# PHOEBE J. LAM

DEPARTMENT OF MARINE CHEMISTRY AND GEOCHEMISTRY, CLARK 461
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MS #25
WOODS HOLE, MA 02543
PJLAM@WHOI.EDU WWW.WHOI.EDU/PEOPLE/PJLAM
T. 508-289-3792 F. 508-457-2193


## EDUCATION

| | |
|---|---|
| MIT | S.B., Environmental Engineering Science, June 1997 |
| Princeton University | M.A., Department of Geosciences, May 1999 |
| UC Berkeley | Ph.D., Earth and Planetary Science, December 2005 |

## PROFESSIONAL EXPERIENCE

| | |
|---|---|
| July 2011-present: | *Associate Scientist without tenure*, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, Woods Hole, MA. |
| June 2007-July 2011: | *Assistant Scientist*, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, Woods Hole, MA. |
| Dec 2005-May 2007: | *Postdoctoral Scholar*, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, Woods Hole, MA. |

## AWARDS

- Woods Hole Oceanographic Institution Postdoctoral Award, December 2005
- Dissertation Symposium on Chemical Oceanography (DISCO XIX), Waikoloa, HI, May 1-7, 2005
- Outstanding Student Paper Award, AGU, Ocean Sciences Section, San Francisco, CA, Dec 2004
- NSERC Postgraduate Scholarship A, 1998-2000
- Scholarship Award, the Society of General Physiologists, Marine Biological Laboratory, 1998
- 1st Year Merit Fellowship in Natural Sciences and Mathematics, Princeton University, 1997-98
- Richard Lee Russel Award, Dept. of Civil and Environmental Engineering, MIT, 1997

## PROFESSIONAL AFFILIATIONS

Member, American Geophysical Union, 2001-present.
Member, Geochemical Society, 2011-present.

## RESEARCH INTERESTS

Provenance of iron to the open ocean; speciation and bioavailability of particulate iron; geochemistry of marine particles; particle dynamics; factors affecting the strength and efficiency of the biological carbon pump.

## PROFESSIONAL ACTIVITIES

WHOI (NON-EDUCATION RELATED):

- *Ad-hoc* Reviewer: Ocean and Climate Change Institute

OUTSIDE WHOI:

- Member of planning committee for 3rd GEOTRACES Data/Model Synergy Workshop on particles, to be held in Barcelona, Spain, November 2011
- Contributor to IOC-commissioned initial drafting group for "Ocean Fertilization: A scientific summary for policy makers" document.
- External Reviewer: Canadian Light Source Facility, October 2009-present.
- Panelist for NSF Chemical Oceanography, May 2011

- *Ad-hoc* Reviewer: Biogeosciences, Deep Sea Research I, Deep Sea Research II, Geophysical Research Letters, Global Biogeochemical Cycles, Journal of Geophysical Research—Oceans, Limnology and Oceanography, NSF, NERC, Science.
- US GEOTRACES Pacific Planning Workshop, La Jolla, CA (September 12-14, 2011).
- GEOTRACES Intercalibration Workshops, Norfolk, VA (March 8-10, 2010), San Francisco, CA (December 13-14, 2008).
- GEOTRACES Atlantic Implementation Workshop, WHOI, Woods Hole, MA (September 22-24, 2008).
- International GEOTRACES Pacific Basin Planning Workshop, University of Hawaii, Manoa, Honolulu, HI (June 26-28, 2007).
- Alternative Sampling Platforms in the Antarctic workshop, Washington, DC (August 2-3, 2006)

## PARTICIPATION IN EDUCATION PROGRAM

COMMITTEES:

- MIT-WHOI Joint Program Strategic Planning Committee, 2010-2011.
- MIT-WHOI Joint Program Admissions Advisory Committee, 2009-2010.
- Post-doc mentoring committee, Marine Chemistry and Geochemistry, WHOI, April 2011—present.

ADVISING:

- Graduate Research Advisor for MIT-WHOI Joint Program student Dan Ohnemus (Summer 2008-present) and Sarah Rosengard (September 2011-present)
- Thesis committee member for Joint Program students Andrew McDonnell, Abigail Noble, Stephanie Owens, Jong-Mi Lee, Jessica Fitzsimmons
- Research advisor for Guest Student John Swartz (Fall 2011)
- Summer Research Advisor for Partnership in Education Program (PEP) student Janeea Ventour (Summer 2011)
- Co-advisor for the 2007 MIT-WHOI Joint Program incoming class of graduate students

TEACHING:

- Guest lecture for 12.755—Marine Bioinorganic Chemistry (Fall 2009, 2011)
- Co-Instructor, MIT-WHOI Joint Program, 12.759—Classic Papers in Marine Chemistry seminar (Spring 2008, 2010)

OUTREACH:

- Research co-mentor to Troy Pettit and Connor Cobb for Falmouth High School Science fair project (2011-2012 school year)
- Career Panelist for the Partnership in Education Program, a Woods Hole Diversity Committee Initiative, June 2010
- Mentor for the Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science (MS PHDS) Program during 2009 OCB summer workshop
- Keynote speaker to Woods Hole Summer Student Fellow Welcoming Dinner, June 2010
- Guest lecture to the Linden Ponds retirement community, May 2010
- Guest teacher for a day at the Children's School of Science (10-11 year olds) in Woods Hole, MA in summer 2009
- "Communicating Ocean Sciences" Workshop participant, Woods Hole Oceanographic Institution, Woods Hole, MA (October 19, 2007).
- Radio Interview, "Science in Action" with Gareth Mitchell, on iron fertilization in the ocean. Broadcast April 23, 2004 on BBC World Service

## SUPERVISION AT WHOI

- Current: Maureen Auro Wisch, Research Associate II (July 1, 2010-present)
- Past: Molly Burtis, Part-time helper (July 2011-November 2011); Kristine Bunker, Falmouth High School student part-time helper (Summer 2009, 2010); Tracy Atwood, Research Assistant (Oct 2008-June 2009)

## CRUISE PARTICIPATION

- Ross Sea, Iron sources to the summer Ross Sea ecosystem, McLane pumps, R/V N.B. Palmer, Jan-Feb 2011 (28 days)
- Subantarctic South Atlantic, The Great Calcite Belt, $^{234}$Th and McLane pumps, R/V Melville, Jan-Feb 2011 (sent Res.Assocs. M.Auro and S. Pike)
- North Atlantic, U.S. GEOTRACES North Atlantic Zonal Transect, McLane pumps, R/V Knorr, October 2010 (sent student, D. Ohnemus)
- North Pacific, Particle sampling methods—MULVFS, GEOTRACES Intercalibration cruise 2, R/V Knorr, May 2009 (24 days).
- Tropical Eastern North Atlantic Time-Series Observatory (TENATSO), SIRENA part 2, McLane pumps—**Chief Scientist,** R/V Islandia, March 2009 (2 days).
- Tropical North Atlantic, Sources of Iron to the Eastern Tropical North Atlantic (SIRENA), McLane pumps—**Chief Scientist**, R/V Oceanus, September 2008 (11 days).
- Tropical North Atlantic, Iron in the tropical and subtropical Atlantic, McLane pumps, R/V Oceanus, August 2008 (30 days).
- North Atlantic, Particle sampling methods—MULVFS, GEOTRACES Intercalibration cruise 1, R/V Knorr, July 2008 (13 days).
- Tropical South Atlantic, CoFeMUG, Geochemistry of particles, McLane pumps, R/V Knorr, Nov-Dec 2007 (28 days).
- Southern Ocean, Subantarctic Zone Sensitivity Study (SAZ-SENSE), Aurora Australis, $^{234}$Th and McLane pumps, Jan-Feb 2007 (34 days).
- North Atlantic (A16N-leg 1), Particulate inorganic carbon sensor testing and calibration, R/V R.H. Brown, June-July 2003 (22 days).
- California Current, Carbon sensor development, R/V Gordon Sproul, August 2003 (2 days).
- Southern Ocean, Southern Ocean Iron Enrichment Experiment (SOFeX)—MULVFS, R/V Roger Revelle, Jan-Feb 2002 (40 days).
- California Current, Transect of coastal to oligotrophic waters—MULVFS, R/V New Horizon, Aug 2001 (14 days).
- Subarctic Pacific (Lines P & Z), Coccolithophore response to trace metal additions, CCGS J.P. Tully, Aug-Sep 1999 (20 days).
- Gulf of Maine, Coccolithophore response to $pCO_2$ and trace metals, R/V Edwin Link, June 1999 (7 days).
- Sargasso Sea, Picoplankton and copper stress, R/V Oceanus, June 1996 (14 days).

## PAPERS IN REFEREED JOURNALS AND BOOKS

SUBMITTED

**Lam, P. J.**, D. C. Ohnemus, and M.A. Marcus. The speciation of marine particulate iron adjacent to active and passive continental margins. *Revisions submitted to Geochimica et Cosmochimica Acta*.

Bishop, J.K.B., **P.J. Lam,** and T.J. Wood. Getting good particles: Accurate sampling of particles by large volume in-situ filtration. *Submitted to Limnology and Oceanography Methods*.

Marchal, O. and **P.J. Lam**. What can paired measurements of Th isotope activity and particle concentration tell us about particle cycling in the ocean? *Submitted to Geochimica et Cosmochimica Acta*.

Noble, A.E., M.A. Saito, C.H. Lamborg, D.C. Ohnemus, **P.J. Lam**, T.J. Goepfert, C.H. Frame, K.L. Casciotti, J. Jennings. Basin-scale inputs of cobalt, iron, and manganese from the Benguela-Angola front into the South Atlantic Ocean. *Revisions submitted to Limnology and Oceanography*.

PUBLISHED

**Lam, P. J.**, S.C. Doney, and J. K. B. Bishop. 2011. The dynamic ocean biological pump: insights from a global compilation of Particulate Organic Carbon, $CaCO_3$, and opal concentration profiles from the mesopelagic. *Global Biogeochemical Cycles,* **25(3)**: GB3009, doi:10.1029/2010GB003868.

Jacquet, S.H.M, **Lam, P. J.**, T. Trull, and F. Dehairs. 2011. Carbon export production in the Subantarctic Zone and Polar Front Zone south of Tasmania. *Deep Sea Research II*, **58(21-22)**: 2222-2234, doi: 10.1016/j.dsr2.2011.05.029.

Lannuzel, D., T. Remenyi, **P. Lam**, A. Townsend, E. Ibisanmi, E. Butler, T. Wagener, V. Schoemann, and A.R. Bowie. 2011. Distributions of dissolved and particulate iron in the sub-Antarctic and Polar Frontal Southern Ocean (Australian sector). *Deep Sea Research II*, **58(21-22)**: 2094-2112, doi: 10.1016/j.dsr2.2011.05.027.

Bowie, A.R, D. Lannuzel, T.A. Remenyi, T. Wagener, **P.J. Lam**, P.W. Boyd, C. Guieu, A. T. Townsend, and T. W. Trull. 2009. Different processes drive biogeochemical iron budgets in the subantarctic and polar Southern Ocean during summer. *Global Biogeochemical Cycles*, **23**, GB4034, doi:10.1029/2009GB003500.

Lamborg, C.H. K.O. Buesseler and **P.J. Lam**. 2008. Sinking fluxes of minor and trace elements in the North Pacific Ocean measured during the VERTIGO program, *Deep Sea Research II*, **55(14-15)**: 1564-1577, doi:10.1016/j.dsr2.2008.04.012.

Buesseler, K.O., T.W. Trull, D.K. Steinberg, M.W. Silver, D. Siegel, S.-I. Saitoh, C.H. Lamborg, **P.J. Lam**, D.M. Karl, N.Z. Jiao, M.C. Honda, M. Elskens, F. Dehairs, S.L. Brown, P.W. Boyd, J.K.B. Bishop, R.R. Bidigare. 2008. VERTIGO (VERtical Transport In the Global Ocean): a study of particle sources and flux attenuation in the North Pacific. *Deep Sea Research II*, **55(14-15)**: 1522-1539, doi:10.1016/j.dssr2.2008.04.024.

**Lam, P. J.** and J. K. B. Bishop. 2008. The continental margin is a key source of iron to the HNLC North Pacific Ocean, Geophys. Res. Lett., **35**, L07608, doi:10.1029/2008GL033294.

Buesseler, K.O., C.H. Lamborg, P.W. Boyd, **P.J. Lam**, T.W. Trull, R.R. Bidigare, J.K.B. Bishop, K. L. Casciotti, F. Dehairs, M. Elskens, M. Honda, D.M. Karl, D. Siegel, M.W. Silver, D.K. Steinberg, J. Valdes, B. Van Mooy and S. Wilson. 2007. Revisiting Carbon Flux through the Ocean's Twilight Zone. Science, **316**: 567-570, DOI: 10.1126/science.1137959.

**Lam, P.J.** and J.K.B. Bishop. 2007. High Biomass Low Export Regimes in the Southern Ocean. Deep Sea Research II: The Role of Marine Organic Carbon and Calcite Fluxes in Driving Climate Change, Past and Future, **54**: 601-638, DOI: 10.1016/j.dsr2.2007.01.013.

**Lam, P.J.,** J.K.B. Bishop, C.C. Henning, M.A. Marcus, G.A. Waychunas, I.Y. Fung. 2006. Wintertime phytoplankton bloom in the Subarctic Pacific supported by continental margin iron. Global Biogeochemical Cycles, **20(1)**, GB1006, DOI: 10.1029/2005GB002557.

**Lam, P.J.,** P.D. Tortell, and F.M.M. Morel. 2001. Differential effects of iron additions on organic and inorganic carbon production by phytoplankton. Limnology and Oceanography, **46(5)**: 1199-1202.

Rosenthal, Y., **P. Lam**, E.A. Boyle, and J. Thomson. 1995. Authigenic cadmium enrichments in suboxic sediments: Precipitation and postdepositional mobility. Earth and Planetary Science Letters, **132**: 99-111.

## OTHER PUBLICATIONS

**Lam, P.J**., J.K.B. Bishop, R. Sherrell, P.J. Morris, B.S. Twining, T.J. Wood, D.C. Ohnemus, M. Charette. In-situ pumping sampling protocols for particulate trace metals for GEOTRACES. *In* Sampling and Sample-handling Protocols for GEOTRACES Cruises, edited by the 2010 GEOTRACES Standards and Intercalibration Committee.

Wallace, D., C. Law, P. Boyd, Y. Collos, P. Croot, K. Denman, **P. Lam**, U. Riebesell, S. Takeda, P. Williamson. 2010. Ocean Fertilization: A summary for policy makers. A report commissioned by the Intergovernmental Oceanographic Commission.

**Lam, P.J**. and S.W. Chisholm. 2002. Iron fertilization of the Oceans: Reconciling Commercial Claims with Published Models. White Paper available at: http://chisholmlab.mit.edu/publications/2002_lam_ironfertilization.pdf

## PUBLISHED ABSTRACTS, PAPERS PRESENTED AT MEETINGS, INVITED LECTURES

*INDICATES STUDENTS IN THE LAM LAB

2011:

- The speciation of marine particulate iron adjacent to active and passive continental margins. Chemical Oceanography and Biogeochemistry Seminar. MIT EAPS department. September 23, 2011. (**Invited**)
- **Lam, P.J**., Ohnemus, D.C., and Marcus, M.A. The speciation of marine particulate iron adjacent to active and passive continental margins. Poster presented at Goldschmidt 2011, Prague, Czech Republic. August 14-19, 2011.
- *Ohnemus, D.C. and **Lam, P.J.** Trace element composition of size-fractionated particulates in the Mauritanian upwelling zone of the eastern North Atlantic U.S. GEOTRACES section. Talk at Goldschmidt 2011, Prague, Czech Republic. August 14-19, 2011.
- **Lam, P.J**., Doney, S.C., and Bishop, J.K.B. The dynamic biological pump: insights from a global compilation of particulate organic carbon (POC), $CaCO_3$, and opal concentration profiles from the mesopelagic. Poster presented at the Ocean Carbon and Biogeochemistry Summer Workshop, WHOI, July 18-21, 2011.
- Illuminating the black box of particulate iron speciation in the ocean. Marine Sciences Program seminar series. University of South Carolina, March 4, 2011. **(Invited)**

2010:

**Lam, P. J.** (2010) A global compilation of POC, $CaCO_3$, and Opal concentration profiles in the mesopelagic, *Eos Trans. AGU, 91(26),* Ocean Sci. Meet. Auppl., Abstract BO24B-06.

*Ohnemus, D.C., **P.J. Lam,** J.K.B. Bishop (2010) The mini-MULVFS holder: A new 142mm filter holder design for particulate sampling from in-situ pumps, *Eos Trans. AGU, 91(26),* Ocean Sci. Meet. Suppl., Abstract CO25B-05.

Wood, T.J., J.K. Bishop, **P.J. Lam** (2010) Large and small particle collection by in-situ filtration during GEOTRACES inter-calibration expeditions. *Eos Trans. AGU, 91*(26), Ocean Sci. Meet. Suppl., Abstract CO23A-01.

Dehairs, F., S. Jacquet, A. Cavagna, D. Cardinal, **P.J. Lam,** B. Griffiths, T. Trull. (2010) Export and twilight zone carbon remineralization efficiencies in SAZ and PFZ of the Southern Ocean. *Eos Trans. AGU, 91*(26),, Ocean Sci. Meet. Auppl., Abstract BO25G-13.

- Illuminating the black box of particulate iron speciation in the ocean. Marine Chemistry and Geochemistry Seminar Series. WHOI. Nov 2, 2010.

2009:

- The biological pump in the Southern Ocean and beyond. Marine Chemistry and Geochemistry Seminar Series. WHOI. Sep 29, 2009.
- The export of pyrite from the African continental margin into the water column (and other insights from synchrotron chemical mapping). Poster at Gordon Research Conference on Chemical Oceanography, Tilton, NH. Aug 2-7, 2009.
- Southern Ocean (and beyond) particle fluxes: efficiency of shallow POC export and export to the mesopelagic. Ocean Carbon and Biogeochemistry (OCB) summer workshop, WHOI, Jul 20-23, 2009. **(Invited)**
- SIRENA: Sources of Iron to the Eastern North Atlantic. WHOI biogeochemistry seminar. June 3, 2009.

2008:

- **Lam, P. J.**, J.K. Bishop, J.M. Lee, T.J. Wood (2008) Tracing the source of iron to the HNLC western subarctic Pacific. 2008 Ocean Sciences Meeting, March 2-7, 2008, Orlando, Florida. **(Invited)**
- SAZ-SENSE: the SubAntarctic Zone Sensitivity Project. WHOI biogeochemistry seminar. May 28, 2008.
- Using synchrotron x-ray radiation to trace the source of iron to the open ocean. Dept. of Physics, U Mass Dartmouth, Apr 11, 2008. **(Invited)**

2007:

- Community Structure, Ballast, and POC profiles in the mesopelagic Twilight Zone. Dept. of Estuarine and Ocean Sciences seminar series, School of Marine Science and Technology, University of Massachusetts, Dartmouth, Oct 24, 2007. **(Invited)**
- Lateral transport of elements from the margin to the open ocean: using particles to trace the sources of iron. Gordon Research Conference on Chemical Oceanography, Tilton, NH. Aug 5-10, 2007. **(Invited)**
- The speciation of marine particulate iron from an active margin: a tracer of source and particle dynamics. WHOI biogeochemistry seminar. July 18, 2007.
- The continental margin as a source of iron to the open ocean. Geochemistry Division Seminar, Lamont-Doherty Earth Observatory, Apr 4, 2007. **(Invited)**
- Iron supply and biological productivity in the ocean. Dept. of Earth Sciences, University of New Hampshire. Apr 2, 2007. **(Invited)**
- The continental margin as a source of iron to the open ocean. School of Earth and Atmospheric Sciences, Georgia Tech. Mar 15, 2007. **(Invited)**

2006:

**Lam, P. J.**, J.K. Bishop (2006) Ballasting and remineralization of POC in the Twilight Zone of the Southern Ocean. *Eos Trans. AGU, 86*(36), Ocean Sci. Meet. Suppl., Abstract OS24H-05.

- The continental margin as a source of iron to the open ocean. Dept. of Oceanography, SOEST, University of Hawaii. Nov 2, 2006. **(Invited)**
- Who needs dust? The continental margin as a source of iron to the open ocean. E34 Oceanography and Geobiology Seminar, Dept. of Earth, Atmospheric, and Planetary Science. MIT. Oct 20, 2006. **(Invited)**
- Hunting for an Fe source in the Northwest Pacific. WHOI biogeochemistry seminar. Sept 26, 2006.
- Iron supply and primary productivity in the ocean. Dept. of Civil and Environmental Engineering Seminar. MIT. Apr 4, 2006. **(Invited)**
- The continental margin as a source of iron to the open ocean. Marine Chemistry and Geochemistry Seminar Series. WHOI. Jan 31, 2006.

2005:

- Ballasting in the Twilight Zone? AGU Chapman Conference on Marine Organic Carbon and Calcite Fluxes, WHOI. Jul 2005. **(Invited)**
- Iron supply, marine productivity, and the biological carbon pump. Department of Earth and Planetary Science, McGill University, Montreal, Canada. Apr 18, 2005. **(Invited)**

2004:

**Lam, P. J.**, J.K. Bishop, C.C. Henning, M.A. Marcus, G.A. Waychunas, I.Y.Fung (2004) Continental delivery of iron to Ocean Station Papa in the Subarctic Pacific. *Eos Trans. AGU, 85*(47), Fall Meet. Suppl., Abstract OS43A-0532.

2002:

**Lam, P. J.**, T.J. Wood, J.K. Bishop (2002) Large volume in-situ filtration during SOFeX: an overview of preliminary results. *Eos Trans. AGU, 83*(47), Fall Meet. Suppl., Abstract OS11A-0218, 2002.