

Natasha Sekhon (she/her)

Department of Earth, Environmental and Planetary Sciences &
Institute at Brown for Environment and Society

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Primary Research Interests

Terrestrial climate change, abrupt climate change, speleology, karst hydrogeology, carbonate critical zone, low-temperature stable isotopes, trace element geochemistry, environmental sciences, Holocene and Quaternary hydroclimate, multivariate and big data statistical analysis, science and society, science communication

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

12. Fohlmeister, J., **N. Sekhon**, A. Columbu, K. Rehfeld, L. Sime, C. Veiga-Pires, N. Marwan, & N. Boers. 2023 “Global reorganization of atmospheric circulation during Dansgaard-Oeschger cycles.” at Proceedings of the National Academies of Sciences. DOI: 10.1073/pnas.2302283120

11. **Sekhon, N.**, D.M. Tremaine, J. L. Banner, & D. O. Breecker. 2023 “Mapping atypical and typical stalagmite morphologies using high resolution X-Ray computed tomography as a non-destructive and rapid test for paleoclimate suitability.” Journal of Cave and Karst Studies. DOI:10.4311/2021ES0122

10. Covington, M. D., J. B. Martin, L. Toran, J. Macalady, **N.Sekhon**, P. L. Sullivan, A. A. Garcia, J.B. Heffernan, W. D. Graham, 2023, “Carbonates in the Critical Zone.” Earth’s Future. DOI: 10.1029/2022EF002765

9. **Sekhon, N.**, C.P.C. David, M.C.M. Geronia, M.J.G. Custado & D.E. Ibarra, 2022, “Investigating the response of hydrological processes to El Niño events using a 100-year dataset from the western Pacific Ocean.” Journal of Hydrology: Regional Studies DOI: doi.org/10.1016/j.ejrh.2022.101174

8. David, C.P., M.J., Custado, **N. Sekhon** & D.E. Ibarra, 2022, “Forecasting tropical ENSO-induced drought conditions using sea surface heights in the Western Pacific.” All Earth. DOI: 10.1080/27669645.2022.2089484

7. Gallagher, T., L. Serach, **N. Sekhon**, H. Zhang, H.Wang, S. Ji, C. Xi, H Lu, & D.O. Breecker, 2021, “Regional patterns in Miocene-Pliocene aridity across the Chinese Loess Plateau revealed by high resolution records of paleosol carbonate and occluded organic matter.” Earth and Planetary Science Letters. DOI: doi.org/10.1029/2021PA004344

6. **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

5. **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

3. 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

2. 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

1. 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 (^Undergraduate Student)

3.

2. ^Marsh,C., **N. Sekhon**, T. Beach, D. McGee & D.E. Ibarra. “Late Holocene hydroclimate changes recorded in $\delta^{18}\text{O}$ of a stalagmite from Cueva De La Fabrica, Colombia.” For Paleoclimatology and Paleoceanography.

1. **Sekhon, N.**, J. L. Banner, D. O. Breecker, B. A. Black, & N. R. Miller. “Moving towards an understanding of transition metal variability controls in stalagmites: An assessment in sub-annually resolved 20th-century stalagmites from semi-arid southwestern United States.” at Geochimica et Cosmochimica Acta (PDF Available on request).

In Progress

2. **Sekhon, N.**, A. Gao^, J.W. Partin, S. Mallick & D.E. Ibarra. “Advancing standardization of carbonate LA-ICP-MS analyses using a speleothem sample from the tropic.” For Rapid Communications in Mass Spectrometry

1. **Sekhon, N.**, J. L. Banner, D. O. Breecker, N.R. Miller & D. M. Tremaine. “A two-year source to sink monitoring study to interpret elemental and isotopic variability in a karst system in southeastern New Mexico.” For Journal of Hydrology.

Research Funding

Karst Records 9 Travel Grant, Karst Records Meeting, Austria 2022, \$884.

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.
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 nd Summer School in Speleothem Sciences, 2015,	\$1,500.

Teaching

Year	Role	Course	No. Of Pupils	Responsibilities
<i><u>Institute at Brown for Environment and Society, Brown University</u></i>				
Fall 2022	Co-Instructor	ENVS0070G: Historical climatology and global climate change	1 x 20	Co-developed and -taught course aimed at undergraduate students to introduce paleoclimatology, (historical) climatology, and Python coding exercises. Website.
<i><u>Department of Geological Sciences, University of Texas at Austin</u></i>				
Spring 2020	Teaching Assistant	GEO 302E: Earth, Fire,	3 x 20	Taught 3 laboratory sections. Designed and taught exercises focused on

		Wind		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.

Department of Geography and the Environment, University of Texas at Austin

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 Lecture	GRG 339: Process Geomorphology	30	The exercise was implemented through Guest Lectures aimed at junior undergraduate students. The end results were published in a pedagogy journal.

Environment Science Institute, University of Texas at Austin

Spring 2018	Field Teaching Assistant	EVS 311: Field Seminar in 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
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Watershed to name a few.

Fellowships/ Honors/ Awards

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|---|---|---------------------|
| 2022 | Brown's Postdoctoral Excellence Award for Research/Teaching | \$500 |
| 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 | | |

Seminar Talks (** Invited)

16. ** Department of Geology, Geography, and Environmental Studies, Spring Seminar Series, *James Madison University*, March 2023 (Declined).
15. **Department of Earth System Sciences, Spring Seminar Series, *University of California, Irvine*, February 2023.
14. **Faculty of Geosciences, Winter Seminar Series, *Utrecht University*, January 2023. (Declined)
13. **Department of Geology, Fall Seminar Series, *Occidental College*, November 2022.

12. **Department of Earth and Environmental Geosciences, Fall Seminar Series, *Washington and Lee University*, November 2022.
11. **Department of Geology, Geography, and Environmental Studies, Fall Seminar Series, *James Madison University*, November 2022.
10. Department of Earth, Environmental and Planetary Sciences, Co-shared Colloquium Seminar, *Brown University*, September 2022.
9. **Cagayan Museum and Historical Research Center, *Tuguegarao City, Philippines*, April 2022.
8. **Brown Alumni Club of Hawaii, Back to Class Technical Event with Prof. Ibarra and Dr. Sekhon, *Virtual*, March 2022.
7. **Department of Geology, Geography, and Environmental Studies, Fall Seminar Series, *Mount Holyoke*, November 2021.
6. Department of Earth, Environmental and Planetary Sciences, Climate and Environment Seminar, *Brown University*, November 2021.
5. **School of Geosciences, Geosciences Seminar Series, *University of Louisiana at Lafayette*, April 2021.
4. **Department of Geology, Palmer Geology Lecture Series, *Kent State University*, March 2021.
3. **Environmental Studies Program, *University of Portland*, February 2021.
2. Department of Geological Sciences, Water, Climate, and Environment Seminar, *University of Texas at Austin*, November 2018.
1. **Austin Geological Society Symposium, May 2016.

Mentoring Experience

7. *Celia Kong-Johnson*. B.S. Candidate in Geology, Brown University, Class of 2025. Stable isotope analyses of Colombia stalagmite to replicate climate data from Christina Marsh's summer research (see point 5). Co-advisor with Dr. Dan Ibarra
6. *Annabelle Gao*. B.S. Candidate in Geology-Chemistry, Brown University, Class of 2023. Trace element analyses and sample preparation for Holocene stalagmite from the Philippines. Sample preparation, post fieldwork analyses of cave monitoring data. Co-advisor with Dr. Dan Ibarra

5. *Christina Marsh*. B.A. Candidate in Environmental Analysis, Pomona College, Class of 2023. Brown's Leadership Alliance Research Experience for Undergraduate (LANS) student (June-August 2022) from Pomona College, CA. Christina will be reconstructing Holocene paleoclimate utilizing stable isotope records of a stalagmite from Colombia. Co-advisor with Dr. Dan Ibarra

4. *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.

3. *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

2. *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. Primary Advisor: Dr. Jay Banner

1. 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 (Since Graduate School)

Year	Role	Location	Responsibilities
2022- Present	Primary Co-ordinator	Philippines	Field campaign working with collaborators in the Philippines to set up cave monitoring networks in three caves (3 National Parks) for monthly cave variable collection. Responsible for all logistics planning and scientific questioning.
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 planning 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.

Conferences since Postdoc (#Talk | *Poster | ^Undergraduate Student)

8. **N Sekhon**, ^A Gao, BK Belanger, CPC David, MCM Geronia, S Jalandoni, JV Gatdula, NSD Cruz, MG Vega, DE Ibarra. What it takes to develop speleothem records: A deep-dive into the transfer functions between climate and geochemistry in tropical cave systems from the Philippines. # (Invited) GSA 2023.

7. **N Sekhon**, ^A Gao, CPC David, MCM Geronia, S Jalandoni, JV Gatdula, NSD Cruz, DE Ibarra. Leveraging Stable Isotope and Trace element Geochemistry From Continuous Cave Monitoring to Discern Tropical Hydroclimate Variability in the Philippines. #Goldschmidt 2023.
6. **N Sekhon**, A Gao, CPC David, MCM Geronia & DE Ibarra. Insights into tropical hydroclimate using cave dripwater and modern calcite geochemistry from multiple caves in the Philippines. *2023 IAEA International Symposium on Isotope Hydrology.
5. ^ Marsh, C., **N. Sekhon**, T. Beach, D. McGee & D.E. Ibarra. Late Holocene hydroclimate changes recorded in $\delta^{18}\text{O}$ of a stalagmite from Cueva De La Fabrica, Colombia. *GSA Fall 2022 Meeting
4. **Sekhon, N.**, A. Gao^, J.W. Partin, S. Mallick & D.E. Ibarra. Advancing standardization of carbonate LA-ICP-MS analyses using a speleothem sample from the tropic. #GSA Fall 2022 Meeting
3. **Sekhon, N.**, C.P.C. David, M.C.M. Geronia, M.J.G. Custado & D.E. Ibarra. A 100 Year Paired River Discharge and Rainfall Data Investigation Into Tropical Droughts in the Philippines Over Interannual Timescale. #Asia Oceania Geosciences Society 2022 Virtual
2. **Sekhon, N.**, A. Gao^, J.W. Partin, S. Mallick & D.E. Ibarra. In-situ trace element analyses of a speleothem from the tropics to track paleoflood events through the Holocene. *KR9 Climate Change Meeting 2022
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

Workshops

Carbonate Critical Zone Florida Workshop	April 4-6, 2022
SISAL 5 th Workshop Virtual Participant	Feb. 28- March 4, 2022
Carbonate Critical Zone Virtual Workshop	August 2020
Introduction to Remote Sensing for Tribal Lands	October 6-29, 2020
HYSPLIT Workshop Participating Member (online)	June 22-25, 2020
SISAL 4 th Workshop Participant (Xi'an, China)	October 14-18, 2019
SISAL 3 rd Workshop Participant (Agadir, Morocco)	October 8-12, 2018
2 nd Summer School in Speleothem Sciences (Oxford, UK)	August 21-27, 2015

Press Coverage

PAGES ECR North America
 Guest post: Pal(a)eoPERCS. EGU Blogs, Biogeosciences Division
<https://blogs.egu.eu/divisions/bg/2023/03/28/guest-post-palaeopercs/> 2023

A global palaeo-science community: an interview with Pal(a)eoPERCS. <i>Commun Biol</i> 5 , 978 (https://doi.org/10.1038/s42003-022-03936-2)	2022
High Country News September Issue	2022
National Cave and Karst Research Institute Magazine, USA	2021-2022
Institute at Brown for Environment and Society Bi-Monthly Feature Article	2022
Today@Brown: Postdoctoral Excellence Awards Announced , USA	2022
National Cave and Karst Research Institute Magazine, USA	2019-2020
National Cave and Karst Research Institute Magazine, USA	2017-2018

Service

Peer Review

International Journal of Speleology, Journal of Geography, Geochimica et Cosmochimica Acta, Geology, Rapid Communications in Mass Spectrometry, Chemical Geology

Disciplinary

GSA Annual Meeting Session Co-Chair 2022; 2023
Co-Charing two topical sessions with Drs. Daniel Jones, Lewis Land, Pat Kambeises; T140. Karst Hydrology and Hydrogeology; T142. Frontiers in Karst Research

Pal(a)eoPERCS Committee 2021-Present
A virtual seminar series designed to share research, build collaborations and strengthen the diverse and global paleo community. The series focuses on the research of Early Career Researchers in paleo- (ntology, ecology, ceanogrphy, climate).

GSA Karst Division Webmanager 2023-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. Attending quarterly board meeting and maintaining the Karst Website and Twitter.

SISAL North America Regional Coordinator 2017-Present
Work with members of the North America regional team, led by Prof. 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.

Skype A Scientist Participating Member 2017-2021
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.

3rd 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 (Since Postdoc)

Brown University

2023

Postdoc representative for the Dean of the Graduate School Search Committee.

Selection committee member for the inaugural Postdoc Symposium Keynote Speaker.

Brown Postdoc Council

2021 - 2023

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 Drs. Tucker Manton, Adrian Thompson, we developed postdoc workshops geared towards academia and non-academia.

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

Professional Societies

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

Skills

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

Computer: Python (Proficient), ArcGIS (Intermediate), MySQL Workbench (Intermediate), LaTeX (Intermediate), Matlab (Intermediate), ImageJ (Intermediate), Adobe Creative Suite (Illustrator, InDesign, Photoshop) (Intermediate)

Laboratory: Drilling carbonates (paleosols, stalagmites, corals, forams) using a dental drill, Dremel, and New Wave micromill and CNC mill setup, preparing, analyzing, and reducing data of carbonate samples for traditional stable isotopes using an IRMS (MAT253, Delta Thermo V) attached to a KIEL III, IV, Gas Bench, water sample analyses using an IRMS attached to a continuous flow Gas Bench ($\delta^{18}\text{O}$) and TCEA

(δD), sample preparation for organic carbon $\delta^{13}C$ and $\delta^{15}N$ 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, analysis and data reduction (LA-tools package for Python) for LA-ICP-MS analysis of 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, XRD analysis, U-Series column chemistry.

Field: ISCO and LTC deployments in surface waters, cave-air monitoring for CO_2 , 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), Turkish (Working or Conversational, B2), Scottish Gaelic (Beginner, A1)