

CURRICULUM VITAE – JOHN “CHIP” BREIER

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Applied Ocean Physics & Engineering
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PROFESSIONAL APPOINTMENTS & EXPERIENCE

2012-present Woods Hole Oceanographic Institution, Associate Scientist
2008-2012 Woods Hole Oceanographic Institution, Assistant Scientist
2006-2008 Woods Hole Oceanographic Institution, NSF RIDGE2000 Postdoctoral Fellow
2006 Stanford University, Postdoctoral Researcher,
2001-2006 The University of Texas at Austin, Marine Science, Research Assistant
2001-2003 Naval Reserve, Naval Research Laboratory Science & Technology Unit 510
1996 DOE Bettis Atomic Power Laboratory, Reactor Engineering School, Student
1995-2000 United States Navy, Officer, Naval Reactors, Nuclear Power Engineer
1993 Lockheed Martin, Summer Engineering Intern.

EDUCATION

Ph.D. (2006) The University of Texas at Austin Department of Marine Science
B.S. cum laude (1995) Texas A&M University Mechanical Engineering

HONORS AND AWARDS

2011 WHOI Deep Ocean Exploration Institute Fellowship
2006 NSF RIDGE 2000 Postdoctoral Fellowship
2004 E.J. Lund Fellowship in Marine Science, The University of Texas at Austin
2002 Environmental Science Institute Summer Research Fellowship, The University of Texas

RESEARCH INTERESTS

I am interested in chemical and energy exchange between the lithosphere and the ocean and how this class of processes influences Earth's biogeochemical cycles. I am particularly interested in dynamic processes including those associated with the mixing of deep-sea hydrothermal fluid and seawater as well as the dynamics of coastal freshwater/seawater mixing. My research is currently focused on the scavenging and transport of trace elements by iron, which involves to varying degrees questions of mineral formation and chemical reactivity, mineral and microbe interactions, and the chemical energy available for chemosynthesis. As both a geochemist and engineer, I am also interested in the development and application of ocean instrumentation and vehicles for the enhanced study of Earth system processes.

PROFESSIONAL AFFILIATIONS

American Geophysical Union
American Society of Limnology and Oceanography
The Geochemical Society
The Geological Society of America
IEEE

PROFESSIONAL ACTIVITIES

- WHOI, Scientific Staff Executive Committee member.
- WHOI Deep Ocean Exploration Institute, Advisory Committee member.
- WHOI, AOP&E Department, Postdoctoral Mentoring Committee member.
- Senior Design Clinic Sponsor, Smith College Pickering Engineering Program – an outreach collaboration with Smith College to sponsor and mentor teams of four undergraduates per year during their senior design course.
- Group Co-Moderator, Biogeochemical fluxes from mid-ocean ridges, RIDGE 2000 Integration and Synthesis Workshop, Meeting to integrate datasets and to synthesize conceptual and empirical models of oceanic spreading center processes, 30 Oct. 2010.
- Group Moderator, Export of heat and material (living and nonliving) from hydrothermal systems to the water column, RIDGE 2000 Integration and Synthesis Workshop, Meeting to integrate datasets and to synthesize conceptual and empirical models of oceanic spreading center processes, 30 Sep. 2009.

JOURNAL REVIEWS

Annales de Limnologie – International Journal of Limnology
Biogeochemistry
Geochemistry, Geophysics, Geosystems
Geophysical Research Letters
IEEE Journal of Ocean Engineering
International Journal of Offshore and Polar Engineering
Journal of Environmental Management
Limnology & Oceanography
Marine Chemistry
Spectroscopy Letters

PROPOSAL REVIEWS

NSF Ocean Technology and Interdisciplinary Coordination
NSF Hydrological Sciences
NSF Chemical Oceanography

COURSES TAUGHT

2001-2002 Teaching Assistant, UT MNS307, Introduction to Oceanography Laboratory

PARTICIPATION IN SCIENTIFIC EXPEDITIONS

2013 R/V *Falkor* Mid-Cayman Rise, Caribbean (4 weeks).
2012 R/V *Atlantis* Mid-Cayman Rise, Caribbean (3 weeks).
2010 R/V *Atlantis* North Atlantic Ocean (4 weeks).
2009 R/V *Thomas G. Thompson* Lau Basin/Pacific Ocean (4 weeks).
2007 R/V *Atlantis* East Pacific Rise (3 weeks).
2004 R/V *Kilo Moana* Lau Basin/Pacific Ocean (6 weeks).
2002 R/V *Longhorn* Gulf of Mexico shelf transect (3 days).

PUBLICATIONS

1. Anantharaman, K., **Breier**, J.A., Sheik, C.S., Dick, G.J., 2013. Evidence for hydrogen oxidation and metabolic plasticity in widespread deep-sea sulfur-oxidizing bacteria. *Proceedings of the National Academy of Sciences* 110, 330-335, doi:10.1073/PNAS.1215340110.
2. **Breier**, J.A., Gomez-Ibanez, D., Reddington, E., Huber, J.A., Emerson, D., 2012. A precision multi-sampler for deep-sea hydrothermal microbial mat studies. *Deep Sea Research Part I: Oceanographic Research Papers* 70, 83-90, doi:/10.1016/J.DSR.2012.10.006.
3. **Breier**, J.A., B.M. Toner, S.C. Fakra, M.A. Marcus, S.N. White, A.M. Thurnherr, and C.R. German, 2012, Sulfur, sulfides, oxides, and organic matter aggregated in submarine hydrothermal plumes at 9° 50' N East Pacific Rise, *Geochimica Cosmochimica Acta* 88, 216-236, doi:10.1016/J.GCA.2012.04.003.
4. Holden, J.F., J.A. **Breier**, K.L. Rogers, M.D. Schulte, and B.M. Toner, 2012, Biogeochemical processes at hydrothermal vents: Microbes and minerals, bioenergetics, and carbon fluxes. *Oceanography* 25(1), 196–208, doi:/10.5670/OCEANO.2012.18.
5. **Breier**, J.A., C.F. Breier, and H.N. Edmonds, 2010, Seasonal dynamics of dissolved Ra isotopes in the semi-arid bays of south Texas, *Marine Chemistry*, 122, 39-50, doi:/10.1016/J.MARCHEM.2010.08.008,
6. **Breier**, J.A., S.N. White, and C.R. German, 2010, Mineral–microbe interactions in deep-sea hydrothermal systems: a challenge for Raman spectroscopy, *Philosophical Transactions of the Royal Society A*, 368, 3067-3086, doi:10.1098/RSTA.2010.0024.
7. **Breier**, J.A., C.R. German, and S.N. White, 2009, Mineral phase analysis of deep-sea hydrothermal particulates by a Raman spectroscopy expert algorithm: Towards autonomous in situ exploration and experimentation, *Geochemistry, Geophysics, and Geosystems*, 10, Q05T05, doi:/10.1029/2008GC002314.
8. **Breier**, J.A., N. Nidzieko, S. Monismith, W. Moore, and A. Paytan, 2009, Tidally regulated chemical fluxes across the sediment–water interface in Elkhorn Slough, California: Evidence from a coupled geochemical and hydrodynamic approach, *Limnology & Oceanography*, 54(6), 1964-1980, doi:/10.4319/LO.2009.54.6.1964
9. **Breier**, J.A., C.R. Rauch, K. McCartney, B.M. Toner, S. Fakra, S.N. White, and C.R. German, 2009, A suspended-particle rosette multi-sampler for discrete biogeochemical sampling in low-particle-density waters, *Deep Sea Research I*, 56, 1579-1589, doi:/10.1016/J.DSR.2009.04.005.
10. **Breier**, J.A. and H.N. Edmonds, 2007, High ²²⁶Ra and ²²⁸Ra activities in Nueces Bay, Texas indicate large submarine saline discharges, *Marine Chemistry*, 103, 131-145, doi:/10.1016/J.MARCHEM.2006.06.015
11. **Breier**, J.A., C.F. Breier, and H.N. Edmonds, 2005, Detecting submarine groundwater discharge with synoptic surveys of sediment resistivity, radium, and salinity, *Geophysical Research Letters*, 32, L23612, doi:/10.1029/2005GL024639.

FUNDED RESEARCH

1. NSF Ocean Technology and Interdisciplinary Coordination, (**Breier**, Jakuba & Saito, OCE-1333212, 08/12/2013 – 08/12/2016, \$1,308,601 total; \$1,084,195 to Breier) Collaborative Research: An autonomous vertical sampling vehicle for global ocean biogeochemical mapping.
2. The Gordon and Betty Moore Foundation, (Dick, **Breier**, Toner, Jiang, Schloss, Andersson,

- Klausmeier, 10/19/2010 – 03/01/2014, \$381,210 total to **Breier**), Unveiling the microbiology that underpins deep-sea biogeochemistry
3. The Gordon and Betty Moore Foundation, (**Breier**, 11/01/2010 – 08/31/2013, \$253,781), Developing a particulate sampling and in situ preservation system for high spatial and temporal resolution studies of microbial and biogeochemical processes.
 4. NSF Ocean Technology and Interdisciplinary Coordination, (Petersen, **Breier**, Singh, OCE-1028990, 09/01/2010 – 08/31/2014 with 1 year no cost extension, \$878,007 total; \$696,402 to Breier, 1 year no cost extension) Collaborative Research: Development of a submersible, autonomous Rn-222 survey system.
 5. NSF RIDGE2000, (**Breier**, Jiang, Toner, Dick, OCE-1038055, 09/15/2010 – 09/16/2013, \$771,644 total; \$328,197 to Breier), Collaborative Research: Integrating geochemistry, microbiology, and hydrodynamics: A model for trace element transport and fate in hydrothermal plumes.
 6. NSF Ocean Technology and Interdisciplinary Coordination, (**Breier & Emerson**, OCE-0926805, 10/01/2009 – 09/30/2012, with 1 year no cost extension, \$292,354 to Breier)) Collaborative Research: High resolution Microbial Mat Sampler for operation with deep submergence vehicles.

CONFERENCE PAPERS

1. **Breier**, J. A., C. G. Rauch, and C. R. German, 2007, A suspended particle rosette sampler for investigating hydrothermal plumes, *OCEANS 2007 IEEE Press*, Vancouver, Canada.
2. **Breier** J. A., 2006, The impact of groundwater flows on estuaries, In *Aquifers of the Gulf Coast of Texas, Report 365*, Texas Water Development Board, Austin, Texas, pp. 165-172.

CONFERENCE ABSTRACTS

1. **Breier**, J.A., B. Toner; C. Sheik; K. Anantharaman; J. B. Sylvan, K. J. Edwards, P. R. Girguis; K. Wendt, J. Sorensen, A. Madison, G. W. Luther, H. Jiang, G. Dick, 2012, Linking hydrothermal plume geochemistry with deep-sea microbial community structure along the Eastern Lau Spreading Center, Abstract B44B-05 presented at 2012 Fall Meeting, *AGU*, San Francisco, Calif., 3-7 Dec.
2. Dick, G., J.A. **Breier**, B.M. Toner, C. Sheik, B.R. Cron, M. Li, D.R. Reed, K. Anantharaman, B.J. Baker, S. Jain, C.A. Klausmeier, H. Jiang, C.R. German, J. Seewald, S.P. Sylva, J.M. McDermott, S.A. Bennett, 2012, Microbial geochemistry in rising plumes of two hydrothermal vents at the Mid-Cayman Rise, Abstract OS22B-05 presented at 2012 Fall Meeting, *AGU*, San Francisco, Calif., 3-7 Dec, *Invited*.
3. Huber, J.A., J. Reveillaud, E. Reddington, J.M. McDermott, S.P. Sylva, J.A. **Breier**, C.R. German, J. Seewald, 2012, Subseafloor Microbial Life in Venting Fluids from the Mid Cayman Rise Hydrothermal System, Abstract B41F-03 presented at 2012 Fall Meeting, *AGU*, San Francisco, Calif., 3-7 Dec, *Invited*.
4. Cron, B.R., B.M. Toner, S.A. Bennett, C.R. German, G. Dick, J.A. **Breier**, 2012, The spatial distribution and speciation of iron in buoyant hydrothermal plumes of the Mid-Cayman Rise, Abstract OS13B-1741 presented at 2012 Fall Meeting, *AGU*, San Francisco, Calif., 3-7 Dec.
5. **Breier**, J.A., O.N. Osicki, K. Wendt, J.V. Sorenson, B. Toner, K. Anantharaman, G. Dick, H. Jiang, 2012, Distribution of chemical energy in a rising hydrothermal plume of the Lau Basin, Abstract 11943 presented at 2012 *AGU Ocean Sciences Meeting*.
6. Toner, B.M., J.A. **Breier**, K.J. Edwards, S.C. Fakra, C.R. German, M.A. Marcus, O.J.

- Rouxel, 2012, Measuring the speciation of iron in hydrothermal plume particles, Abstract presented at 2012 *Goldschmidt* Conference.
7. **Breier**, J.A., O. Osicki, H. Jiang, K. Anantharaman, G. Dick, Wendt, K., Sorenson, J.V., B. Toner, 2011, Mineral formation and trace element uptake in rising hydrothermal plumes of the Lau basin, Abstract OS23B-01 presented at 2011 Fall Meeting, *AGU*, San Francisco, Calif., 5-9 Dec.
 8. Jiang, H., J.A. **Breier**, G. Dick, B. Toner, 2011, Computational fluid dynamics simulation of the rising portion of a seafloor hydrothermal plume, Abstract OS11B-1472 presented at 2011 Fall Meeting, *AGU*, San Francisco, Calif., 5-9 Dec.
 9. Sorenson, J.V., B. Toner, G. Dick, J.A. **Breier**, H. Jiang, 2011, Major and trace-element speciation in deep-sea hydrothermal plumes of Eastern Lau Spreading Center, Abstract OS23B-02 presented at 2011 Fall Meeting, *AGU*, San Francisco, Calif., 5-9 Dec.
 10. Wendt K., K. Anantharaman, J.A. **Breier**, G.J. Dick, K.J. Edwards, P.R. Girguis, J.V. Sorensen, J. Sylvan, B. M. Toner, 2011, Biogeochemical patterns and processes in buoyant, deep-sea hydrothermal plumes, Abstract presented at 2011 *Goldschmidt* Conference.
 11. **Breier**, J. A., S. N. White, and C. R. German, 2010, Applications and challenges for the application of Raman spectroscopy in deep-sea hydrothermal systems, *GeoRaman 2010*, *invited plenary speaker*.
 12. **Breier**, J. A., K. Anantharaman, B. M. Toner, and G. J. Dick, 2010, Biotic-abiotic interactions in deep-sea hydrothermal plumes, Abstract presented at 2010 *Goldschmidt* Conference.
 13. **Breier**, J.A., K. Anantharaman, J.B. Sylvan, S.N. White, K.J. Edwards, G. Dick, B.M. Toner, 2010, Early-stage hydrothermal particle formation along the Eastern Lau Spreading Center *Eos Trans. AGU*, 91(26), Ocean Sci. Meet. Suppl., Abstract IT45G-12.
 14. Toner, B.M., S.C. Fakra, M.A. Marcus, O. Rouxel, K.J. Edwards, C.R. German, J.A. **Breier**, 2009, Integrated biogeochemistry of mid-ocean ridge hydrothermal plumes (Invited), *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS12A-01.
 15. **Breier**, J.A., B. Toner, S.J. Manganini, and C.R. German, 2008, Hydrothermal plume particles deconstructed: evidence of biotic and abiotic interactions in particle formation at 9N East Pacific Rise, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract B21A-0339.
 16. **Breier**, J. A., N. Nidziko, S. Monismith, and A. Paytan, 2006, Quantifying seawater recirculation through subtidal estuarine sediments in Elkhorn Slough, California: coupling Ra isotope geochemistry with hydrodynamic modelling, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract B22C-08.
 17. **Breier**, J. A., C. F. Breier, and H.N. Edmonds, 2006, Regional-scale investigation of submarine discharge to Texas bays, *Eos Trans. AGU*, 87(36), Ocean Sciences Meet. Suppl., Abstract OS14A-05.
 18. **Breier**, J.A., Jr., and H.N. Edmonds, 2005. Continuous sediment resistivity profiling with synoptic dissolved ^{226}Ra , ^{228}Ra , ^{224}Ra , ^{223}Ra and surface salinity measurements detect and characterize submarine discharges to Nueces Bay, Texas. *The Geological Society of America*, 37, Fall Meeting, Abstract 211-12.
 19. **Breier**, J.A., Jr. and H.N. Edmonds, 2005. Seawater circulation in coastal sediments. *Texas Bays and Estuaries*, Annual Meeting.
 20. **Breier**, J.A., Jr. T.A. Villareal, and H.N. Edmonds, 2004. Radium derived groundwater fluxes and nutrient inputs to Nueces Bay, Texas. *EOS, Trans. AGU*, 84(52), 84(52), Ocean Sciences Meet. Suppl., Abstract OS21D-05.

21. Edmonds, H. N., C. R. German, J. A. **Breier**, D. P. Connelly, A. Townsend-Small, J. A. Resing, C. Aumack, E. T. Baker, and C. H. Langmuir, 2004. Plume mapping and shipboard chemical data used to locate new vent sites in the Lau Basin. *EOS, Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract B13A-0191.
22. **Breier**, J.A., Jr., H.N. Edmonds, T.A. Villareal, 2002. Measuring groundwater inflow to Nueces Bay using natural radium isotopes as tracers. *National Estuarine Research Reserve System 2003 Spring Symposium*
23. **Breier**, J.A., Jr., H.N. Edmonds, T.A. Villareal, and L. Tinnin, 2002. Groundwater and nutrient infiltration in an inverse estuary: Nueces Bay, Texas. *The Geological Society of America*, 34, Fall Meeting, Abstract 156-7.
24. Edmonds, H.N., J.A. **Breier**, and C.R. German, 2002. Particle geochemistry and radionuclides in the Edmond and Kairei hydrothermal plumes, Indian Ocean: Preliminary results. *EOS, Trans. AGU*, 84(4), Ocean Sciences Meet. Suppl., Abstract OS31F-103.

PUBLICATIONS (non-peer reviewed)

1. **Breier**, J.A., H.N. Edmonds, and T.A. Villareal, 2004, Submarine groundwater discharge and associated nutrient fluxes to the Corpus Christi Bay system, *Report 2002483416*, 54 pp., Texas Water Development Board, Austin, TX.

INVITED SEMINARS

1. Deep Ocean Exploration Institute, Woods Hole Oceanographic Institution, Board of Trustees Meeting 2012, Exploring the Limits of Life: Chemosynthesis in the Deep Sea.
2. Woods Hole Oceanographic Institution, Applied Ocean Physics & Engineering, April, 2008. Forward Deployed Suspended Particle Sampling and In Situ Analysis.
3. The University of New Hampshire, Earth Sciences Department, March 30, 2007. Quantifying porewater and surface water exchange with Ra isotopes: a complete hydrology of a shallow estuary.
4. Aquifers of the Gulf Coast of Texas Conference, Texas Water Development Board, 2006. The impact of groundwater flows on estuaries.
5. The University of Texas at Austin, Environmental Science Institute, October 25, 2002. The Dynamics of groundwater inflow and coastal nutrient supply: A study of Nueces Bay, Texas

COLLABORATORS IN PAST 48 MONTHS:

WHOI: C.R. German, H. Jiang, B. Peucker-Ehrenbrink, H. Singh, S.N. White, D. Yoerger

Outside WHOI: G. J. Dick (U. Michigan), D. Emerson (Bigelow Laboratory for Ocean Sciences), S. Fakra (Lawrence Berkeley National Lab), B. Glazer (UH), J. Huber (MBL), M. Marcus (Lawrence Berkeley National Lab), R. Peterson (Coastal Carolina University), A. M. Thurnherr (LDEO), B. Toner (UMN – Twin Cities)

POSTDOCTORAL ADVISORS: Adina Paytan (UC Santa Cruz), Chris German (Woods Hole Oceanographic Institution), Sheri White (Woods Hole Oceanographic Institution)

Ph.D. ADVISOR: Hedy Edmonds, The University of Texas at Austin (currently NSF).