, University of Texas at Austin, TX

2014              *B.S.*, Earth System Sciences (Honors), University of California Irvine, CA  
Minor in *Comparative Literature*

2013              University of California Education Abroad Program (UCEAP), University of Edinburgh, Scotland, UK

### Publications

#### *Published*

1. **Sekhon, N.**, D.M. Tremaine, J. L. Banner, & D. O. Breecker. "Mapping atypical and typical stalagmite morphologies using high resolution X-Ray computed tomography as a

non-destructive and rapid test for paleoclimate suitability.” Minor Revisions at Journal of Cave and Karst Studies.

2. **Sekhon, N.**, V. F. Novello, F. A. Cruz, B.E. Wortham, T.G.R. Ribeiro, & D. O. Breecker, 2021, “Diurnal to seasonal cave ventilation in Brazilian Caves.” Global and Planetary Change. DOI: 10.1016/j.gloplacha.2020.103378

3. **Sekhon, N.**, T. Beach, S. Krause, & S. Eshleman, 2020, “Understanding climate trends in Central America through practical problem-based learning.” Journal of Geography in Higher Education. DOI: 10.1080/03098265.2020.1833318

4. Griffiths, M.L., K.R. Johnson, F.S.R. Pausata, J.C. White, G.M. Henderson, C.T. Wood, H. Yang, V. Ersek, C. Conrad & **N. Sekhon**, 2020, “Mid-to-Late Holocene Megadroughts in the Middle Mekong Basin Linked to Global Climate Changes.” Nature Communications. DOI: 10.1038/s41467-020-17927-6

5. Oster, J. L., S. F. Warken, **N. Sekhon**, M. M. Arienzo, & M. Lachniet, 2019, “Speleothem Paleoclimatology for the Caribbean, Central America, and North America.” Quaternary. DOI: 10.3390/quat2010005

6. Comas-Bru, L., S.P. Harrison, M. Werner, K. Rehfeld, N. Scroxton, C. Veiga-Pires, & **SISAL Working Group Members**, 2019, “Evaluating model outputs using integrated global speleothem records of climate change since the last glacial.” Climate of the Past. DOI: 10.5194/cp-15-1557-2019

7. Atsawawanunt, K, S. Harrison, L., Comas-Bru, & **SISAL Working Group Members**, 2018, “The SISAL database: a global resource to document oxygen and carbon isotope records from speleothems.” Earth System Science Data. DOI: 10.5194/essd-10-1687-2018

#### *In Review*

1. **Sekhon, N.**, J. L. Banner, D. O. Breecker, B. A. Black, & N. R. Miller. “Records of recharge in transition metal concentrations of annually resolved stalagmites: An assessment from the arid Southwest United States.” In Review at Geochimica et Cosmochimica Acta.

2. Fohlmeister, J., **N. Sekhon**, A. Columbu, K. Rehfeld, L. Sime, C. Veiga-Pires, N. Marwan, & N. Boers. “Global reorganization of atmospheric circulation during Dansgaard-Oeschger cycles.” In Review at Proceedings of the National Academies of Sciences.

3. Gallagher, T., L. Serach, **N. Sekhon**, H. Zhang, H.Wang, S. Ji, C. Xi, H Lu, & D.O. Breecker. “Regional patterns in Miocene-Pliocene aridity across the Chinese Loess Plateau revealed by high resolution records of paleosol carbonate and occluded organic matter.” In Review at Earth and Planetary Science Letters.

### *Submitted*

1. David, C.P., M.J., Custado, **N. Sekhon** & D.E. Ibarra. “Forecasting tropical ENSO-induced drought conditions using sea surface heights in the Western Pacific.” Submitted at *Scientific Reports*
2. Axelsson, J., J. Bühler, and **SISAL Working Group for the Last Millennium**. “Last Millennium data-model comparison using the SISALV2 and isotope-enabled model simulations.” Submitted at *Climate of the Past*.

### *In Progress*

1. **Sekhon, N.**, J. L. Banner, D. O. Breecker, N.R. Miller & D. M. Tremain. “A two-year source to sink monitoring study to interpret elemental and isotopic variability in a karst system in southeastern New Mexico.” *Journal of Hydrology* (to be submitted to co-authors end 2021).
2. Weiss, A.M., R.C. Martindale, A. Kosir, J. Oefinger, **N. Sekhon**, E.J. Ramos, D.O. Breecker, & N.R. Miller. “A late Paleocene-early Eocene dissolution surface on a mid-latitude shallow carbonate platform, with paleoenvironmental implications.” For *Geology*.

### **Research Funding**

Co-PI, National Cave and Karst Research Institute Seed Grant, 2021-2022, *Utilizing Stalagmites from the Philippines (USPS): Quantifying and understanding interannual hydroclimate variability in the Philippines through cave monitoring and stalagmite analyses.* \$24,991.

PI, Voss Postdoctoral Research and Presidential Diversity Postdoctoral Fellowship. Brown University. \$4,000.

Geological Society of America Graduate Student Research Grant, 2020, \$1,375.

National Cave and Karst Research Institute Fellowship for Research, 2019, \$5,000.

Jackson School of Geosciences Match Grant, 2019, \$1,000.

Patty Daw Memorial Grant, 2019, \$752.

Cleveland Grotto Science Fund, 2018, \$1,610.

DeFord Field Scholarship, 2018, \$1,500.

Jackson School of Geosciences Match Grant, 2018, \$1,000.

Graduate Research Grant for Cave and Karst Research, 2017, \$2,000.

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| Jackson School of Geosciences Match Grant, 2017,                         | \$1,000. |
| DeFord Field Scholarship, 2017,  | \$1,500. |
| Geological Society of America Graduate Student Research Grant, 2017,     | \$1,750. |
| Muehlberger Field Scholarship Off-Campus Summer Research, 2015,          | \$1,500. |
| ANSTO Grant, 2 <sup>nd</sup> Summer School in Speleothem Sciences, 2015, | \$1,500. |

## Teaching

| Year   | Role               | Course                                   | No. Of Pupils | Responsibilities  |
|--|--------------------|--|---------------|---|
| <i><u>Department of Geological Sciences, University of Texas at Austin</u></i>           |                    |  |               |   |
| Spring 2020  | Teaching Assistant | GEO 302E: Earth, Fire, Wind              | 3 x 20        | Taught 3 laboratory sections. Designed and taught exercises focused on introductory geology topics with a focus towards non-geology majors. |
| Spring 2017  | Teaching Assistant | GEO 302C: Climate: Past, Present, Future | 2 x 15        | Taught 2 laboratory sections with a focus on climate dynamics. Course is aimed at geology major junior – sophomore undergraduates.          |
| Fall 2016  | Teaching Assistant | UGS 303: Sustaining a Planet             | 4 x 20        | Taught 4 laboratory sections. Graded lab sections and essays. Class also counted towards a writing requirement for incoming freshman.       |
| <i><u>Department of Geography and the Environment, University of Texas at Austin</u></i> |                    |  |               |   |
| Spring 2018  | Guest Lecture      | GRG 333K: Climate Change                 | 25            | Designed and taught a course on using readily available climate data to understand climate trends through the lens of the Maya.             |

|  |                                |   |    |   |
|--|--------------------------------|---|----|---|
| Fall 2018  | Guest<br>Lecture               | GRG 339:<br>Process<br>Geomorphology              | 30 | The exercise was implemented through Guest Lectures aimed at junior undergraduate students. The end results were published in a pedagogy journal.   |
| <hr/>  |                                |   |    |   |
| <i><u>Environment Science Institute, University of Texas at Austin</u></i> |                                |   |    |   |
| Spring 2018  | Field<br>Teaching<br>Assistant | EVS 311:<br>Field<br>Seminar in<br>Sustainability | 40 | Co-led with fellow TA Lily Serach, field trips across central and southeastern Texas. Responsibilities included help with designing, grading labs, logistics for travel, and collaboration with institutes such as the Marine Science Institute, Biology and Ecology Department at UT, Austin Energy, Barton Springs Watershed to name a few. |

## Fellowships and Honors

|              |   |                     |
|--------------|---|---------------------|
| 2021-Present | <i>Voss Postdoctoral Research and Presidential Diversity Postdoctoral Fellowship.</i> Brown University. | ~\$130,000          |
| 2020-2021    | <i>Graduate Student Continuing Fellowship.</i> University of Texas at Austin                            | \$2,500 x 12 months |
| 2017         | <i>Jackson School of Geosciences Independent Study Fellowship.</i> University of Texas at Austin        |                     |
| 2014         | <i>Outstanding Senior in Earth and Environmental Sciences.</i> University of California at Irvine.      |                     |
| 2014         | <i>Honors in Earth System Sciences.</i> University of California at Irvine.                             |                     |
| 2014         | <i>Chancellor's Award for Excellence in Research.</i> University of California at Irvine.               |                     |
| 2014         | <i>Phi Beta Kappa Honor Society.</i>  |                     |
| 2012-2013    | <i>Maria Rebecca and Maureen Bellettini Award.</i> UCEAP  |                     |

Dean's List: Winter 2012, Spring 2012, Spring 2013, Fall 2013, Winter 2014, Spring 2014

## Invited Seminars

1. School of Geosciences, Geosciences Seminar Series, *University of Louisiana at Lafayette*, April 2021.
2. Department of Geology, Palmer Geology Lecture Series, *Kent State University*, March 2021.
3. Environmental Studies Program, *University of Portland*, February 2021.
4. Austin Geological Society Symposium, May 2016

## Mentoring Experience

1. *Kara Posso*. The University of Texas at Austin. Class of 2017. Senior Thesis: Geochemical and physical response of central Texas cave drip water to changing climate conditions. Now at Zara Environmental Consulting.
2. *Rachel Wright*. The University of Texas at Austin. Class of 2018. Senior Thesis: Correlating growth banding in Texas speleothems: Paleoclimate Implications. Primary Advisor: Dr. Jay Banner
3. *Nayong Hur*. The University of Texas at Austin. Class of 2019. Senior Thesis: Coupling geomorphology and nutrients. Primary Advisor: Dr. Paola Passalacqua. Now at Lynker Technologies.
4. Field work to Sitting Bull Falls, NM. Organized and led undergraduate and graduate students to Sitting Bull Falls, New Mexico from 2017 - 2020. Close interaction with National Forest Service rangers at the Lincoln National Forest, Guadeloupe Section, New Mexico and researchers at the National Cave and Karst Research Institute. Over Summer 2018 and 2019, led high-school students from Carlsbad High School for fieldwork experience.

## Field Work

| Year      | Role                 | Location   | Responsibilities   |
|-----------|----------------------|------------|--|
| 2017-2020 | Primary Co-ordinator | New Mexico | Set up and led bi-monthly to bi-weekly trips to Sitting Bull Falls for active cave, stream, rainfall monitoring. |

|                      |                               |                           |   |
|----------------------|-------------------------------|---------------------------|---|
|                      |                               |                           | Responsible for all logistics and scientific questioning.   |
| 2017-2021            | Primary Co-ordinator          | Texas                     | Led monthly cave monitoring trips to Inner Space Caverns, Westcave, Natural Bridge Caverns, Cave Without A Name for cave monitoring. Trained undergraduate students for the same. Part of Dr. Banner's Central Texas cave monitoring expeditions.     |
| Spring 2018          | Graduate Field Assistant      | Central Texas             | Karst Hydrogeology field course that involved setting up LTC loggers, ISCO deployments, dye tracing with charcoal, stream discharge measurements. PI: Dr. Marcus Gary   |
| May-June 2016        | Field Assistant               | Northwestern Belize       | Assisted with soil excavation pits in wetlands, sampling for radiocarbon and stable isotope analysis, tree IDs using DFW, water sampling, sieving anthropological sites to investigate Environmental Changes in the Maya Lowlands. PI: Dr. Tim Beach. |
| November 2015        | Graduate Field Assistant      | Gulf of Mexico            | CDT sediment traps redeployment and maintenance on R/V Point Sur with PhD student Kaustubh Thirumulai. PI: Dr. Terry Quinn.   |
| January - April 2014 | Undergraduate Field Assistant | Sequoia National Park, CA | Bi-monthly cave monitoring trip to Crystal Cave with PhD student Staryl Mc-Gabe. PI: Dr. Kathleen Johnson.  |
|                      |                               |                           | Learned basic geologic field mapping skills in the Scottish   |

May - June 2013    Student

Scotland

Highlands as part of the  
Inchnadamph Field Course.

## Conference Abstracts

(#Talk | \*Poster)

1. **Sekhon, N.**, C.P.C. David, M.C.M. Geronia, M.J.G. Custado & D.E. Ibarra. Tropical drought and El Niño: historic and future river discharge analysis of the Philippine archipelago. \*AGU Fall 2021 Meeting (Upcoming)
2. **Sekhon, N.**, J. L. Banner, D. O. Breecker, D.M. Tremaine & N.R. Miller. Monitoring a unique karst system over two-years (2017-2019 CE) to elucidate hydroclimate variables influencing the geochemistry of surface and sub-surface waters. #GSA Fall 2021 Meeting
3. Fohlmeister, J., **N. Sekhon**, A. Columbu, K. Rehfeld, L. Sime, C. Veiga-Pires, N. Marwan, N. Boers. Global reorganization of atmospheric circulation during Dansgaard-Oeschger cycles. \*EGU 2021 Meeting - Online due to Covid-19
4. **Sekhon, N.**, J. L. Banner, D. O. Breecker. A two-year source to sink monitoring study to interpret elemental and isotopic variability in a karst system in southeastern New-Mexico. #GSA Fall 2020 Meeting - Online due to Covid-19
5. Fohlmeister, J., N. Boers, N. Marwan, A. Columbu, K. Rehfeld, **N. Sekhon**, L. Sime, C. Veiga-Pires. Composite data set of last glacial Dansgaard/Oeschger events obtained from stable oxygen isotopes in speleothems. \*EGU 2020 Meeting
6. **Sekhon, N.**, J. L. Banner, D. O. Breecker, B. A. Black, N. R. Miller. High-Resolution Stalagmite Reconstruction Examining Local Hydroclimate Variability From A Shallow Cave in Semi-Arid New Mexico. #GSA Fall 2019 Meeting
7. **Sekhon, N.**, J. L. Banner, D. O. Breecker, B. A. Black, N. R. Miller. Insights From The Geochemistry of Stalagmite: Examining Local Hydroclimate Variability In Semi-Arid New Mexico. #Water, Climate, Environment Informal Seminar Fall 2018
8. **Sekhon, N.**, J. L. Banner, N.R. Miller, P.E. Carlson, D.O. Breecker. Seasonally resolved trace element concentrations in stalagmites from a shallow cave in New Mexico. \*AGU 2017 Fall Meeting
9. **Sekhon, N.**, J. L. Banner, D. Breecker, P.E. Carlson. Near entrance Speleothems: Archives of seasonality? #GSA South-Central Conference 2017
10. Breecker, D. O. & **N. Sekhon**. Global Stacking of Speleothem Carbon and Oxygen Isotope Records. #KR8 Conference 2017



11. **Sekhon, N.**, T. M. Quinn, J. W. Partin, R.L. Edwards, Hai Cheng, Pu Zhang. Assessing multi-decadal rainfall variability in the South Pacific Convergence Zone using the geochemistry of stalagmites from the Solomon Islands. \*AGU Fall 2015 Meeting
12. **Sekhon, N.**, T. M. Quinn, J. W. Partin, R.L. Edwards, Hai Cheng, Pu Zhang. Investigating recent SPCZ rainfall variability using a Stalagmite from the Solomon Islands: Initial Report. \*2nd Summer School in Speleothem Science Meeting 2015
13. **Sekhon, N.**, T. M. Quinn, J. W. Partin, R.L. Edwards, Hai Cheng, Pu Zhang. Proposed work to investigate recent SPCZ rainfall changes using cave deposits from the South Pacific. \*4th Annual Jackson School Research Symposium 2015
14. **Sekhon, N.**, K.R. Johnson, H. Yang. Holocene tropical hydroclimate reconstruction from speleothem oxygen isotopes. \*Undergraduate Research Opportunities Program Symposium, UC Irvine 2014
15. Yang, H., K.R. Johnson, M. Griffiths, **N. Sekhon**, A. LeGrande, K. Yoshemura, V Ersek, H. Gideon. Southeast Asian Monsoon Variability during the Holocene Based on Speleothems from Laos. \*Goldschmidt Conference 2014

## Workshops

|   |                      |
|---|----------------------|
| Carbonate Critical Zone Workshop Participant                      | July 16 2020-Present |
| Introduction to Remote Sensing for Tribal Lands                   | October 6-29, 2020   |
| HYSPLIT Workshop Participating Member (online)                    | June 22-25, 2020     |
| SISAL 4 <sup>th</sup> Workshop Participant (Xi'an, China)         | October 14-18, 2019  |
| SISAL 3 <sup>rd</sup> Workshop Participant (Agadir, Morocco)      | October 8-12, 2018   |
| 2 <sup>nd</sup> Summer School in Speleothem Sciences (Oxford, UK) | August 21-27, 2015   |

## Press Coverage

|   |           |
|---|-----------|
| National Cave and Karst Research Institute Magazine | 2017-2018 |
| National Cave and Karst Research Institute Magazine | 2019-2020 |

## Professional Societies

Geological Society of America, American Geophysical Union, National Speleological Society, PAGES

## Service

### Peer

International Journal of Speleology, Journal of Geography, Geochimica et Cosmochimica Acta

## **Disciplinary**

Pal(a)eoPERCS Committee 2021-Present

A virtual seminar series designed to showcase the research of Early Career Researchers in paleo- (ontology, ecology, oceanography, climate). It is a seminar series to share research, build collaborations and strengthen the diverse and global paleo community.

GSA Karst Division Representative 2021-Present

Duties include the promotion of the Karst Division during Geological Society of America meetings with booth set up and interaction with attending audience, participation in monthly meetings with the board, budget discussions, award distribution selection.

Skype A Scientist Participating Member 2017-Present

Interacted with students at various K-12 levels across North America. As a participant, I give a 40–50-minute lecture on climate change, paleoclimatology, introduction to geology, followed by questions and informal discussion with students. The lecture is prepared in collaboration with the teachers. I have participated in 3 sessions in English in the United States and 2 sessions in French in Canada.

SISAL Phase 1 North America Regional Coordinator 2017-2019

Worked with members of the North America regional team, led by Dr. Jessica Oster, to organize, compile, and interpret existing published stalagmite records from North and Central America. SISAL is a PAGES funded initiative to increase interaction between researchers interested in paleoclimatology, karst, and stalagmites.

3<sup>rd</sup> Summer School in Speleothem Sciences 2015-2017

Part of the organizing committee that consisted of speleothem graduate students from across the world. Our aim was to organize a successful and engaging Summer School in Speleothem Sciences held at CENIEH, Burgos, Spain.

## **Departmental**

Brown Postdoc Council 2021 - Present

Member of Brown Postdoc Council where the steering committee has weekly meetings to discuss activities both professional development and community building amongst postdocs at Brown. As Academic Co-Chair with fellow postdoc Dr. Adrian Thompson, we are working on developing postdoc workshops geared towards academia and non-academia for Spring/Summer 2022.

Science Y'All Blog 2017-2021

Editorial Board member for UT Austin's Geoscience Blog. Pitch and write stories that cover a wide range of geoscience topics, geared towards a wider audience. Examples of my contribution: [Example 1](#), [Example 2](#), [Example 3](#)

Water, Climate, Environment Informal Seminar 2018-2019

Co-organizer with fellow graduate student, Alison Tune, of UT Austin's geoscience seminars focused on Water, Climate, and Environment research theme.

Explore @ University of Texas at Austin 2019-2021  
Every year, UT Austin welcomes families, teachers, and students from across Texas to discover research activities. Volunteered with the Jackson School of Geosciences.

Summer Statistics School Teaching Assistant 2017-2021  
Teaching assistant with UT Austin's Summer School of Statistical Studies. Courses TA'd include Intro to Data Analysis and Graphics Using R, Introduction to SQL and Relational Database Design, Questionnaire Design and Analysis

## **Community**

Mentor at Communities in School (CIS) of Central Texas 2020-2021  
High School Math Tutor and Mentor for students with the aim of encouraging students to reach their full potentials. CIS is a high-school dropout prevention national endeavor.

Writer for numerous outlets - Science Y'All, Envirobites, NewU 2012-2020

Austin Cave Festival Volunteer 2018-2020

Radio Host volunteer at KVRX, 91.7 FM, Austin, TX 2017-2021

Radio Host at KVRX, 91.7 FM, Austin, TX 2015-2017

Radio Host at KUCI, 88.9 FM, Irvine, CA 2013-2014

The primary focus of my radio shows has been to expose multicultural music with roots deep in the geosciences with themed shows, interviews with fellow graduate students, artists, and musicians.

## **Academic Advisors**

Post-Doc: *Dan E. Ibarra*, Brown University

Ph.D.: *Dan O. Breecker & Jay L. Banner*, University of Texas at Austin

M.S.: *Terry M. Quinn & Jud Partin*, University of Texas at Austin

B.S.: *Kathleen R. Johnson*, University of California, Irvine

*Alexander Tudhope*, University of Edinburgh

## **Skills**

Communication: public speaking, writing articles for general audience, radio hosting

Computer: Python (Proficient), Matlab (Intermediate), Latex (Intermediate), ImageJ (Intermediate), Adobe Creative Suite (Illustrator, InDesign, Photoshop), ArcGIS (Basic)

Laboratory: drilling carbonates (paleosols, stalagmites, corals, forams) using a dental drill, Dremel, and micro mill setup, preparing carbonate samples for traditional stable isotopes using an IRMS (MAT253) attached to a KIEL III, IV, Gas Bench, water sample analyses for traditional isotopes using an IRMS attached to a continuous flow Gas Bench and TCEA, sample preparation for organic carbon  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  using an EA

attached to an IRMS, water sample preparation (diluting and pipetting) for solution mode ICPMS with a Quadruple sample introduction for trace element concentrations, stalagmite sample preparation for LA-ICP-MS analysis for trace element concentrations, preparation of modern cave calcite growth analysis for traditional isotopes and trace element analysis, Confocal Fluorescent Laser Microscope and XRCT imaging of stalagmite sections/cores.

Field: ISCO and LTC deployments in surface waters, cave-air monitoring for CO<sub>2</sub>, temperature, relative humidity variability, cave dripwater monitoring set up to collect dripwaters, calculate drip rate to quantify epikarst processes, Ultrameter II for water temperature, pH, TDS, conductivity measurements, modern cave calcite plate deployments to measure modern cave precipitation variability, proficient in surface and cave water and soil sampling, hand held coring equipment to extract stalagmite cores, belay and lead climbing certified

Languages: English (Native, C2), Hindi (Native, C2), Punjabi (Native, C2), French (Working or Conversational, B2), Spanish (Working or Conversational, B2), Scottish Gaelic (Beginner, A1)