

Lorraine E. Lisiecki

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Education

Ph.D., 2005, Geological Sciences, Brown University, Providence, RI

Thesis title: "Paleoclimate time series: New alignment and compositing techniques, a 5.3-Myr benthic $\delta^{18}\text{O}$ stack, and analysis of Pliocene-Pleistocene climate transitions"
Advisor: Prof. Timothy Herbert

Sc.M., 2003, Geological Sciences, Brown University, Providence, RI

Sc.M., 2000, Geosystems, Massachusetts Institute of Technology, Cambridge, MA

S.B., 1999, Earth, Atmospheric, and Planetary Science, Massachusetts Institute of Technology, Cambridge, MA

Professional and Academic Appointments

Associate Professor, Department of Earth Science, University of California, Santa Barbara, July 2012 – Present

Assistant Professor, Department of Earth Science, University of California, Santa Barbara, July 2008 – 2012

Research Fellow, Department of Earth Sciences, Boston University, Sept. 2007 – Aug. 2008

Postdoctoral Fellow, Department of Earth Sciences, Boston University, Sept. 2005 – Aug. 2007
NOAA Climate and Global Change Fellowship, Advisor: Prof. Maureen Raymo

Ph.D. Candidate, Department of Geological Sciences, Brown University, 2000 – 2005

Master's Candidate, Dept. of Earth, Atmosphere, and Planetary Science, Massachusetts Institute of Technology, 1999 – 2000

Research Assistant, Atmospheric and Environmental Research, Inc., Cambridge, MA, 1999

Research Interests

I believe we cannot confidently predict future climate change until we understand past climate responses. My research focuses on computational approaches to the comparison and interpretation of paleoclimate records because the integrated analysis of widely distributed paleoclimate records yields important information about the climate system that cannot be obtained by studying these records individually. I am particularly interested in the evolution of Plio-Pleistocene climate as it relates to orbital forcing, glacial cycles, the carbon cycle, and deep ocean circulation and in improving paleoclimate age models and quantifying uncertainty. I developed a "stack" (average) of benthic oxygen isotope ($\delta^{18}\text{O}$) records from 57 globally distributed sites, which provides the paleoclimate community with an important stratigraphic tool to aid in the comparison of widely distributed marine climate records. My current research focuses on glacial changes in the carbon cycle and deep ocean circulation and on quantifying/improving uncertainty in climate record and their age models.

Publications

Underline indicates a Lisiecki student or postdoctoral researcher

1. Khider, D., S. Ahn, L. E. **Lisiecki**, C. E. Lawrence, M. Kienast (in review), The role of uncertainty in estimating lead/lag relationships in sea surface temperatures in the tropical Pacific, *Paleoceanography*.
2. Schmittner, A., H. C. Bostock, O. Cartapanis, W. B. Curry, H. L. Filipsson, E. D. Galbraith, J. Gottschalk, J. C. Herguera García, S. Jaccard, L. E. **Lisiecki**, D. Lund, G. Martínez-Méndez, J. Lynch-Stieglitz, A. Mackensen, E. Michel, A. C. Mix, D. Oppo, C. D. Peterson*, H. J. Spero, and C. Waelbroeck (in review), Calibration of the Carbon Isotopic Composition ($\delta^{13}\text{C}$) of Epibenthic Foraminifera, *Paleoceanography*.
3. Ahn, S., D. Khider, L. E. **Lisiecki**, and C. E. Lawrence (in review), A probabilistic Pliocene-Pleistocene stack of benthic $\delta^{18}\text{O}$ using a profile hidden Markov model, *Dynamics and Statistics of the Climate System*.
4. **Lisiecki**, L. E., and Stern, J. V. (2016), Regional and global benthic $\delta^{18}\text{O}$ stacks for the last glacial cycle, *Paleoceanography*, 31, 1-27, doi:10.1002/2016PA003002.
5. Spratt, R. M., and L. E. **Lisiecki** (2016), A Late Pleistocene sea level stack, *Climate of the Past*, 12, 1079-1092, doi:10.5194/cp-12-1079-2016.
6. Gebbie, G., C. Peterson, L. **Lisiecki**, H. Spero (2015), Global-mean marine $\delta^{13}\text{C}$ and its uncertainty in a glacial state estimate, *Quaternary Science Reviews*, 125, 144-159.
7. Shakun, J.D., D.W. Lea, L. E. **Lisiecki**, and M.E. Raymo (2015), An 800-kyr record of global surface ocean $\delta^{18}\text{O}$ and implications for ice volume-temperature coupling, *Earth and Planetary Science Letters*, 426, 58-68.
8. Stern, J. V., and L. E. **Lisiecki** (2014), Termination 1 timing in radiocarbon-dated regional benthic $\delta^{18}\text{O}$ stacks, *Paleoceanography*, 29, 1127-1142, doi:10.1002/2014PA002700.
9. Lin, L., D. Khider, L. E. **Lisiecki**, and C. E. Lawrence (2014), Probabilistic Sequence Alignment of Stratigraphic Records, *Paleoceanography* 29, 976-989, doi:10.1002/2014PA002713.
10. Peterson, C. D., L. E. **Lisiecki**, and J. V. Stern (2014), Deglacial whole-ocean $\delta^{13}\text{C}$ change estimated from 480 benthic foraminiferal records, *Paleoceanography*, 29, 549-563, doi:10.1002/2013PA002552.
11. **Lisiecki**, L. E. (2014), Atlantic overturning responses to obliquity and precession over the last 3 Myr, *Paleoceanography*, 29, doi:10.1002/2013PA002505.
12. Stern, J. V., and L. E. **Lisiecki** (2013), North Atlantic circulation and reservoir age changes over the past 41,000 years, *Geophys. Res. Lett.*, 40, doi:10.1002/grl.50679.
13. Imbrie, J. Z., A. Imbrie-Moore, and L. E. **Lisiecki** (2011), A phase-space model for Pleistocene ice volume, *Earth and Planetary Science Letters*, 307, 94-102.
14. **Lisiecki**, L. E. (2010), A benthic $\delta^{13}\text{C}$ -based proxy for atmospheric pCO_2 over the last 1.5 Myr, *Geophys. Res. Lett.*, 37, L21708, doi:10.1029/2010GL045109.

15. **Lisiecki**, L. E. (2010), A simple mixing explanation for late Pleistocene changes in the Pacific-South Atlantic benthic $\delta^{13}\text{C}$ gradient, *Clim. Past*, 6, 305-314.
16. **Lisiecki**, L. E. (2010), Links between eccentricity forcing and the 100,000-year glacial cycle, *Nature Geoscience*, 3, 349-352.
17. **Lisiecki**, L. E., and M. E. Raymo (2009) Diachronous benthic $\delta^{18}\text{O}$ responses during Late Pleistocene terminations, *Paleoceanography* 24, PA3210, doi:10.1029/2009PA001732.
18. **Lisiecki**, L. E., M. E. Raymo, and W. B. Curry (2008), Atlantic overturning responses to Late Pleistocene climate forcings, *Nature* 456, 85-88.
19. **Lisiecki**, L. E., and T. D. Herbert (2007), Automated composite depth scale construction and estimates of sediment core extension, *Paleoceanography*, 22, PA4213, doi:10.1029/2006PA001401.
20. Kawamura, K., F. Parrenin, L. **Lisiecki**, and 15 others (2007), Northern Hemisphere forcing of climatic cycles in Antarctica over the past 360,000 years, *Nature*, 448, 912-917.
21. **Lisiecki**, L. E., and M. E. Raymo (2007), Plio-Pleistocene climate evolution: Trends and transitions in glacial cycle dynamics, *Quaternary Science Reviews*, 26, 56-69.
22. Raymo, M. E., L. E. **Lisiecki**, and K. H. Nisancioglu (2006), Plio-Pleistocene ice volume, Antarctic climate, and the global $\delta^{18}\text{O}$ record, *Science*, 313, doi: 10.1126/science.1123296.
23. **Lisiecki**, L. E., and M. E. Raymo (2005), A Pliocene-Pleistocene stack of 57 globally distributed benthic $\delta^{18}\text{O}$ records, *Paleoceanography*, 20, PA1003, doi:10.1029/2004PA001071.
24. Coles D., Y. Vichabian, R. Fleming, C. DesAutels, V. Briggs, P. Vermeesch, J. R. Arrell, L. **Lisiecki**, T. Kessler, H. Hooper, E. Jensen, J. Sogade, F. D. Morgan (2004), Spatial decision analysis of geothermal resource sites in the Qualibou Caldera, Saint Lucia, Lesser Antilles, *Geothermics*, 33(3), 277-308.
25. **Lisiecki**, L. E., and P. A. Lisiecki (2002), Application of dynamic programming to the correlation of paleoclimate records, *Paleoceanography*, 17, PA1049, doi:10.1029/2001PA000733.

Research Grants

- Spero, H., G. Gebbie, and L. E. Lisiecki, National Science Foundation – CDI. Collaborative Research – 4 Dimensional Visualization of Past Ocean Circulation from Paleoceanographic Data, \$303,207. Sept. 2011 – Sept. 2015
- Lawrence, C. and L. E. Lisiecki, National Science Foundation – CMG. Uncertainty estimation in graphic correlation algorithm, \$234,170. Sept. 2010 – Sept. 2013
- Lisiecki, L.E., National Science Foundation – MGG. Climate forcing of Atlantic overturning over the last 3 Myr. \$317,113. Sept. 2009 – August 2012.

Meeting Abstracts (past 5 years)

- Lisiecki, L. E. C. Herrero, and A. Garcia-Olivares (2016), Insight to Marine Isotope Stage 13 using Late Pleistocene relaxation models of ice volume and carbon cycle change, 2016 Fall Meeting, AGU, San Francisco, Calif.
- Lisiecki, L. E., S. Ahn, A. Jones, D. Khider, C. E. Lawrence, G. Gebbie (invited, 2016) Quantitative Approaches to Paleoclimate Data, Models, and Their Intercomparison, 2016 Fall Meeting, AGU, San Francisco, Calif.
- Peterson, C., and L. E. Lisiecki (2016), Benthic $\delta^{13}\text{C}$ stacks: Metrics for deglacial changes in deep ocean carbon storage and the terrestrial biosphere, 2016 Fall Meeting, AGU, San Francisco, Calif.
- Lisiecki (2016), Marine Isotope Stratigraphy and Termination Timing, QUIGS “Glacial Terminations: Timing & Shape” Workshop, Montreal
- Lisiecki (2016), What is the future of stacking?, 12th International Conference on Paleoceanography
- Peterson, C., and L. E. Lisiecki (2016), Benthic $\delta^{13}\text{C}$ stacks: Metrics for deglacial changes in deep ocean carbon storage and the terrestrial biosphere, 12th International Conference on Paleoceanography.
- Ahn, S., D. Khider, L. E. Lisiecki, and C. E. Lawrence (2016), A probabilistic Pliocene-Pleistocene stack of benthic $\delta^{18}\text{O}$ using a profile hidden Markov model, 12th International Conference on Paleoceanography.
- Ahn, S., D. Khider, L. E. Lisiecki, and C. E. Lawrence (2015) Probabilistic Stack of 178 Plio-Pleistocene Benthic $\delta^{18}\text{O}$ Records Constructed Using Profile Hidden Markov Models, 2015 Fall Meeting, AGU, San Francisco, Calif.
- Shakun, J. D., D.W. Lea, L. E. Lisiecki, and M.E. Raymo (2015), An 800-kyr Record of Global Surface Ocean $\delta^{18}\text{O}$ and Implications for Ice Volume-Temperature Coupling, 2015 Fall Meeting, AGU, San Francisco, Calif.
- Peterson, C., and L. E. Lisiecki (2015), Deglacial and global benthic $\delta^{13}\text{C}$ stacks, 2015 Fall Meeting, AGU, San Francisco, Calif.
- Peterson, C., and L. E. Lisiecki (2015), 3D movies for teaching seafloor bathymetry, plate tectonics, and ocean circulation in large undergraduate classes, 2015 Fall Meeting, AGU, San Francisco, Calif.
- Khider, D., S. Ahn, L. E. Lisiecki, C. E. Lawrence, M. Kienast (2015), On the timing of glacial terminations in the equatorial Pacific, 2015 Fall Meeting, AGU, San Francisco, Calif.
- Khider, D., and L.E. Lisiecki (2014), Statistical constraints on the relative link between eccentricity forcing and the 100,000-year glacial cycle, Abstract PP41D-1436 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec.
- Peterson, C., and L.E. Lisiecki (2014), Spatio-temporal variability in benthic $\delta^{13}\text{C}$ across the last deglaciation, Abstract PP11B-1344 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec
- Spratt, R., and L.E. Lisiecki (2014), Late Pleistocene sea level stack, Abstract PP33C-1258 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec.
- Lisiecki, L. E., and J.V. Stern (2014), New benthic $\delta^{18}\text{O}$ stacks and age models for the last glacial cycle (0-150 kyr ago), Abstract PP41D-1434 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec.

- Shakun, J., D.W. Lea, L.E. Lisiecki, and M.E. Raymo (2014), An 800-kyr record of global surface ocean $\delta^{18}\text{O}$ and implications for ice volume-temperature coupling, Abstract PP41F-04 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec.
- Gebbie, G., C. Peterson, L.E. Lisiecki, and H. Spero (2014), Toward the inference of deglacial ocean dynamics from the spatial pattern of LGM-to-modern $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ change, Abstract PP41B-06 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec.
- Lisiecki, L. E., and J.V. Stern (2014), An isolated deep Indian water mass during Heinrich 1?, iPODS-OC3 Joint Meeting, Bern, Switzerland, 30 Sept-3 Oct
- Peterson, C., and L.E. Lisiecki (2014), Spatio-temporal variability in benthic $\delta^{13}\text{C}$ across the last deglaciation, iPODS-OC3 Joint Meeting, Bern, Switzerland, 30 Sept-3 Oct
- Lisiecki, L. E. (2014), Orbital responses in North Atlantic ice-rafted debris records and links with overturning circulation, Goldschmidt, Sacramento, CA
- Lisiecki, L. E. (2013), On the interpretation of Late Pleistocene 100-kyr phases, Abstract PP11A-1800 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
- Stern, J., and L. E. Lisiecki (2013), Regional benthic $\delta^{18}\text{O}$ stacks with radiocarbon age models show Termination I onset differences of up to 4,000 years, Abstract PP13B-1891 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
- Peterson, C. D., L. E. Lisiecki, and G. Gebbie (2013), Two techniques for estimating deglacial mean-ocean $\delta^{13}\text{C}$ change from the same set of 493 Benthic $\delta^{13}\text{C}$ Records, Abstract PP21E-06 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
- Lawrence, C.E., L. Lin, J. Stern*, L.E. Lisiecki (2013), Probabilistic sequence alignment of Late Pleistocene benthic $\delta^{18}\text{O}$ data, Abstract PP11A-1799 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
- Lisiecki, L. E., and J. Stern* (2013), Improving paleoceanographic chronologies of the last 40 kyr: ^{14}C -dated regional $\delta^{18}\text{O}$ stacks and North Atlantic reservoir ages, PMIP Ocean Workshop, Corvallis, OR
- Stern, J., and L.E. Lisiecki (2013), North Atlantic Circulation and Radiocarbon Reservoir Ages, PMIP Ocean Workshop, Corvallis, OR
- Peterson, C.D., L.E. Lisiecki, and J.V. Stern* (2013), Deglacial whole-ocean $\delta^{13}\text{C}$ change estimated from 480 benthic foraminiferal records, oral presentation at PMIP ocean workshop – Understanding changes since the Last Glacial Maximum, Corvallis, Oregon
- Lisiecki, L. E., and J. Stern (2013), Improving paleoceanographic chronologies of the last 40 kyr: ^{14}C -dated regional $\delta^{18}\text{O}$ stacks and North Atlantic reservoir ages, 11th International Conference on Paleoceanography, Sitges, Spain
- Peterson, C.D., G. Gebbie, A. Gerndt, H. Hagen, B. Hamann, L. Kellogg, L.E. Lisiecki, H. Spero, G. Streletz, R. Westerteiger (2013), 3D Visualization of Past Ocean Circulation, 11th International Conference on Paleoceanography, Sitges, Spain
- Lawrence, C., L. E. Lisiecki, and L. Lin (2013), Probabilistic sequence alignment of Late Pleistocene benthic $\delta^{18}\text{O}$ data, 11th International Conference on Paleoceanography, Sitges, Spain
- Peterson, C. D., and L. E. Lisiecki (2013) Deglacial change in terrestrial carbon storage estimated by benthic $\delta^{13}\text{C}$, Goldschmidt, Florence, Italy
- Stern, J., and L.E. Lisiecki (2012), Timing of deglacial changes in regional Atlantic benthic $\delta^{18}\text{O}$, EGU, Vienna, 2012
- Lisiecki, L. E. (invited, 2012) Links between Orbital Eccentricity and the 100-kyr Glacial Cycle, International Partnerships in Ice Core Science, Presqu'île de Giens, France.

- Stern, J., and L. E. Lisiecki (invited, 2012) Timing of benthic $\delta^{18}\text{O}$ change in regional radiocarbon-dated stacks, Northeastern Section Annual Meeting, GSA, Hartford, CT
- Lisiecki, L. E. (2012), Orbital Responses of North Atlantic Deep Water Formation and Ice Rafting since 1.5 Ma, Abstract PP23B-2050 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
- Peterson, C. D., and L. E. Lisiecki (2012), Deglacial change in terrestrial carbon storage estimated by benthic $\delta^{13}\text{C}$, Abstract PP51A-2090 in: Abstract Proceedings of American Geophysical Union Fall Meeting 2012, Eos Trans. AGU 93, Fall Meeting Suppl., AGU Meetings Department, Washington, D.C.
- Stern, J., and L. E. Lisiecki (2012), High Latitude North Atlantic Reservoir Age History: Implications for Age Models, Carbon Cycling, and the Timing of Ocean Circulation Changes, Abstract PP51A-2094 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

Awards & Honors

- Subaru Outstanding Woman in Science Award, Geological Society of America, 2008
- Editors' Citation for Excellence in Refereeing for *Paleoceanography*, 2008
- Travel funding to the Leverhulme Climate Symposium, March 2008.
- NOAA Climate and Global Change Postdoctoral Fellowship, September 2005 – August 2007
- Joukowsky Outstanding Dissertation Award, May 2005
(The sole dissertation award presented by Brown for the physical sciences.)
- Charles Wilson Brown Fellowship, September 2004 – May 2005
- Schlanger Ocean Drilling Fellowship, September 2002 – August 2003
- University Fellowship, Brown University, September 2000 – May 2001
- Graduate Fellowship, Exxon Educational Foundation, September 1999 – May 2000

Professional Organizations

- American Geophysical Union, Earth Science Women's Network, National Association of Geoscience Teachers, Union of Concerned Scientists

Other Professional Activities

- OC3 (a PAGES working group) organizing committee
- Founder and organizer of Earth Science Women's Book Club at UCSB (2013-2017)
- Interview on forecastpod.org, 2015
- Session convener and chair at 2014 AGU Fall Meeting: Understanding Uncertainties in Paleoclimate and Paleoecology: Age Models, Proxy Processes, and Beyond II
- NSF OCE review panel, Fall 2014
- Organizing committee for PAGES OC3 working group (Ocean Circulation and Carbon Cycling)
- IODP Schlanger Fellowship review panel, January 2014
- Guest editor for *Proceedings of the National Academy of Science*, 2009
- Mentor for GSA Women in Geology Mentor Program, 2008
- On-air interview on Progressive Radio Network show "Paradise Parking Lot," 2008.
- Organizer of Climate Science Seminar, Boston University, September 2005 – 2008

Session chair, American Geophysical Union Fall Meeting, 2007

Referee for *Nature*, 2008-2010, 2016; *Science*, 2013, 2014; *Geology*, 2014, 2015; NSF proposals, 2009-2010, 2012-2017; *Nature Geoscience*, 2008, 2010, 2012, 2016; *Nature Communication*, 2013; *PNAS*, 2017; *Paleoceanography*, 2006-2008, 2010, 2012-2016; *Climate of the Past*, 2016; *G-cubed*, 2016; *Journal of Geophysical Research*, 2013; *Quaternary Geochronology*, 2014; *Journal of Climatic Change*, 2012; *Geophysical Research Letters*, 2006-2008, 2010; Integrated Ocean Drilling Program, 2005, 2009; ACS Petroleum Research Fund, 2012; *Journal of Quaternary Science*, 2009; *Climate Research*, 2009; *Earth and Planetary Science Letters*, 2004-2008, 2012, 2014-2015; *Quaternary Science Reviews*, 2005, 2012, 2014

UCSB Courses Taught

Earth 201C, Mathematical Methods in Earth Science

Earth 105/205, Earth's Climate: Past and Present

Earth 106/206, Introduction to Climate Modeling

Earth 4, Introduction to Oceanography

Earth 270, Writer's Club

Students & Post-docs Advised

Joseph V. Stern, PhD, 2014

Deborah Khider, post-doc, 2013-2015

Carlye Peterson, PhD, 2016

Rachel Spratt, PhD, expected 2018

Alan Jones, Masters, expected 2017