Approved by the Regents
May 16, 2024

PROMOTION RECOMMENDATION
The University of Michigan
College of Literature, Science, and the Arts

Sierra V. Petersen, assistant professor of earth and environmental sciences, College of Literature, Science, and the Arts, is recommended for promotion to associate professor of earth and environmental sciences, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	2014	Harvard University
M.S.	2012	Harvard University
B.Sc.	2009	California Institute of Technology

Professional Record:

2017-Present	Assistant Professor, Department of Earth and Environmental Sciences, University of Michigan
2016-2017	Post-doctoral Fellow, Department of Earth and Environmental Sciences, University of Michigan
2014-2016	NSF-OCE Post-doctoral Research Fellow, Department of Earth and Environmental Sciences, University of Michigan
2009-2014	Graduate Research Assistant/Fellow, Harvard University

Summary of Evaluation:

Teaching: Professor Petersen has taught one large-lecture introductory course intended for all UM students, one small-lecture course intended for all UM students, and one graduate seminar. With guidance from CRLT and the Foundational Course Initiative (led by teaching professor Michela Arnaboldi), she has made, and continues to make, remarkable progress in remodeling the "Introductory Oceanography" class. Professor Petersen leads a large and productive lab group, with students commonly taking the lead on papers, giving talks in major national and international meetings, and receiving awards (GRFP, RMF). Her graduate students and post-doctoral researchers have all published peer-reviewed scientific papers and have successfully obtained positions after leaving her group. She has embarked on a new effort to scale up undergraduate research with an authentic research experience class, which the department enthusiastically welcomes.

Research: Professor Petersen is at the forefront of the development and application of clumped and stable isotope techniques to achieve more accurate estimates of Earth's temperature history, particularly during warm-climate intervals of the past ~100 million years. She is leading novel work to reconstruct seasonal variations in temperature and seawater chemistry during these periods. She has applied her expertise in collaborations across a wide range of topics, including broader environmental and biologic aspects of the end-Cretaceous extinction; application of clumped isotopes to terrestrial carbonate deposits; and the relevance of "deep-time" research to understanding today's climate prediction challenges. The breadth of geographical locations and time periods covered in Professor Petersen's research, her strength in both methodology development and scientific applications, and the regard with which she is held by colleagues at Michigan and in the broader scientific community suggest a strong upward trajectory.

Recent and Significant Publications:

Petersen, S.V., W.F. Defliese, C. Saenger, M. Daëron, C.M. John, K.W. Huntington, J.R. Kelson, S.M. Bernasconi, A.S. Colman, T. Kluge, G.A. Olack, A.J. Schauer, D. Bajnai, M. Bonifacie, S.F.M Breitenbach, J. Fiebig, A.B. Fernandez, G.A. Henkes, D. Hodell, A. Katz, S. Kele, K.C. Lohmann, B.H. Passey, D.A. Petrizzo, B.E. Rosenheim, A. Tripati, R. Venturelli, E.D. Young, I.Z. Winkelstern. (2019). Effects of improved ^{17}O Correction on Inter-Laboratory Agreement in Clumped Isotope Calibrations, Estimates of Mineral-Specific Offsets and Temperature Dependence of Acid Digestion Fractionation, *Geochemistry, Geophysics, Geosystems*, *20*, 3495–3519. doi:10.1029/2018GC008127.

Jones, M.M., S.V. Petersen, A.N. Curley. (2022). Peak mid-Cretaceous greenhouse warmth in the Western Interior Seaway of North America, *Geology*, *50*(8). 954-958. doi:10.1130/G49998.1.

Curley, A.N., S.V. Petersen, S.M. Edie, R.C. Mohr, T.S. Tobin. (2023). Biologically driven isotopic fractionations in bivalves: paleoenvironmental problem to palaeophysiological proxy, *Biological Reviews*. doi:10.1111/brv.12940.

Huntington, K.W. and S.V. Petersen. (2023). Frontiers of Carbonate Clumped Isotope Thermometry, *Annual Review of Earth and Planetary Sciences*, *51*(1). doi:10.1146/annurev-earth-031621-085949.

Service: Professor Petersen is a valued colleague and faculty member of the Department of Earth and Environmental Sciences. She chaired the Laboratory Committee, playing a leadership role in development of a fair and sustainable departmental policy for technician support, following a long struggle over this issue. She transformed the department's internal grad student grants program to include a writing rubric, awards, and an opportunity for critical feedback. At the college and university level, Professor Petersen served on the SACUA Faculty COVID council and as a panelist of the Foundation Relations information session on Sloan Fellowships. Her external service has included convening sessions and judging student papers at national and international meetings.

External Reviewers:

Reviewer (A): "[Professor Petersen] has a stellar record of recognition of the importance and quality of her research as reflected by her successful NSF CAREER grant, her Sloan Fellowship, and the NSF Postdoctoral Fellowship. All of these are extremely competitive research awards and are reserved for the upper echelon of researchers; hence, this is evidence of the high regard that her peers and colleagues have for her research."

Reviewer (B): "In short, I see no reason why [Professor Petersen's case] is not an open and shut case for a successful tenure decision, and it is clearly strong enough to be successful in my department/ institution."

Reviewer (C): "I am very impressed with [Professor Petersen's] body of work. She utilizes the relatively new and powerful clumped isotope technique to determine paleotemperatures and water isotope compositions in modern and ancient samples. Although this breakthrough preceded her, she is applying the technique to important problems in paleoclimate. As importantly, she got into the field doing method development (at Harvard) and continues to improve the method and publish those improvements. So she's not just a user of this powerful technique, nor is she just a methods developer. She's doing it all, and that supports my conclusion that she'll have a sustained career in paleoclimatology with breakthroughs in analysis and interpretation."

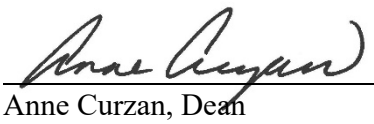
Reviewer (D): "Sierra Peterson [sic] is developing a strong international reputation in isotope geochemistry and its application to important and challenging scientific questions in

paleoclimatology. Her research is consistently of very high quality and exhibits a continuously expanding level of scientific breadth and impressive rigor. Her accomplishments to date are certainly comparable with those of other faculty who have been recently promoted to Full Professor at other research-one universities, including a couple colleagues at [my institution]."

Reviewer (E): "It is clear that Dr. Petersen is not just a user of clumped isotopes but she is also pushing forward on understanding the isotope system, its analytical issues and the role of mollusk physiology in setting the isotope signal…She is well on her way to be a leading expert on clumped isotope systems."

Reviewer (F): "The best measure of Dr. Petersen's scholarly impact is her major success at fund raising. First-authored papers or not, this a vote of confidence from the scientific community. The Early Career Award and Sloan Fellowship stand out, not to mention several other NSF awards. Taken as a whole, Dr. Petersen's scholarly output is quite exceptional."

Summary of Recommendation:
Professor Petersen is a generational leader in the development and application of clumped isotope thermometry to address critical questions about Earth's climate history, questions that had been spiraling unanswered because of limits affecting other paleotemperature proxies. The breadth, depth, and quality of her research program are impressive. Professor Petersen has a very active, innovative, productive, and visible, grant-supported research program; she is a respected role model for students; she mentors many undergraduate and graduate students in diverse research opportunities; she teaches at the undergraduate and graduate level; and she provides an abundance of service to her profession, university, department, and community. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Assistant Professor Sierra V. Petersen be promoted to the rank of associate professor of earth and environmental sciences, with tenure, College of Literature, Science, and the Arts.



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