United States Geological Survey
Eastern Geology and Paleoclimate Science Center
926A National Center
Reston, Virginia 20192
Phone: (703) 648-5291
mmrobinson@usgs.gov

Marci M. Robinson

EDUCATION

Ph.D. Environmental Science and Policy (Geology) **George Mason University** **2007**
Thesis: Paleo-inlet dynamics and the genesis of shelf sand ridges via benthic foraminifera: Old Currituck Inlet, Virginia/North Carolina
Advisor: Randolph A. McBride

B.S. Earth Systems Science (High Distinction) **George Mason University** **1996**
Thesis: Planktonic foraminiferal assemblages and sea surface temperature estimates for the Benguela Current region of Southwest Africa
Advisor: Richard J. Diecchio

RESEARCH EXPERIENCE

Project Chief, Eastern Coastal Plain Studies **USGS (Reston)** **2015-Present**

Eastern Coastal Plain Studies aims to develop a greater understanding of the geology of the U.S. Atlantic Coastal Plain Province through the development of geologic maps and complementary geochronologic and paleontologic data. We combine detailed and regional-scale geologic mapping, subsurface investigations, and focused studies of landscape evolution and paleoclimate to address geologic framework problems, paleoclimate reconstructions, and applied water resource issues such as water-resource availability and sustainability.

Research Geologist **USGS (Reston)** **2009-Present**

Specializing in planktic and benthic foraminifera and climate change research. Current projects focus on Pliocene climate, Eocene hyperthermals and sea level change.

Pliocene Research, Interpretation and Synoptic Mapping (PRISM): PRISM is a collaborative data analysis and climate modeling effort that strives to 1) accurately and comprehensively reconstruct and understand Pliocene climate and climate dynamics in order to gain insight into a warmer than present world that may resemble a future climate and to 2) construct Pliocene paleoenvironmental/paleoclimatic boundary conditions as an aid to general

circulation model experiments designed to explore the impacts of climate forcings and feedbacks. The Pliocene world provides an unequalled paleo-laboratory to test the sensitivity of the physical models that we rely upon for estimating future warming impacts. It challenges our understanding of the sensitivity of key components of the climate system and how we simulate that system.

Eocene Hyperthermals: The late Paleocene-early Eocene gradual warming trend that culminated in the Early Eocene Climatic Optimum is punctuated by a series of sudden and extreme global warming events known as hyperthermals. The most intensely studied of the Eocene hyperthermals is the Paleocene-Eocene Thermal Maximum (PETM). During the PETM, global temperatures rose by ~5°C, ocean acidification was widespread, floral and faunal communities were severely disrupted, and benthic foraminifera suffered a mass extinction in the deep sea due to changing oceanic circulation and a disrupted carbon cycle. Subsequent successive and progressively less extreme hyperthermals followed. The Middle Eocene Climatic Optimum is a less abrupt event set in a background of global cooling; the global temperature rise, however, is comparable to that of the PETM. While more recent warm intervals better represent modern or near future climate, Eocene hyperthermals most closely resemble the current rate of change of atmospheric CO_2 and temperature. It is here that we will find potential analogs in the response of marine ecosystems to abrupt changes in climate.

East Coast Sea Level: Sea-level rise and associated storm surges are major threats to low-lying areas of U.S. coastal zones, including much of the east coast. In order to fully understand how high and how fast sea level will rise and what the impacts will be, it is necessary to examine paleo-sea level records preserved in ancient marine shorelines and sediments deposited along the eastern U.S. Understanding sea level variability during warm interglacial periods is critical to understanding background rates of the current Holocene interglacial and for detecting anomalous human-induced sea level rise.

Mendenhall Post-doctoral Fellow **USGS (Reston)** **2007-2009**
Project Title: Integrated Multi-proxy Analyses of mid-Pliocene Ocean Temperatures for an Improved Paleoclimate Reconstruction

Working within the PRISM (Pliocene Research, Interpretation and Synoptic Mapping) Project to supply additional paleothermometry estimates to those gained from quantitative analytical procedures utilizing planktic foraminiferal assemblages through techniques offering alternate pathways to high latitude SST estimation and temperature estimation at depth. The improved PRISM reconstruction will reflect not only a greater representation of data points in the high latitudes, but also an improved understanding of the seasonality and depth stratification of the mid-Pliocene surface layer, adding a depth component to the surface temperature reconstruction. Integration of this improved SST reconstruction into available bottom water temperature estimates and vegetation and ice models will help to provide a three-dimensional mid-Pliocene ocean temperature reconstruction appropriate for use by fully coupled ocean-atmosphere general circulation climate models.

Science Research Assistant **USGS (Reston)** **2004-2006**

Bolstered existing mid-Pliocene paleoclimate data by estimating sea surface temperatures (SST) from alkenone unsaturation indices and foraminiferal Mg/Ca in deep-sea samples and

comparing them to existing PRISM faunal-based estimates and helped to integrate new bottom water temperature data into a sea surface reconstruction to provide modelers with a three-dimensional ocean temperature data set.

- Compared mid-Pliocene SST estimates from Mg/Ca values in planktic foraminifers and alkenone unsaturation indices from bulk sediment to SSTs previously estimated from quantitative faunal analyses to improve SST reconstructions in the North Atlantic.
- Found each proxy to record a different aspect of surface conditions, and comparisons to be valuable not for verification purposes but instead to permit seasonality and water column structure studies to enhance paleoclimate reconstructions.
- Helped to construct a three-dimensional, thirteen-layer mid-Pliocene ocean temperature data set for the Atlantic basin, the first of several regional data sets that will comprise a global mid-Pliocene reconstruction, for use by climate modelers.
- From this data set, found increased North Atlantic Deep Water (NADW) production and decreased Antarctic Bottom Water (AABW) production during the Pliocene when NADW was ~2°C warmer than modern temperatures, and Pliocene AABW was ~0.3°C warmer than modern temperatures.

Research Assistant **George Mason University** **2001-2004**

Assisted in coastal geomorphology research along the North Carolina and Virginia barrier islands and coastlines by conducting salinity surveys, collecting and opening sediment vibracores, completing core descriptions, sampling sediment cores, and completing microfossil and grain size analyses.

- Documented the existence of a former inlet along the North Carolina Outer Banks using relict flood tidal delta morphology, sediments, microfossil (benthic foraminifera) assemblages and ground penetrating radar.
- Provided a foraminiferal signature of inlet activity, recorded in relict flood tidal delta sediments, that can be used to identify the position of other former inlets along barrier islands.
- Collected and completed a salinity history of Back Bay, Virginia, and Currituck Sound, North Carolina, extending from 1925 to 2004, establishing a range of natural salinity variation in a barrier island estuary lacking proximal connection to the ocean.
- Began a continuing investigation into the possible linkages between former inlets and shoreface-attached sand ridges using microfossil assemblages and stratigraphic relationships.

Physical Science Technician **USGS (Reston)** **1994-1998**

Provided technical support in the Foram Lab to include deep-sea core and coastal sediment sample collection and processing, microfossil sample preparation, and species

identification as well as data manipulation and analysis for paleoclimate reconstructions, and computer graphics assistance.

- Learned lab procedures to clean and extract foraminifer specimens from sediment samples, to prepare microfossil slides, to identify foraminifer species, and to quantify foraminiferal assemblage data for analyses.
- Assisted in reconstructing Pliocene sea-surface temperatures from foraminiferal assemblage data using quantitative analytical techniques to include the modern analog technique and factor analytic transfer functions.

AWARDS

GMU Graduate Fellowships **George Mason University** **2003-2006**
Awarded annually to support superior graduate research

Cushman Award for Student Research **Cushman Foundation** **1995**
Awarded annually to support student research projects utilizing foraminifera

Outstanding Senior in Geology Award **George Mason University** **1996**
Awarded annually to top graduating senior in Geology

Geology Research Award **George Mason University** **1996**
Awarded for top undergraduate research project in Geology

PUBLICATIONS

Clemens, S.C., Kuhnt, W., LeVay, L.J., and the **Expedition 353 Scientists**, 2015. Indian monsoon rainfall. *International Ocean Discovery Program Preliminary Report,* 353. http://dx.doi.org/10.14379/iodp.pr.353.2015.

Dowsett, H.J., Chandler, M.A. and **Robinson M.M.,** 2009. Surface temperatures of the mid-Pliocene North Atlantic Ocean: Implications for future climate. *Philosophical Transactions of the Royal Society A, The Pliocene. A Vision of Earth in the late twenty-first century?* 367: 69-84, doi:10.1098/rsta.2008.0213

Dowsett, H.J., Foley, K.M., Stoll, D.K., Chandler, M.A., Sohl, L.E., Bentsen, M., Otto-Bliesner, B.L., Bragg, F.J., Chan, W.-L., Contoux, C., Dolan, A.M., Haywood, A.M., Jonas, J.A., Jost, A., Kamae, Y., Lohmann, G., Lunt, D. J., Nisancioglu, K.H., Abe-Ouchi, A., Ramstein, G., Riesselman, C.R., **Robinson, M.M.,** Rosenbloom, N.A., Salzmann, U., Stepanek, C., Strother, S.L., Ueda, H., Yan, Q., and Zhang, Z., 2013. Sea surface temperature of the mid-Piacenzian ocean: a data-model comparison, Scientific Reports, 3, doi:10.1038/srep02013.

Dowsett, H.J., Haywood, A.M., Valdes, P.J., **Robinson, M.M.,** Lunt, D.J., Hill, D.J., Stoll, D.K., and Foley, K.M., 2011. Sea surface temperatures of the mid-Piacenzian warm period: A

comparison of PRISM3 and HadCM3. *Palaeogeography, Palaeoclimatology, Palaeoecology* 309: 83-91.

Dowsett, H.J. and **Robinson, M.M.**, 1998. Application of the Modern Analog Technique (MAT) of sea surface temperature estimation to middle Pliocene North Pacific planktonic foraminifer assemblages. *Palaeontologia Electronica* 1. http://palaeo-electronica.org/1998_1/dowsett/issue1.htm

Dowsett, H.J. and **Robinson, M.M.**, 2006. Stratigraphic framework for Pliocene paleoclimate reconstruction: the correlation conundrum. *Stratigraphy* 3: 53-64.

Dowsett, H.J. and **Robinson, M.M.**, 2007. Mid-Pliocene Planktic Foraminifer Assemblage of the North Atlantic Ocean. *Micropaleontology* 53: 105-126.

Dowsett, H.J. and **Robinson M.M.**, 2008. USGS Corecast Episode 77: Prehistoric climate provides clues to future changes. Hosted by Pat Jellison. Released: 24 November 2008. http://www.usgs.gov/corecast/details.asp?ep=77

Dowsett, H.J. and **Robinson M.M.**, 2009. Mid-Pliocene equatorial Pacific sea surface temperature reconstruction: A multi-proxy perspective. *Philosophical Transactions of the Royal Society A, The Pliocene. A Vision of Earth in the late twenty-first century?* 367: 109-126, doi:10.1098/rsta.2008.0206

Dowsett, H.J. and **Robinson M.M.**, 2010. USGS Corecast Episode 115: Want Clues to Climate Change? Let's Look Back 3 Million Years. Hosted by Jessica Robertson. Released: 7 January, 2010. http://www.usgs.gov/corecast/details.asp?ep=115

Dowsett H.J., and **Robinson M.M.**, 2013. Planktic Foraminifera. In: Elias S.A. (ed.) *The Encyclopedia of Quaternary Science* 2: 825-829. Amsterdam: Elsevier.

Dowsett, H., **Robinson, M.**, Dwyer, G., Chandler, M. and Cronin, T., 2006. PRISM3 DOT1 Atlantic Basin reconstruction. *US Geological Survey Data Series* 189.

Dowsett, H.J., **Robinson, M.M.** and Foley, K.M., 2009. Pliocene three-dimensional global ocean temperature reconstruction. *Climate of the Past* 5: 769-783, doi:10.5194/cp-5-769-2009.

Dowsett, H.J., **Robinson, M.M.**, Haywood, A.M., Hill, D.J., Dolan, A.M., Stoll, D.K., Chan, W.-L., Abe-Ouchi, A., Chandler, M.A., Rosenbloom, N.A., Otto-Bliesner, B.L., Bragg, F.J., Lunt, D.J., Foley, K.M., and Riesselman, C.R., 2012. Assessing confidence in Pliocene sea surface temperatures to evaluate predictive models, *Nature Climate Change* 2: 365-371, doi: 10.1038/NCLIMATE1455.

Dowsett, H., **Robinson, M.,** Haywood, A., Salzmann, U., Hill, D., Sohl, L., Chandler, M., Williams, M., Foley, K. and Stoll, D., 2010. The PRISM3D Paleoenvironmental Reconstruction. *Stratigraphy,* 7: 123-140.

Dowsett, H., **Robinson, M.** and Robertson, J., 2009. Getting warmer? Prehistoric climate can help forecast future changes. USGS *Sound Waves,* 112: 1-3.

Dowsett, H., **Robinson, M.** and Robertson, J., 2010. New Discoveries about the Deep Ocean Could Improve Climate Projections. USGS *Sound Waves,* Volume FY 2010, Issue 122: 6-7.

Dowsett, H., **Robinson, M.,** Stoll, D. and Foley, K., 2010. Mid-Piacenzian mean annual sea surface temperature analysis for data-model comparisons. *Stratigraphy* 7: 189-198.

Dowsett, H.J., **Robinson, M.M**., Stoll, D.K., Foley, K.M., Johnson, A.L.A., Williams, M., and Riesselman, C.R., 2013. The PRISM (Pliocene Palaeoclimate) Reconstruction: Time for a Paradigm Shift, *Philosophical Transactions of the Royal Society A* 371: 20120524, http://dx.doi.org/10.1098/rsta.2012.0524.

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Haywood, A.M., Dowsett, H.J., **Robinson, M.M.**, Stoll, D.K., Dolan, A.M., Lunt, D.J., Otto-Bliesner, B. and Chandler, M.A., 2011. Pliocene Model Intercomparison Project (PlioMIP): experimental design and boundary conditions (Experiment 2). *Geoscientific Model Development* 4: 571-577.

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Raymo, M.E., Hearty, P. De Conto, R. O'Leary, M., Dowsett, H.J., **Robinson, M.M.** and Mitrovica, J.X., 2009. PLIOMAX: Pliocene maximum sea level project. *PAGES News*, 17: 58-59.

Robinson, M.M., 2016. Sand Ridge. In: Michael J. Kennish (ed.) *Encyclopedia of Estuaries*: 536-537. Netherlands: Springer, doi:10.1007/978-94-017-8801-4.

Robinson, M.M., 2011. Pliocene Climate Lessons. *American Scientist* 99: 228-235.

Robinson, M.M., 2009. New Quantitative Evidence of Extreme Warmth in the Pliocene Arctic. *Stratigraphy* 6: 265-275.

Robinson, M.M., 1996. Planktic foraminifer census data from sites V19-257 and RC17-44. *U.S. Geological Survey Open File Report* 96-545.

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LeVay, L.J., and the Expedition 353 Scientists, Indian Monsoon Rainfall. Proceedings of the International Ocean Discovery Program, 353: College Station, TX (International Ocean Discovery Program). http://dx.doi.org/10.14379/iodp.proc.353.109.2016.

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Robinson, M.M., Caballero, R., Pohlman, E., Herbert, T., Peck, V. and Dowsett, H., 2008. Mid-Pliocene planktic foraminifer census data and alkenone unsaturation indices from Ocean Drilling Program Hole 677A, *USGS Data Series* 353.

Robinson, M.M. and Dowsett, H.J., 2010. ePRISM: A case study in multiple proxy and mixed temporal resolution integration. *Stratrigraphy*, 7: 177-188.

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Robinson, M.M. and Dowsett, H.J., 1996. Pliocene planktic foraminifer census data from DSDP Site 592, Southwest Pacific Ocean. *U.S. Geological Survey Open File Report* 96-544.

Robinson, M.M., Dowsett, H.J. and Chandler, M.A., 2008. Pliocene Role in Assessing Future Climate Impacts. *Eos*, Transactions, American Geophysical Union, 89 (49): 501-502.

Robinson, M.M., Dowsett, H.J., Dwyer, G.S. and Lawrence, K.T., 2008. Reevaluation of mid-Pliocene North Atlantic sea surface temperatures. *Paleoceanography* 23, PA3213, doi:10.1029/2008PA001608.

Robinson, M.M., Dowsett, H.J., Stoll, D.K., Riesselman, C.R. and Gibbons, F.T., in review. The Pliocene Indian Ocean: A Planktonic Foraminiferal Perspective. *Paleoceanography*.

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Robinson, M.M. and McBride, R.A., 2006. Benthic foraminifera from a relict flood tidal delta along the Virginia/North Carolina Outer Banks. *Micropaleontology* 52: 67-80.

Robinson, M.M., and McBride, R.A., 2008. Anatomy of a shoreface sand ridge revisited using foraminifera: False Cape Shoals, Virginia/North Carolina inner shelf. *Continental Shelf Research* 28: 2428-2441.

Robinson, M. and Robertson, J., 2010. Arctic Could Face Warmer and Ice-Free Conditions. USGS *Sound Waves*, Volume FY 2010, Issue 122: 7.

Robinson, M.M., Self-Trail, J.M., Wandless, G.A., Willard, D.A, 2014. A Paleocene Pre-Onset Carbon Isotope Excursion Recorded in the Shallow marine Environment of Southern Maryland (USA), *in* G.R. Dickens and V. Luciani (EDS). *Climatic and Biotic Events of the Paleogene 2014*, *Rendiconti Online, Societe Geologica Italiana*, 31:185-186.

Robinson, M.M., Valdes, P.J., Haywood, A.M., Dowsett, H.J., Hill, D.J. and Jones, S.M., 2011. Bathymetric controls on Pliocene North Atlantic and Arctic sea surface temperature and deepwater production. *Palaeogeography, Palaeoclimatology, Palaeoecology* 309: 92-97.

Self-Trail, J.M., **Robinson, M.M**., Willard, D.A., Bralower, T.J., Edwards, L.E., Powars, D.S., Wandless, G.A., Freeman, K.H., and Denis, E., 2014. Comparison between two middle to outer neritic PETM sections: South Dover Bridge and Mattawoman Creek Billingsley Road cores, Mid-Atlantic Coastal Plain, USA, in G.R. Dickens and V. Luciani (EDS). *Climatic and Biotic Events of the Paleogene 2014, Rendiconti Online, Societe Geologica Italiana*, 31:195-196.

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Dowsett, H.J., Chandler, M.A., Cronin, T.M., Dwyer, G.S., Haywood, A.M., Hill, D.J., **Robinson, M.M.,** Salzmann, U. and Williams, M., 2008. PRISM Global Sea Surface Temperature Reconstruction: A Global Warming Data Set. 2008 Ocean Sciences Meeting, From the Watershed to the Global Ocean. Orlando, FL. Meeting Abstracts pg. 107.

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Dowsett, H.J. and **Robinson, M.M.** Global ocean thermal structure during the mid-Pliocene: Data indicate increased northern component deepwater production, Workshop on Pliocene Climate Change, October 23-25, 2009 (Bordeaux, France).

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Dowsett, H.J., **Robinson, M.M.**, Dwyer, G.S., Cronin, T.M. and Chandler, M.A. Constraining mid-Pliocene North Atlantic warming using a multiproxy approach, AGU Fall 2005 (San Francisco, California).

Dowsett, H.J., **Robinson, M.M.**, Foley, K. and Caballero, R. PRISM3 Pliocene sea surface temperature reconstruction, AGU Fall 2008 (San Francisco, California).

Dowsett, H., **Robinson, M.,** Foley, K., Haywood, A., Lunt, D., Stoll, D. and Renaud, K. Pliocene Research, Interpretation and Synoptic Mapping (PRISM): Analysis of past global warming as an aid in understanding future climate change. USGS Climate Change Science: Understanding the Past, Informing Decisions for the Future, March 9-11, 2010 (Denver, CO).

Dowsett, H., **Robinson, M.,** Haywood, A., Chandler, M., Foley, K., Hill, D., Lunt, D., Salzmann, U., Sohl, L., Williams, M. and Willard, D. Pliocene (mid-Piacenzian) warmth and its relationship to future climate, MOCA 2009.

Dowsett, H., **Robinson, M.,** Haywood, A., Valdes, P., Salzmann, U., Hill, D., Foley, K. and Williams, M. Mid-Piacenzian Data-Model Comparison (INVITED). EGU General Assembly 2010, May 3-7, 2010 (Vienna, Austria).

Dowsett, H.J., **Robinson, M.M**., Salzmann, U., Foley, K.M. and PRISM Project Members. Reconstructing the (Pliocene) Paleoenvironment from a synoptic perspective. Multiproxy Approach to the Reconstruction of the Pliocene Climate 2014 (Barcelona, Spain).

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Haywood, A.M. and the PRISM Data/Model Team. The PRISM data/model co-operative: current modelling activities, future plans and data requirements, EGU General Assembly 2010, May 3-7, 2010 (Vienna, Austria).

Hunter, S., Dowsett, H., **Robinson, M.,** Dolan, A., Haywood, A. and Salzmann, U. FAMOUS transient climate simulations compared to PRISM4 SST time-series between 3.3 and 3.2 Ma. AGU Fall Meeting 2014 (San Fransisco, California).

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Littler, K., Clemens, S., Kuhnt, W., LeVay, L., and **the Expedition 353 Scientific Party**. High-resolution records of Indian Monsoon variability: Preliminary results from Expedition 353, 2015 UK IODP General Conference, 25 September, 2015 (Newcastle upon Tyne, UK).

McBride, R.A., Buynevich, I. and **Robinson, M.M.** High-resolution geologic evidence of a former, wave-dominated tidal inlet system: Old Currituck Inlet, Virginia/North Carolina, GSA Northeastern/Southeastern Section Meeting 2004 (Tysons Corner, Virginia).

McBride, R.A. and **Robinson, M.M.** Geomorphic evolution and geology of Old Currituck Inlet and its flood tidal delta, Virginia/North Carolina, USA (Part I), Coastal Sediments 2003 (Clearwater, Florida).

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Robinson, M.M. The mid-Pliocene warm period: New insights into a near perfect analog to future climate. Geological Society of Washington, September 23, 2009 (Washington, DC).

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TEACHING EXPERIENCE

Teaching Assistant/Adjunct Faculty **George Mason University** **2001-2007 and 1996-1998**

Physical Geology Lab (Geology 101L)
Historical Geology Lab (Geology 102L)
Geomorphology Lab (Geology 317L)
Sedimentology and Stratigraphy Lab (Geology 304L)

PROFESSIONAL SERVICE AND AFFILIATIONS

***Micropaleontology* Assistant Editor**
***JR*F Science Evaluation Panel for the International Ocean Discovery Program, 2015-2018**

American Association for the Advancement of Science
American Geophysical Union
European Geosciences Union
Geological Society of America
Sigma Xi, The Scientific Research Society

STUDENTS ADVISED

Nicola Clark, PhD Student, Leicester University

ADVISORS

Randy McBride, George Mason University; Steve Culver, East Carolina University; Harry Dowsett, US Geological Survey; Rick Diecchio, George Mason University; Sheryl Beach, George Mason University