Specific Responses to Forcing as Detected In Paleoclimate Reconstructions of Past Centuries. Submitted for the AGU 2003 Fall Meeting

J **Rutherford, S.D**. M.E. Mann, T.J. Osborn, R.S. Bradley, K.R. Briffa, M.K. Hughes and P.D. Jones, 2003. Proxy-base Northern Hemisphere surface temperature reconstructions: Sensitivity to methodology, predictor network, target season and target domain. *Journal of Climate*, in review.

J Mann, M.E., **S.D. Rutherford**, R.S. Bradley, M. Hughes, F. Keimig, 2003. Optimal Surface Temperature Reconstructions Using Terrestrial Borehole Data. *Journal of Geophysical Research*, VOL. 108, NO. D7, 4203, doi:10.1029/2002JD002532.

J Kashiyama, Y., D.E. Fastovsky, **S.D. Rutherford**, J. King and M. Montellano, 2003. Genesis of a locality of exceptional fossil preservation: Paleoenvironments of Tepexi de Rodriguez (mid-Cretaceous, Puebla, Mexico). *Cretaceous Research* 24:407-431.

J Mann, Michael E., Caspar Amman, Ray Bradley, Keith Briffa, Philip Jones, Tim Osborn, Tom Crowley, Malcolm Hughes, Michael Oppenheimer, Jonathan Overpeck, **Scott Rutherford**, Kevin Trenberth and Tom Wigley, 2003. On Past Temperatures and Anomalous Late-20th Century Warmth *Eos*,Vol. 84, No. 27.

J **Rutherford, S.D.**, M.E. Mann, T. Delworth and R. Stouffer, 2003. The Performance of climate field reconstruction under stationary and nonstationary forcing. *Journal of Climate*, 16:462-479.

A Manor, Uri and **Scott Rutherford**. An improved numerical model for determining chemical reaction rates. Fourteenth Annual Argonne Symposium for Undergraduates in Science, Mathematics and Engineering. Argonne National Laboratory, October 24-25, 2003.

J **Rutherford, S.D.** S. D'Hondt and W. Prell, 1999. Environmental controls on the geographic distribution of zooplankton diversity. *Nature* 400: 749-753.

J Bennington, J. B. and **S. D. Rutherford**, 1999. Precession and reliability in paleocommunity comparisons based on cluster-confidence intervals: How to get more statistical bang for your sampling buck. *Palaios,* 14:506-515.

2000

J **Rutherford, S.D.** and S. D'Hondt, 2000. Early onset and tropical forcing of 100,000 year Pleistocene glacial cycles. *Nature* 408:72-75.

B Peterson, L.C., G.H. Haug, R.W. Murray, K.M. Yarincik, J.W. King, T.J. Bralower, K. Kameo, **S.D. Rutherford** and R.B. Pearce, 2000. Late Quaternary stratigraphy and sedimentation at ODP Site 1002, Cariaco Basin (Venezuela). *Proceedings of the Ocean Drilling Program, Scientific Results, Leg 165.*

A **Rutherford, S.D.**, M. Mann, T. Schneider, T. Delworth and R. Stouffer, The Performance of Covariance-Based Methods of Climate Field Reconstruction Under Stationary and Nonstationary Forcing. *EOS Trans. AGU*, 2000.

A D'Hondt, S., **S.D. Rutherford** and A. Spivack, Chemical limits to microbial communities in deep-sea sediments. *EOS Trans. AGU*, 2000.

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A Kashiyama, Y., D.E. Fastovsky, J. King, **S.D. Rutherford** and M. Montellano, Paleoenvironmental reconstruction of an extraordinary mid-Cretaceous biota, Tepexi de Rodriguez, Pueblo, Mexico. *GSA Abstracts with Programs* Vol. 33, No. 6, 2001.

2002

J Mann, M.E., and **S.D. Rutherford**, 2002. Climate Reconstruction Using 'Pseudoproxies', *Geophysical Research Letters*, 29:10 10.1029/2001GL014554.

J D'Hondt, S., **S.D. Rutherford**, and A.J. Spivack, 2002. Metabolic activity of the subsurface biosphere in deep-sea sediments. *Science* 295:2067-2070.

A **Rutherford, S.D.**, S. D'Hondt and A.J. Spivack, 2002. Global rates of sulfate reduction in deeply-buried marine sediments. *Astrobiology* 2:550.

A Wang, G., **S.D. Rutherford**, S.D'Hondt and A.J. Spivack and the ODP Leg 201 Shipboard Scientific Party, 2002. Distribution of metabolic activity within a deep-sea sediment column. *Astrobiology* 2:556.

A **Rutherford, S.D.**, M.E. Mann R.S. Bradley, K.R. Briffa, M.K. Hughes, P.D. Jones and T.J. Osborn, 2002. Proxy-Based Reconstruction of Surface Temperature Variations in Past Centuries, *EOS Trans. AGU.*

A **Rutherford, S.D.** Mann, M.E. Proxy-Based Reconstructions of Surface Temperature Patterns During the Maunder Minimum, *EOS Trans. AGU* 2002.

A Mann. M.E., **S.D. Rutherford**, R.S. Bradley and M.K. Hughes. Climate Change and Forcing over the Past 500 years. Abstract EGS02-A-01895 *Geophysical Research Abstracts* (European Geophysical Society), 2002.

2003

A Michael E. Mann, Brad Adams, Caspar Ammann, Ronald Miller, **Scott Rutherford**, Gavin A. Schmidt, Drew T. Shindell. Spatially and Seasonally-

c) Hillary Shoreland: "Microbial activity in deep sea sediments." (project TBD).
d) Ashley Smith and Kate Rossi-Snook (co-advisor with Tim Scott) "Shifts in the distribution of diatoms in the sediment of Mount Hope Bay, Rhode Island, due to the ecological responses to thermal pollution."

Courses taught:

1997	OCG 401, Introduction to Oceanography (URI-CCE).
1998-1999	Two sessions of a 2-day Web Design course for the Narragansett Bay Classroom (OMP).
1999	Web Design for Math & Science Educators (EDC 921M)
2003	Science: Discoveries in Context, Marine Geology

V. Bibliography:

Key:
J = Articles in Professional Journals
A = Abstracts of Conference Presentations
C = Papers in Conference Proceedings
B = Books and Book Sections
P = Popular Articles
R = Reports
O = Other
T = Thesis

1996

A Rutherford, S.D. and S. D'Hondt, Re-evaluating latitudinal gradients in planktic foraminiferal diversity, *Geol. Soc. Amer. Abstr. Programs*, 1996.

A **Rutherford, S.D.** and T. King, Evolutive cross-spectral analysis of equatorial Atlantic and Pacific carbonate sedimentation from 0-6 Ma, EOS Trans. AGU, 77, 1996.

A Bennington, J B. and **S.D. Rutherford**, Calculating confidence intervals for species counts in paleoecological studies: A comparison of methods, Geol. Soc. Amer. Abstr. Programs, 1996.

1998

A **Rutherford, S.D.** and S. D'Hondt, Using EOFs to produce a $\delta^{18}O$ stack and $\delta^{18}O$ anomalies for the last 200 ky, *EOS Trans. AGU*, 79,1998.

A **Rutherford, S.D.** and S. D'Hondt, Propagation from the tropics to the high latitude North Atlantic of a linear response to orbital forcing at 1.6 Ma, *EOS Trans. AGU*, 69, 1998

A Wara, M.W., A.C. Ravelo, **S.D. Rutherford** and S. D'Hondt, Sub-Milankovitch variability in the North Atlantic: A pervasive feature of Pleistocene climate (abstract), *EOS Trans. AGU*, 69, 1998.

A Wara, M. W., A.C. Ravelo, **S.D. Rutherford** and S. D'Hondt, Sub-Milankovitch climate variability in the North Atlantic: A Plio-Pleistocene comparison (abstract) International Conference on Paleoceanography, 1998.

R **Rutherford, S.D.** Elevation Profiling of Eight Barrier Beaches on Rhode Island's South Shore: September 1995 to August 1996. University of Rhode Island, Graduate School of Oceanography, 1998.

1999

A **Rutherford, S.D.** and S. D'Hondt, The geographic distribution of zooplankton diversity, Geol. Soc. Amer. Abstr. Programs, *Geol. Soc. Amer. Abstr. Programs*, 1999.

Co-authored fall AGU abstract in 2000.
Dr. Larry Peterson, University of Miami.
Co-authored Ocean Drilling Program, Scientific Results Chapter in 2000
Dr. Gerald H. Haug, Woods Hole Oceanographic Institution,
Co-authored Ocean Drilling Program, Scientific Results Chapter in 2000
Dr. Richard W. Murray, Boston University,
Co-authored Ocean Drilling Program, Scientific Results Chapter in 2000
Dr. Timothy J. Bralower, Pennsylvania State University,
Co-authored Ocean Drilling Program, Scientific Results Chapter in 2000

Lectures and Seminars, Other Than at Professional Meetings:

1997	Introduction to Oceanography , Instructor, University of Rhode Island.
1997	"Milankovitch-band phase variability in the equatorial Atlantic and eastern equatorial Pacific", Brown University
1998	"Oceanography in a Nutshell", GSO SURFO program lecture.
1998	"Scientific Ocean Drilling aboard the R/V JOIDES Resolution", Friends of Oceanography Community Lecture,.
1999	"Geological Oceanography", GSO SURFO program lecture.
1999	"Marine Microfossils: What?, How? and Why?", New York State Marine Education Association, Southampton, NY.
2000	"Multiproxy Climate Field Reconstruction", University of Virginia Atmospheric Sciences seminar series.
2001	"Methodological Approaches to Multiproxy Climate Reconstruction", CLIVAR/PAGES Workshop, Reconstructing Late Holocene Climate, Charlottesville, VA.
2003	"Reconstructing Climate of the last few millennium: The late 20th Century in Perspective." Roger Williams University, Natural Science seminar series.

III. PUBLIC AND INSTITUTIONAL SERVICE:

Professional Societies:

Membership:
American Geophysical Union

Reviewer:
Nature
Paleoceanography
Journal of Climate
Journal of Geophysical Research
Geology

IV. TEACHING ACTIVITIES:

Graduate Student Committee Service:

a) Yuichiro Kashiyama, (URI M.S., 2001, Committee member).
b) Magdalena Andres (URI M.S. 2001, Defense chair).
c) Kurt Rosenberger (URI M.S. 2001, Defense chair).
d) Jennifer Webster (URI M.S.-Defended 2001, Defense chair).

Undergraduate Research:

a) Justin Anderson: "Evaluation of climate reconstruction methods using pseudoproxies."
b) Erika Hasle: "An annual resolution climate record from Narrow River, Narragansett, RI: Organic carbon and sediment color analysis."

standardized database of climate and ecological data that will be accessible to all. The data will allow for examination of low- and high-frequency local responses to large-scale atmospheric patterns and the examination of ecological variability related to climate. These data also permit the analyis of climate trends and extreme event frequency over the last century.

Pliocene-Pleistocene Paleoceanography: The evolution of glacial cycles over the last several million years is one of the most perplexing problems in paleoclimatology/paleoceanography. In the Pliocene glacial cycles varied with a dominant 41,000 year period, whereas the late Pleistocene is dominated by 100,000 year glacial cycles. My research attempts to understand the role that meridional ocean heat transport may have played in this transition.

Deep Biosphere and Global Biogeochemical Cycles: The microbial biosphere in marine sediments is estimated to contain 10-30 percent of Earth's biomass, yet it's metabolic activity and impact on global biogeochemical cycles is not well known. My research in this field is aimed at understanding how the microbial activity varies geographically and with depth in marine sediments and to understand the global impact of these microbes.

2. Outside Collaborators

Dr. J Bret Bennington, Hofstra University
Co-authored *Palaios* paper in 1999.
Co-authored Geological Society of America abstract in 1996.
Dr. Katharina Billups, University of Delaware.
Co-authored NSF proposal in 2002.
Dr. Raymond S. Bradley, University of Massachusetts.
Co-authored paper in *Journal of Climate* in press 2002
Co-authored paper in *Journal of Geophysical Research* in press 2002
Co-authored fall and spring AGU abstracts in 2002 and European Geophysical Society abstract.
Dr. Keith R. Briffa, University of East Anglia
Co-authored fall AGU abstract in 2002.
Dr. William P. Chaisson, University of Rochester.
Co-authored NSF proposal in 2002.
Dr. Thomas L. Delworth, Geophysical Fluid Dynamics Laboratory
Co-authored paper in *Journal of Climate* in press 2002
Co-authored fall AGU abstract in 2000.
Dr. Malcolm K. Hughes, University of Arizona
Co-authored paper in *Journal of Climate* in press 2002
Co-authored paper in *Journal of Geophysical Research* in press 2002
Co-authored fall and spring AGU abstracts in 2002 and European Geophysical Society abstract.
Dr. Philip D. Jones, University of East Anglia
Co-authored fall AGU abstract in 2002.
Dr. Michael Mann, University of Virginia.
Co-authored paper in *Geophysical Research Letters* in 2002
Co-authored paper in *Journal of Climate* 2003
Co-authored paper in *Journal of Geophysical Research* 2003
Co-authored fall and spring AGU abstracts in 2002 and European Geophysical Society abstract.
Dr. Warren Prell, Brown University
Co-authored paper in *Nature* in 1999
Dr. Ronald J. Stouffer, Geophysical Fluid Dynamics Laboratory
Co-authored paper in *Journal of Climate* 2003

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I. PROFESSIONAL HISTORY:

Educational History:

Ph.D.	- 1999	University of Rhode Island (Oceanography)
M.S.	- 1994	Virginia Polytechnic Institute and State University (Geological Sciences)
B.S.	- 1991	Temple University (Geology—*Cum Laude*)

Professional History:

2003-present	Asstistant Professor, Roger Williams University
2002 - 2003	Assistant Marine Research Scientist, University of Rhode Island
2001 - present	Adjunct Asst. Professor, University of Rhode Island
2000 - 2002	Research Associate, University of Virginia
1999 - 2002	Post-Doctoral Researcher , University of Rhode Island
1995 -1999	Graduate Research Assistant, University of Rhode Island

II. RESEARCH ACTIVITIES:

A. Area of Specialization:

Currently, I am involved in two very different fields of research: climatology/paleoclimatology and biogeochemical studies of microbes living deep beneath the sea floor (i.e. deep biosphere). My research in climatology/paleoclimatology is focused on understanding climate response to internal and external forcing at temporal scales ranging from decades and centuries to Milankovitch (10^5 years) scales and beyond. In this context I am probably best described as a Statistical Climatologist with expertise in spatio-temporal data analysis.

My research into the deep biosphere is focused on the metabolic activity of sub-seafloor microbes and their impact on Earth's global biogeochemical cycles. This involves analysis of several decades of chemical measurements made on sedimentary pore waters as well as the development numerical models of subsurface ecosystems.

1. Research and its significance

Climate Field Reconstruction: To understand the significance of the late 20th Century climatic warming it is critical to place it in the context of longer-term climate variability under various conditions of radiative forcing (e.g. solar, volcanic and anthropogenic). My research attempts to do this *via* proxy-based reconstructions of climate over the last millennium. This work also has implications for the sensitivity of the climate system to radiative forcing, a major consideration as climate models try to predict the impact of anthropogenic greenhouse gas emissions.

Recent Climatology: New England climate data over the last century exists in a variety of formats and locations. In order to foster research collaboration I am developing a