

Timothy J. Crone

CONTACT INFORMATION

Lamont–Doherty Earth Observatory
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RESEARCH INTERESTS

I am a marine geophysicist interested in the interplay between large-scale geophysical processes and the microbial biosphere. I am currently studying the nature of fluid flow variability within seafloor hydrothermal systems, with the hope of characterizing the effect of tidal and tectonic forces on hydrothermal convection at mid-ocean ridges. The ultimate goal of this work is to understand how flow variations affect hydrothermal fluxes and seafloor biological production. I use numerical models to investigate these processes, and I develop new observational techniques and instrumentation to verify model predictions.

EDUCATION

University of Washington, Seattle, Washington, USA

Ph.D., Oceanography (Marine Geophysics), June 2007

- Dissertation Topic: “Tidally-Forced Flow Variability Within Mid-Ocean Ridge Hydrothermal Systems: Models and Measurement Techniques”
- Advisor: William S. D. Wilcock

M.S., Oceanography (Marine Geophysics), May 2004

B.S., Oceanography (Physical), June 1999

HONORS AND AWARDS

Lamont–Doherty Earth Observatory Postdoctoral Fellowship (2007-2009)

Theodore and Marie Sarchin Graduate Fellowship in Oceanography (2006)

NASA Space Grant Summer Fellowship (1999)

Mary Gates Research Scholarship (1998)

Best Undergraduate Presentation at the Puget Sound Research Conference (1998)

National Merit Scholarship Commendation (1991)

ACADEMIC EXPERIENCE

Lamont–Doherty Earth Observatory, Palisades, New York, USA

Lamont Assistant Research Professor **July, 2010 – Present**

Doherty Assistant Research Scientist **January, 2010 – June, 2010**

Postdoctoral Research Fellow **September, 2007 – December, 2009**

University of Washington, Seattle, Washington, USA

Research Assistant **September, 2000 – June, 2007**
Includes current Ph.D. research, Ph.D. and Masters level course work and research/consulting projects.

Teaching Assistant **January, 2001 – June, 2005**
Assisted in teaching several courses covering a broad range of topics. Duties included grading, providing supplementary lectures, office hours, and web development.

- Envir215 Earth, Air, Water: The Human Context, Spring 2005
- Ocean410 Marine Geology and Geophysics, Autumn 2004
- Ocean451 Fluid Dynamics Laboratory, Winter 2002
- Ocean485 Fluid Dynamics Laboratory, Winter 2001

STUDENTS
ADVISED

Hannah Moore (LDEO Summer Intern, 2009)

COMMITTEE
SERVICE

Member: LDEO Advisory Committee for Academic Affairs & Diversity

Member: LDEO Website Advisory Committee

Member: LDEO Observatory Technical and Innovation Center Steering Committee

REFEREED
PUBLICATIONS

McNutt, M. K., R. Camilli, **T. J. Crone**, G. D. Guthrie, P. A. Hsieh, T. B. Ryerson, O. Savas, and F. Shaffer (2011) The flow of Macondo: Review of flow rate estimates of the *Deepwater Horizon* oil spill, *Proceedings of the National Academy of Sciences*, doi:10.1073/pnas.1112139108.

Crone, T. J., M. Tolstoy, and D. F. Stroup (2011) Permeability structure of young ocean crust from poroelastically triggered earthquakes, *Geophys. Res. Lett.*, 38, L05305, doi:10.1029/2011GL046820.

Diebold, J., M. Tolstoy, L. Doermann, S. Nooner, S. Webb, and **T. J. Crone** (2010) *R/V Marcus G. Langseth* seismic source: Modeling and calibration, *Geochemistry, Geophysics, Geosystems*, 11, Q12012, doi:10.1029/2010GC003216.

Crone, T. J., and M. Tolstoy (2010) Magnitude of the 2010 Gulf of Mexico Oil leak, *Science*, 330, 634, doi:10.1126/science.1195840.

Crone, T. J., W. S. D. Wilcock, and R. E. McDuff (2010) Flow rate perturbations in a black smoker hydrothermal vent in response to a mid-ocean ridge earthquake swarm, *Geochemistry, Geophysics, Geosystems*, 11, Q03012, doi:10.1029/2009GC002926.

Winckler, G., R. Newton, P. Schlosser, and **T. J. Crone** (2010) Mantle helium reveals Southern Ocean hydrothermal venting, *Geophysical Research Letters*, 37, L05601, doi:10.1029/2009GL042093.

Stroup, D. F., M. Tolstoy, **T. J. Crone**, A. Malinverno, D. R. Bohnenstiehl, and F. Waldhauser (2009) Systematic along-axis tidal triggering of microearthquakes observed at 9°50'N East Pacific Rise, *Geophysical Research Letters*, 36, L18302, doi:10.1029/2009GL039493.

Tolstoy, M., J. Diebold, L. Doermann, S. Nooner, S. C. Webb, D. R. Bohnenstiehl, **T. J. Crone**, and R. C. Holmes (2009) Broadband calibration of the *R/V Marcus G. Langseth* four-string seismic sources, *Geochemistry, Geophysics, Geosystems*, 10, Q08011, doi:10.1029/2009GC002415.

Crone, T. J., R. E. McDuff, and W. S. D. Wilcock (2008) Optical plume velocimetry: A new flow measurement technique for use in seafloor hydrothermal systems, *Experiments in Fluids*, doi:10.1007/s00348-008-0508-2.

Crone, T. J. (2007) Tidally-forced flow variability within mid-ocean ridge hydrothermal systems: Models and measurement techniques, Ph.D. Thesis, School of Oceanography, University of Washington, Seattle, WA, USA.

Crone, T. J., W. S. D. Wilcock, A. H. Barclay, and J. Parsons (2006) The sound generated by mid-ocean ridge black smoker hydrothermal vents, *PLoS ONE*, 1(1): e133, doi:10.1371/journal.pone.0000133.

Crone, T. J., and W. S. D. Wilcock (2005) Modeling the effects of tidal loading on mid-ocean ridge hydrothermal systems, *Geochemistry, Geophysics, Geosystems*, 6, Q07001, doi:10.1029/2004GC000905.

CONFERENCE
PUBLICATIONS

Crone, T. J., C. C. Ebbesmeyer, and W. J. Ingraham, Jr. (1998) Dispersion of 1,000 drift cards released over Victoria's sewage outfalls, *Puget Sound Research '98 Proceedings*, Washington State Convention and Trade Center, Seattle, Washington, 12–13 March.

Ebbesmeyer, C. C., C. A. Coomes, J. M. Cox, **T. J. Crone**, K. A. Kurrus, E. C. Noah, R. Shuman (1998) Current structure in Elliott Bay, Washington: 1977–1996, *Puget Sound Research '98 Proceedings*, Washington State Convention and Trade Center, Seattle, Washington, 12–13 March.

ABSTRACTS

Crone, T. J., R. A. Sohn, and S. C. Webb (2010) Modeling ground surface deformation at the TAG hydrothermal field using feedbacks between permeability and poroelastic flow, *Proceedings of the Goldschmidt Conference on Earth, Energy, and the Environment*, Knoxville, TN, 13–18 June 2010.

Ferrini, V., S. Soule, S. M. White, and **T. J. Crone** (2009) Seafloor change and lava emplacement processes associated with the 2005-2006 East Pacific Rise eruptions, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract V51D-1726.

Crone, T. J., M. Tolstoy, and D. F. Stroup Sumy (2009) Using two-dimensional models of poroelastic fluid flow to constrain the permeability structure of young oceanic crust, *Proceedings of the Ridge 2000 Integration and Synthesis Workshop*, St. Louis, MO, 1–3 October 2009.

Stroup, D. F., M. Tolstoy, **T. J. Crone**, A. Malinverno, D. R. Bohnenstiehl,

and F. Waldhauser (2009) Systematic variations in along-axis tidal triggering of microearthquakes observed at 9°50'N East Pacific Rise, *Proceedings of the Ridge 2000 Integration and Synthesis Workshop*, St. Louis, MO, 1–3 October 2009.

Crone, T. J., (2009) Using two-dimensional models of poroelastic fluid flow to constrain permeability in young oceanic crust, *Proceedings of the Marine Geoscience Leadership Symposium*, Washington DC, 23–27 March 2009.

Crone, T. J., M. Tolstoy, and D. F. Stroup (2008) Two-dimensional models of poroelastically-controlled earthquake triggering at the East Pacific Rise, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract B23F-06.

Tolstoy, M., **T. J. Crone**, F. Waldhauser, D. R. Bohnenstiehl, D. J. Fornari, and K. Von Damm (2008) Seismic activity associated with temperature perturbations at Bio 9 hydrothermal vent on the East Pacific Rise at 9°50'N, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract B21A-0326.

Stroup, D. F., M. Tolstoy, **T. J. Crone**, A. Malinverno, D. R. Bohnenstiehl, and F. Waldhauser (2008) Tidal triggering of microearthquakes constrains permeability at 9°50'N East Pacific Rise, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract B21A-0324.

Diebold, J., M. Tolstoy, S. Webb, L. Doermann, D. Bohnenstiehl, S. Nooner, **T. J. Crone**, and R. C. Holmes (2008) Calibration of *R/V Marcus G. Langseth* seismic sources, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract IN13A-1074.

Crone, T. J. (2008) Integrating numerical models of poroelastic convection with time-series data at the EPR, *Proceedings of the Ridge 2000 East Pacific Rise Integration and Synthesis Workshop*, Cotuit, MA, 26–28 September 2008.

Crone, T. J. (2008) Integrating numerical models of poroelastic convection with time-series data at the Endeavour, *Proceedings of the Ridge 2000 Endeavour Integration and Synthesis Workshop*, Seattle, WA, 18–19 September 2008.

Crone, T. J., and M. Tolstoy (2008) Using applied fluorescent tracers to study mid-ocean ridge hydrothermal systems, *Proceedings of Mantle to Microbe: Integrated Studies at Oceanic Spreading Centers*, Portland, OR, 24–26 March 2008.

Stroup, D. F., M. Tolstoy, **T. J. Crone**, A. Malinverno, D. R. Bohnenstiehl, and F. Waldhauser (2008) The relationship between poroelastic effects and tidal triggering of microearthquakes at 9°50'N East Pacific Rise, *Proceedings of Mantle to Microbe: Integrated Studies at Oceanic Spreading Centers*, Portland, OR, 24–26 March 2008.

Crone, T. J., W. S. D. Wilcock, and R. E. McDuff (2006) Measuring black smoker fluid flow rates using image correlation velocimetry, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract OS31C-1656.

Crone, T. J., W. S. D. Wilcock, and R. E. McDuff (2006) Hydrothermal flow variability: Two new potential measurement techniques, *Proceedings of the Ridge Theoretical Institute*, Mammoth Lakes, CA, 25–30 June 2006.

Crone, T. J., and W. S. D. Wilcock (2005) The acoustic signature of high-temperature deep-sea hydrothermal vents, *Eos Trans. AGU*, 85(52), Fall Meet. Suppl., Abstract HT31A-0486.

Wilcock, W. S. D., **T. J. Crone**, and R. E. McDuff (2003) Tidal variations in fluid discharge velocities at mid-ocean ridge hydrothermal systems: A critical measurement, *Geophysical Research Abstracts*, Vol. 5, Proceedings of the EGS-AGU-EUG Joint Assembly, Nice, France, 6–11 April 2003.

Crone, T. J., and W. S. D. Wilcock (2002) Modeling the effects of tidal loading on hydrothermal discharge at mid-ocean ridges, *Eos Trans. AGU*, 83(47), Fall Meet. Suppl., Abstract H21B-0808.

Crone, T. J., and W. S. D. Wilcock (2002) Modeling the effects of tidal loading on hydrothermal discharge at mid-ocean ridges, *Proceedings of the InterRidge Theoretical Institute*, Pavia, Italy, 9–13 September 2002.

Cherkaoui, A. S., **T. J. Crone**, and W. S. D. Wilcock (1998) Spatial and temporal characteristics of high Rayleigh number thermal convection in an open-top Hele–Shaw cell, *Eos Trans. AGU*, 79(45), Fall Meet. Suppl., Abstract T32A-02.

FUNDED
PROPOSALS

Crone, T. J. (2011) Collaborative Research: Developing New Instrumentation to Accurately Measure Heat and Mass Flux of Hydrothermal Fluids, NSF OCE-1131455, **\$373,982**.

Crone, T. J. (2011) RAPID: Deploying VentCam as a Data Collection Base Station for the Axial Seamount SensorBot Array, NSF OCE-1147104, **\$36,724**.

Crone, T. J. (2009) Using Numerical Models of Poroelastic Fluid Flow to Constrain the Permeability Structure of Young Oceanic Crust, NSF OCE-0928181, **\$152,909**.

Crone, T. J. (2009) A Seafloor Camera System for Flow Rate Measurements in Black Smoker Vents, NSF OCE-0917955, **\$142,371**.

Crone, T. J. (2008) A High-Speed Self-Contained Video Camera System for Optical Plume Velocimetry, Paros-PGI Observatory Technical and Innovation Center (OTIC), **\$26,160**.

R. E. McDuff (2006) Measuring black smoker flow rates using image correlation velocimetry, NSF OCE-0623285, **\$33,895**.

Crone, T. J., and J. D. Parsons (2004) Listening to hydrothermal vents: using measurements of turbulent acoustic energy to estimate black smoker fluid velocities, University of Washington Royalty Research Fund, **\$28,600**.

Crone, T. J. (1998) A drift card study in Victoria Bight, The Explorer’s Club,

\$3000.

FUNDING
SUMMARY

Career Total: \$797,641

SELECTED
PRESENTATIONS

“Lessons learned: Estimating the flow from the Deepwater Horizon oil leak using optical plume velocimetry”, Sustainable Development Seminar Series, Earth Institute of Columbia University, 18 October 2011, **Invited**.

“Using the VentCam flow measurement system to measure flow rates in hydrothermal systems at Axial Seamount”, Axial Seamount RSN Science Workshop, 5 October 2011.

“Measuring the size of the Deepwater Horizon oil leak: Science in the media spotlight”, *R/V Thomas G. Thompson*, 27 August, 2011.

“Measuring the Deepwater Horizon oil leak using optical plume velocimetry: Science in the media spotlight”, School of International and Public Affairs Lecture, LDEO, 27 June 2011, **Invited**.

“Estimating the size of the Deepwater Horizon oil leak using optical plume velocimetry”, Rhodes College, 23 February 2011, **Invited**.

“Estimating the size of the Deepwater Horizon oil leak using optical plume velocimetry”, LDEO Colloquium, 21 January 2011 **Invited**.

“Estimating the size of the Deepwater Horizon oil leak using optical plume velocimetry”, AGU Fall Meeting, 14 December 2010.

“Measuring the size of the Deepwater Horizon oil leak: Science in the media spotlight”, Old Dominion University, 11 November 2010, **Invited**.

“Measuring the size of the Deepwater Horizon oil leak: Science in the media spotlight”, Noon Balloon Lecture, Columbia University, 5 October 2010, **Invited**.

“Estimating the magnitude of the spill”, LDEO Director’s Circle Lecture, 25 September 2010, **Invited**.

“The 2010 Deepwater Horizon oil release: An oceanographic perspective”, Ocean 101 Lecture, Columbia University, 14 September 2010, **Invited**.

“Measuring and modeling fluid flow in hydrothermal vents and other such deep-water places”, *R/V Thomas G. Thompson*, 19 August, 2010.

“Poroelastically triggered earthquakes at the East Pacific Rise: A new view of permeability in young oceanic crust”, Boise State University, 26 April 2010, **Invited**.

“The sounds and sights of hydrothermal vents: Measuring flow using passive

acoustics and optical image analysis”, R/V Atlantis, 31 December 2009.

“Using two-dimensional models of poroelastic fluid flow to constrain the permeability structure of young oceanic crust”, Ridge 2000 Integration and Synthesis Workshop, 2 October 2009, **Invited**.

“Modeling and measuring fluid flow in mid-ocean ridge hydrothermal systems”, OOI Regional Scale Nodes Office, 11 August 2009, **Invited**.

“Report on the Marine Geoscience Leadership Symposium”, Lamont Leadership Forum, 4 June 2009, **Invited**.

“Using two-dimensional models of poroelastic fluid flow to constrain permeability in young oceanic crust”, Marine Geoscience Leadership Symposium, 23 March 2009.

“Two-dimensional models of poroelastically-controlled earthquake triggering at the East Pacific Rise”, AGU Fall Meeting, 16 December 2008.

“Ocean circulation within Earth’s crust”, Earth Institute Postdoc Orientation, 12 Sept 2008, **Invited**.

“Poroelasticity and its implications for subseafloor processes”, WHOI G&G Seminar, 17 June 2008, **Invited**.

“Subseafloor fluid flow: Making measurements of a keystone process”, WHOI Guest Seminar, 16 June 2008, **Invited**.

“Optical flow: Using image analysis to measure hydrothermal fluid fluxes”, LDEO Series on Image Analysis, 5 June 2008, **Invited**.

“Hydrothermal processes at mid-ocean ridges”, LDEO Summer Intern Orientation, 4 June 2008, **Invited**.

“I (heart) poroelasticity - Part 2: Models , measurements , and implications of poroelastic processes in mid-ocean ridge hydrothermal systems”, LDEO MG&G Seminar, 14 May 2008.

“I (heart) poroelasticity - Part 1: Theory and applications ”, LDEO Geodynamics Seminar, 2 May 2008.

“Models and measurements of tidally-forced flow variability within mid-ocean ridge hydrothermal systems”, University of Washington Applied Physics Lab, 15 November 2007, **Invited**.

SYNERGISTIC
ACTIVITIES

Member: American Geophysical Union

Member: American Association for the Advancement of Science

Lead Organizer: LDEO Joint MG&G–SG&T Seminar Series (2008-2009)

Educational Outreach:

- Ocean Inquiry Project Instructor (www.oceaninquiry.org)
- School of Oceanography Outreach Volunteer
- Developed several hands-on fluid dynamics experiments for the School of Oceanography's Open House

Selected Conferences and Workshops:

- Marine Geoscience Leadership Symposium, Washington DC, 2009.
- Ridge 2000 East Pacific Rise Integration and Synthesis Workshop, Cotuit, MA, 2008.
- Ridge 2000 Endeavour Integration and Synthesis Workshop, Seattle, WA, 2008.
- Ridge 2000 Mantle to Microbe: Integrated Studies at Oceanic Spreading Centers, Portland, OR, 2008.
- Ridge Theoretical Institute, Mammoth Lakes, California, 2006.
- Ridge 2000 Progress and Planning Meeting, Vancouver, BC, Canada, 2005.
- Cyprus Field School and Conference, Cyprus, 2005.
- InterRidge Theoretical Institute, Pavia, Italy, 2002.

PROFESSIONAL
EXPERIENCE

Global Remote Sensing, LLC., Seattle, Washington

Scientific Consultant

March, 2006 – July, 2006

Geoacoustics application development, experiment design and assessment, acoustic data analysis and visualization.

The Glosten Associates, Inc., Seattle, Washington

Scientific Consultant

October, 2004 – December, 2004

Dye study design, data analysis and visualization.

Evans-Hamilton, Inc., Seattle, Washington

Oceanographer II

May, 1996 – May, 2000

Oceanographic consulting on a wide range of physical oceanographic projects for government and industry, including environmental remediation, sewage outfall planning, sediment transport monitoring, and current measurements and modeling for exploration/production operations.

SEAGOING
EXPERIENCE

Aug 2011: ***R/V Thomas G. Thompson***

- Axial Seamount, deploying VentCam as a data collection base station for the Sensorbot array using ***ROV ROPOS***

Aug 2010: ***R/V Thomas G. Thompson***

- Axial Seamount, field testing of VentCam flow meter using ***ROV Jason***

Dec 2009: ***R/V Atlantis***

- East Pacific Rise, field testing of VentCam flow meter, participant on ***DSV Alvin*** dives 4577 and 4584

Jan 2008: ***R/V Langseth***

- Gulf of Mexico, air-gun calibrations

Aug/Sep 2005: ***R/V Atlantis***

- Endeavour Segment, deployment of vent hydrophone, participant on ***DSV***

Alvin dive 4137

Sep 2004: *R/V Thomas G. Thompson*

- Endeavour Segment, deployment of hydrophone using *ROV ROPOS*

Aug 2004: *R/V Point Lobos*

- Monterey Canyon, two cruises, deployment/recovery of SlowFlow meter using *ROV Ventana*

May 2004: *R/V Atlantis*

- Northeast Pacific, acoustic telemetry mooring deployment

Sep 2000: *R/V Atlantis*

- Endeavour Segment, participant on *DSV Alvin* dive 3616

Jul 2000: *R/V Calabar Carrier*

- Bight of Benin, Nigeria, current meter recovery/redeployment

Mar 2000: *R/V Calabar Carrier*

- Bight of Benin, Nigeria, current meter deployment

1998–2000: *R/V Reflux*

- Puget Sound, numerous cruises in Bud Inlet, Elliot Bay, Hylebos Waterway, and Willipa Bay

Apr 1999: *R/V Thomas G. Thompson*

- Puget Sound, CTD tow-yos