

# Dr. Lorraine E. Lisiecki

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## Education

### Brown University, Providence, RI

**Ph.D.**, Geological Sciences, May 2005

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.**, Geological Sciences, May 2003

### Massachusetts Institute of Technology, Cambridge, MA

**S.M.**, Geosystems, June 2000

Thesis title: "The effect of changing topological constraints on poleward ocean heat transport induced by plate tectonics over the last 600 million years"

Advisor: Prof. John Marshall

**S.B.**, Earth, Atmospheric, and Planetary Science, February 1999

## Research Interests

My research focuses on computational approaches to the comparison and interpretation of paleoclimate records. The integrated analysis of widely distributed paleoclimate records will yield important information about the climate system that cannot be obtained by studying these records individually. My current research focuses on the evolution of Plio-Pleistocene climate as it relates to orbital forcing, glacial cycles, and deep ocean circulation because we cannot confidently predict future climate change unless we understand past climate responses. In the future, I will apply these techniques to study climate responses on a wide range of timescales. I also develop and distribute software related to age model development and stratigraphy.

My dissertation research involved the development of an automated stratigraphic alignment algorithm and its application to the construction of composite depth sections for ocean sediment cores and to the alignment of benthic oxygen isotope ( $\delta^{18}\text{O}$ ) stratigraphy from 57 globally distributed sites. The averaged  $\delta^{18}\text{O}$  record provides the paleoclimate community with an important stratigraphic tool to aid in the comparison of widely distributed marine climate records and has been cited by >85 journal articles since 2005. My current research focus is the analysis of spatial gradients in benthic  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  records to reconstruct changes in thermohaline circulation over the past 2 Myr.

## Research Experience

Boston University, Department of Earth Sciences

**Postdoctoral research**, September 2005 – Present

NOAA Climate and Global Change Fellowship, Advisor: Prof. Maureen Raymo  
Thermohaline circulation, glacial cycles,  $\delta^{13}\text{C}$  interpretation, ice core age models

Brown University, Department of Geological Sciences

**Dissertation research**, September 2000 – May 2005

Time series analysis,  $\delta^{18}\text{O}$  interpretation, dynamic programming, software development

Massachusetts Institute of Technology, Dept. of Earth, Atmosphere, and Planetary Science

**Master's thesis research**, September 1999 – May 2000

Designed and implemented ocean GCM experiments

**Field research**, January 2000

Decision analysis, geophysical measurements

Atmospheric and Environmental Research, Inc., Cambridge, MA

**Research assistant**, February 1999 – August 1999

Automated calculation of orbital parameters

**NSF Research Experience for Undergraduates**, June 1998 – August 1998

Modeled Io's atmospheric heating and particle collisions

## Academic Honors

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

National Merit Scholarship, September 1995 – May 1996

## Publications

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.

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.

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.

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.

- 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.
- 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.
- 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.

**In Review/In Preparation:**

- Lisiecki, L. E., M. E. Raymo, and W. B. Curry (in review at *Nature*), Frequency-dependent responses in Atlantic overturning over the past 425,000 years.
- Lisiecki, L. E., and M. E. Raymo (in preparation), Termination age differences in Atlantic and Pacific benthic  $\delta^{18}\text{O}$ .
- Lisiecki, L. E., and M. E. Raymo (in preparation), Glacial cycles in Atlantic deep water mass geometry.
- Kawamura, K., L. E. Lisiecki, M. E. Raymo, W. G. Thompson, and J. P. Severinghaus (in preparation), What controls the pacing of 100-ky glacial cycles?

**Invited Talks, Meeting Abstracts, etc.:**

- Lisiecki, L. E., and M. E. Raymo (2007, invited), North Atlantic Deep Water responses to obliquity and precession, AGU Fall Meeting, Abstract PP42B-07.
- Lisiecki, L. E., and M. E. Raymo (2007), Age differences between Atlantic and Pacific benthic  $\delta^{18}\text{O}$  change at terminations, AGU Fall Meeting, Abstract PP51B-0482.
- Lisiecki, L. E. (2007, invited), Trends and transitions in Plio-Pleistocene glacial cycle dynamics, IODP Topical Symposium, North Atlantic and Arctic Climate Variability, Universität Bremen, Germany.
- Lisiecki, L. E., and M. E. Raymo (2006), Quantifying the effects of changes in ocean circulation and endmember composition on variability in Late Pleistocene carbon isotope records, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract PP31A-1733.
- Raymo, M. E., L. Lisiecki, and K. H. Nisancioglu (2006, invited), Plio-Pleistocene ice volume, Antarctic climate, and the global  $\delta^{18}\text{O}$  record, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract PP51B-1135.
- Raymo, M. E., K. Kawamura, L. Lisiecki, W. G. Thompson, and J. P. Severinghaus (2006), What controls the pacing of 100-ky glacial cycles?, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract GC24A-01.
- Thompson, W. G., H. A. Curran, and L. Lisiecki (2006), The coral record of millennial-scale sea level change: An orbital influence, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract GC24A-03.
- Lisiecki, L. E. (2006, invited), Trends and transitions in Plio-Pleistocene climate dynamics, International Symposium on the Dynamics of the Ice Age Climate, Nagoya, Japan.
- Lisiecki, L. E. (2006, invited), Multiple modes of orbital-scale change in thermohaline circulation, Summer Institute for the NOAA Climate and Global Change Postdoctoral Fellowship Program.

- Lisiecki, L. E. (2006), A new automated technique for the construction of more accurate composite depth, JOI CoreWall Workshop.
- Lisiecki, L. E., and M. E. Raymo (2005), Multiple modes of orbital-scale change in thermohaline circulation?, *Eos Trans. AGU*, 86(52), Fall Meet. Suppl., Abstract PP33A-1554. (View poster at <http://lorraine-lisiecki.com/agu05>)
- Lisiecki, L. E. (2004), The spectral evolution of Plio-Pleistocene  $\delta^{18}\text{O}$ , *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract PP33B-0947.
- Lisiecki, L. E. (2003), A new automated technique for the construction of more accurate composite depth scales and an analysis of core deformation in different sediment types, *Eos Trans. AGU*, 84(46), Fall Meet. Suppl., Abstract U11B-0010.
- Lisiecki, L. E. (2003), 5.3-Myr benthic  $\delta^{18}\text{O}$  stack of 41 sites, *Geophys. Res. Abstracts*, 5, EGS-AGU-EUG Joint Assembly, OS15-1TH3P-0579.

## Teaching Philosophy

I believe that student participation and the practical application of theory are crucial components of the learning process. My primary goals are to convey an understanding of how science works in addition to teaching the fundamental concepts of Earth system science and developing critical thinking skills. To this end, I focus on the scientific process, providing exposure to scientific literature, practicing writing skills, and promoting discussion of conflicting theories and sources of uncertainty. I also believe in a balance between qualitative, intuitive descriptions and quantitative, physical relationships. In my experience, computer exercises are excellent interactive teaching tools which engage students in the learning process.

## Teaching Experience

Teaching assistant, Brown University, Providence, RI

Introduction to Oceanography, Spring 2004

Field trips, office hours, grading

Stratigraphy and Sedimentation, Fall 2003

Laboratory teaching, field trips, office hours, grading

Meteorological Aspects of Climate Change, Spring 2002

Laboratory design and teaching, office hours, grading

Mars, Moon, and the Earth, Fall 2001

Office hours, grading

Completed a series of seminars and workshops on teaching presented by the Harriet W. Sheridan Center for Teaching and Learning at Brown University.

## Other Professional Activities

Organizer of Climate Science Seminar, Boston University, September 2005 – Present

Seminar speaker at Harvard University, Columbia University, Woods Hole Oceanographic Institute, Brown University, and Boston University

Session chair, American Geophysical Union Fall Meeting, 2007

Referee for *Earth and Planetary Science Letters*, 2004-2007; *Geophysical Research Letters*, 2006-2007; *Paleoceanography*, 2006-2007; Integrated Ocean Drilling Program, 2005; *Quaternary Science Reviews*, 2005

Member of American Geophysical Union, AAAS, Sigma Xi, Earth Science Women's Network  
Attended Climate Working Group Retreat: NOAA and the Drought Challenge. Santa Fe, New Mexico, July 31- August 4, 2006.

## **Research Skills**

Data analysis: principal component analysis, time series analysis,  
computational probability and statistics

Algorithms and models: Monte Carlo, box models, ocean GCMs, dynamic programming

Computer languages: Matlab, C, FORTRAN