# David Barclay

Dalhousie University, Department of Oceanography

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## Education

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| 2011 | Scripps Institution of Oceanography, University of California, San Diego. Ph.D. in Oceanography |
| 2005 | McGill University, Canada. B.Sc. Honors in Physics, minor in Music Technology. |

## Research Experience

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| 2015 | **Assistant Professor**, Canada Research Chair (Tier II), Ocean Technology Systems, Department of Oceanography, Dalhousie University. |
| 2014 | **Post-Doctoral Fellow**, ONR Special Research Award in Ocean Acoustics, Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution.<br>Research topic: 3D ambient noise modeling<br>Supervisor: *Dr. Ying-Tsong Lin* |
| 2013 | **Post-Doctoral Scholar**, Deep Ocean Exploration Institute, Woods Hole Oceanographic Institution.<br>Research topics: Noise modeling using a 3D parabolic equation, spatial properties of sediment generated ambient noise, deep ocean ambient noise. |
| 2012 | **Post-Doctoral Fellow**, Physical Oceanography, Memorial University of Newfoundland<br>Supervisors: *Dr. Len Zedel, Dr. Alex Hay*<br>Research topic: Sediment transport in coastal environments |
| 2005 - 2011 | **Graduate Researcher**, Acoustical Oceanography, Marine Physical Lab, Scripps Institution of Oceanography, University of California, San Diego.<br>Supervisor: *Dr. Michael Buckingham.*<br>Thesis: Ambient Noise in the Deep Ocean |
| 2004 | **Undergraduate Researcher**, NSERC, Structured Surface Physics Lab, University of British Columbia, supervisor *Dr. Lorne Whitehead.* |
| 2003 | **Undergraduate Researcher**, NSERC, Dept. of Earth and Ocean Sciences, University of Victoria, supervisors *Dr. Chris Garrett* and *Dr. Svein Vagle*. |
| 2002 | **Undergraduate Researcher**, NSERC, Atmospheric physics, University of Toronto, supervisor *Dr. Kim Strong*. |

## Awards

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|---|---|
| 2015 | Canada Research Chair (Tier II), Ocean Technology Systems |
| 2014 | Postdoctoral Fellowship, Special Research Award in Ocean Acoustics, Office of Naval Research |
| 2012 | Deep Ocean Exploration Institution Post-Doctoral Scholar award, Woods Hole Oceanographic Institution. |

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| 2010 | Graduate Traineeship, Special Research Award in Ocean Acoustics, Office of Naval Research. |
| 2010 | Acoustical Oceanography student presentation, second prize, Acoustical Society of America, Cancun meeting. |
| 2009 | University of California Ship Grant |
| 2009 | Student Presentation honorable mention, Underwater Acoustic Measurements, Technology and Results, Nafplion, Greece. |
| 2008 | Acoustical Oceanography student presentation, second prize, Acoustical Society of America, Paris meeting. |
| 2007 | Acoustical Oceanography, Best Student Paper, Acoustical Society of America, New Orleans meeting. |
| 2005 | Doherty Entrance Fellowship, Scripps Institution of Oceanography, University of California, San Diego. |
| 2004 | Outstanding Teaching Assistant, Faculty of Engineering, McGill University. |
| 2002 - 2004 | Natural Sciences and Engineering Research Council of Canada Undergraduate Student Research Award. |
| 2000 - 2004 | Hugh Brock Scholarship, McGill University |

## Student Supervision

Graduates (*current position*)

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| 2018 - | Emmanuelle Cook, MSc candidate |
| 2018 - | Calder Robinson, MSc candidate |
| 2017 – 2018 | Emma Giesbrecht, M. Marine Management, (*Transport Canada*) |
| 2017 - | Najeem Shajahan, PhD candidate |
| 2016 - | Meghan Troup, PhD candidate |
| 2016 – 2018 | Maxime Miron-Morin, MSc, co-supervised with Dr. Jean-Francois Bousquet, (*RCAF*) |
| 2015 - | Bruce Martin, PhD candidate |
| 2015 - | Dugald Thomson, PhD candidate |
| 2015 - 2017 | Carolyn Binder, PhD, co-supervised with Dr. Paul Hines, (*DRDC, scientist*) |
| 2015 - 2016 | Anne Lombardi, MSc, co-supervised with Dr. Alex Hay (*NSCC, Faculty*) |

Undergraduates

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| 2017 – 2018 | Calder Robinson, undergraduate research assistant, Oceanography honours thesis |
| 2016 – 2017 | Matthew Auvinen, Oceanography honours student, undergraduate research assistant |
| 2016 - 2017 | Faisel Fahad Aldenaini, Sebastien Boivin, and Mohammed Alhamoud, Electrical and Computer Engineering capstone project |
| 2016 | Liang Bao, engineering co-op student, undergraduate research assistant |
| 2016 | Leo Vinour, visiting student, ENSTA-Bretagne, France |

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| 2016 | Shannon Steele, Oceanography honours student, undergraduate research assistant |
| 2015 - 2016 | Brian Little and Eric Hamilton, Electrical and Computer Engineering capstone project |
| 2015 - 2016 | Nick Hansen, Andrew Noujaim and Duc Cuong Dinh, Cody Page, Electrical and Computer Engineering capstone project |
| 2015 - 2016 | Danielle Moore, biology Co-op student, undergraduate research assistant |

## Teaching Experience

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| 2017 | OCEA 5421, Special Topics in Oceanography (Ocean Acoustics), Dalhousie University |
| 2016, ‘18, ‘19 | OCEA 4311/5311, Fluid Dynamics, Oceanography and Physics, Dalhousie University |
| 2016, ‘18 | OCEA 4250/5250, Acoustical Oceanography, Oceanography and Physics, Dalhousie University |

## Field Experience

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| 2018 | **Grand Passage propagation experiment**, co-PI, measured sound transmission through a turbulent tidal passage. |
| 2017 | **Dalcomms 1 Experiment**, scientist, R/V Sorsa, measured acoustic channel characteristics using multiple physical oceanographic sensors in St. Margaret’s Bay, Nova Scotia. |
| 2017 | **Office of Naval Research Seabed Characterization Experiment**, scientist, R/V Neil Armstrong, recorded ambient noise at the ‘mud patch’ south of Martha’s Vineyard, Massachusetts. |
| 2016 | **Minas Passage, Bay of Fundy**, chief scientist, R/V Nova Endeavour, Testing an array for low frequency noise measurement in high flow environments. |
| 2016 | **Canyon Acoustics Experiment**, scientist, R/V Neil Armstrong, Recorded ambient noise and transmission loss in a shelf break canyon. |
| 2014 | **Schmidt Ocean Institute ‘Exploring the Mariana Trench’**, Scientist, R/V Falkor, Measured ambient noise in the Challenger Deep. |
| 2013 | **Advocate beach**, Bay of Fundy, scientist. Measured spatial properties of the noise field in the sediment due to near shore processes using passive acoustic arrays. |
| 2012 | **Tongan Trench expedition**, scientist, R/V Revelle. Deployed ‘Deep Sound’ instruments to profile noise field and land on the trench floor. |
| 2012 | **Advocate beach**, Bay of Fundy, scientist. Measured sediment transport and other near shore processes using active and passive acoustics alongside direct and optical methods. |
| 2011 | **Mississippi Delta cruise**, chief scientist. Measured ambient noise over 750 miles of the lower Mississippi river from a small sailboat. |
| 2011 | **Mariana Trench National Geographic cruise**, scientist, M/V Super Emerald. Assisted in deploying deep ocean landers to the bottom of the Sirena Deep. |
| 2009 | **Deep Sound cruise**, chief scientist, R/V Revelle. Deployed ‘Deep Sound’ in the Mariana Trench during three week cruise. |

2009 **Northern Pacific Acoustic Laboratory, Philippine Sea Experiment**, scientist, R/V Kilo Moana. Deployed 'Deep Sound' and assisted with operation of the Four Octave Research Array (FORA) during a four week cruise.

2005 **Office of Naval Research Makai Experiment**, Kauai, scientist. Deployed and operated the Fly-By acoustic array during small boat operations.

2003 **Ocean Station Papa cruise**, technician, CCGS John P. Tully. Recovered, turned around and re-deployed Air-Sea gas exchange array during a month long cruise.

## Publications (students underlined)

Barclay, D.R., Bevans, D., Buckingham, M.J., **(2018)** *Estimation of the geo-acoustic properties of the New England Mud Patch from the vertical coherence of the ambient noise in the water column*, IEEE J. Ocean. Eng., submitted.

Barclay, D.R., Lin, Y.T., **(2018)** *3D noise modeling in a submarine canyon*, J. Acoust. Soc. Am., in revisions.

Auvinen, M.F. and Barclay, D.R., **(2018)** *The performance of a passive linear array in a tidal channel*, IEEE J. Ocean. Eng., in revisions

Thomson, D.J., Dosso, S.E., Barclay, D.R., **(2017)**, *Modeling AUV localization error in a long baseline acoustic positioning system,* IEEE J. Ocean. Eng. 43, 4 pp 955-968,

Auvinen, M.F. and Barclay, D.R., **(2017)** *Evaluating the performance of a coherent array in a high-flow tidal channel*, Proceedings of the 4th Underwater Acoustics Conference and Exhibition, Skiathos, Greece., pp 837-844

Barclay, D.R., Buckingham, M.J., Bevans, D.A., **(2017),** *The depth dependence of ambient noise coherence in the Challenger Deep*, Acoustic Bulletin, July-August Issue, Institute of Acoustics, UK, pp 36-40

Lombardi, A. R., Hay, A.E., Barclay, D.R., **(2016)** *Soundscape characterization in a dynamic acoustic environment: Grand Passage, Nova Scotia, a planned in-stream tidal energy site.* Proc. Meet. Acous. 4ENAL. Vol. 27. No. 1. pp 005001

Barclay, D.R., and Buckingham, M.J., **(2014)**, *Spectral and spatial properties of wind-driven ambient noise at the bottom of the Tonga Trench,* J. Acoust. Soc., 136, pp 2497-2511

Stark, N., Hay, A.E., Cheel, R., Zedel, L., Barclay, D.R., **(2014)**, *Laboratory Measurements of Coarse Sediment Bedload Transport Velocity Using a Prototype Wideband Coherent Doppler Profiler (MFDop)*, J. Atmos. and Ocean. Tech., 31, pp 999-1011

Barclay, D.R. and Buckingham, M.J. **(2013)**, *The depth-dependence of rain noise in the Philippine Sea*, J. Acoust. Soc. Am., 133, pp 2567.

Barclay, D.R., and Buckingham, M.J. **(2013)**, *Depth dependence of wind-driven, broadband ambient noise in the Philippine Sea*, J. Acoust. Soc. Am., 133, 1, pp 62-71

Barclay, D.R., Simonet, F. and Buckingham, M. J., **(2009)**, *Deep Sound: A Free-Falling Sensor Platform for Depth-Profiling Ambient Noise in the Deep Ocean*, Marine Tech. Soc. J., 43, 144.

Barclay, D.R. and Buckingham, M.J. **(2009)**, *On the shapes of natural sand grains*, J. Geophys. Res., 114, B02209.

Szylowski, M., Mossman, M., Barclay, D., and Whitehead, L. **(2006)**, *Novel fiber-based integrating sphere for luminous flux measurements*, Rev. Sci. Instr. 77, 063102

## Invited Conference Presentations

Barclay, D.R., Lin, Y.T., (2017). *Three-dimensional ambient noise modeling*, The International Conference on UnderWater Networks and Systems, Halifax.

Barclay, D. R., Buckingham, M. J., Bevans, D. (2016). *The depth dependence of ambient noise in deep ocean trenches.* J. Acoust. Soc. Am., 140, 4, pp. 2977-2977, Hawaii, USA.

Barclay, D.R., Lin, Y.T. (2013), *Ambient noise modeling using sound field reciprocity,* J. Acoust. Soc. Am., 134, 5, pp. 4151, San Francisco, USA.

Barclay, D.R. and Buckingham, M.J., (2011), *Rain noise in the deep ocean*, Underwater Acoustic Measurements, 4th International Conference, Kos, Greece.

Barclay, D.R. and Buckingham, M.J., (2010), *Ambient noise in the Mariana Trench*, J. Acoust. Soc. Am., 128, 4, pp. 2300, Cancun, Mexico.

Barclay, D.R. and Buckingham, M.J., (2010), *Ambient noise in the Mariana Trench*, European Conference on Underwater Acoustics, Istanbul, Turkey.

Barclay, D.R., Simonet, F., and Buckingham, M.J., (2010), *Depth-profiling ambient noise in the deep ocean*, J. Acoust. Soc. Am., 127, 3, pp. 1783, Baltimore, USA.

Barclay, D.R. and Buckingham, M.J., (2009), *Noise Profiling with 'Deep Sound'*, Underwater Acoustic Measurements, 3rd International Conference, Nafplion, Greece.

Barclay, D.R. and Buckingham, M.J., (2008), *Doppler Geo-Spectroscopy in the Makai Experiment*, J. Acoust. Soc. Am., 123, 5, pp 3364, Paris, France.

## Other Conference Presentations

Barclay, D.R., Bevans, D., Buckingham M.J., (2018), *Measuring of muddy seabed properties using ambient noise coherence,* ASA, Victoria B.C.

Barclay, D.R., Bevans, D., Buckingham M.J., (2018), *The measurement of muddy seabed properties using passive acoustics*, 52nd Canadian Meteorological and Oceanographic Society meeting, Halifax, Canada.

Barclay, D. R., & Lin, Y. T. (2017). *Three-dimensional noise modeling*. J. Acoust. Soc. Am., 142(4), pp 2487.

Barclay, D.R., Auvinen, M., (2017), *Performance of a coherent array in a high flow tidal channel*, Underwater Acoustics Conference & Exhibition, Skiathos, GR.

Barclay, D. R., Zedel, L., & Hay, A. E. (2017), *Estimating the speed of poroelastic interface waves using ambient noise*, J. Acoust. Soc. Am., 141(5), pp 3590

Barclay, D.R., Buckingham, M.J., Bevans, D. (2016), *The depth dependence of ambient noise coherence in the deep ocean*, Acoustic and Environmental Variability, Fluctuations and Coherence, Institute of Acoustics (UK), Oxford

Moore, D., and Barclay, D.R., (2016) *Modelling the performance of fish tag monitoring stations on the Scotian Shelf*, J. Acoust. Soc. Am. 139, 4, pp 2172, Salt Lake City.

Moore, D. and Barclay, D.R., (2016) *The performance of fish tag monitoring stations on the Scotian Shelf,* 50th Canadian Meterological and Oceanographic Society congress, Fredericton. (poster)

Barclay, D.R., Zedel, L., Hay, A.E., and Lin, Y-T., (2015), *Ambient noise measurements from hydrophones buried in a mixed-gravel beach*, Seabed and Sediment Acoustics, Institute of Acoustics (UK), Bath.

Barclay, D.R. and Lin, Y-T., (2015) *Ambient noise modeling in shallow water environments,* 49th Canadian Meteorological and Oceanographic Society meeting, Whistler.

Barclay, D.R. and Lin, Y-T., (2015) *Three-dimensional noise modeling in a submarine canyon*, J. Acoust. Soc. Am., 137, 4, pp 2421, Pittsburgh.

Barclay, D.R., Buckingham, M.J., Bevans, D. (2015) *Ambient noise in the challenger deep*, Canadian Acoustics Weeks, Halifax.

Barclay, D.R. and Zedel, L., (2014) *Exploring wave and bedload transport generate noise*, 17th Ocean Sciences meeting, Hawaii.

Barclay, D.R., Zedel, L., Hay, A., and Hatcher, M. (2013) *Modeling the spatial properties of sediment generated noise*, 1st UAC, pp 235. Corfu, Greece.

Barclay, D.R., Zedel, L., Hay, A., and Hatcher, M. (2013) *The spatial properties of breaking wave generated and bedload transport generated noise in the sediment layer of a shallow water wave guide*, Proc. Meet. Acoust., pp 005002. Montreal, Canada.

Barclay, D.R., Zedel, L., Hay, A.E., Stark, N., (2012), *The Simulation of Bedload Transport Measurement by Coherent Doppler Backscatter*, AGU Fall Meeting (poster)

Barclay, D.R., Zedel, L., Hay, A.E., Stark, N., (2012), *Simulating coherent Doppler backscatter from a moving bottom: measuring bedload transport*, Can. Met. & Ocean. Soc. 46th congress

Barclay, D.R. and Buckingham, M.J., (2009), *Synthesizing the shape of sand grains*, J. Acoust. Soc. Am., 125, 4, p. 2747.

Barclay, D.R., Simonet, F., and Buckingham, M.J., (2008), *Vertical profiling of ambient noise with 'Deep Sound'*, J. Acoust. Soc. Am., 124, 4, p. 2599.

Barclay, D.R. (2008), *Adaptive Characterization of Near and Far field Elements in the Soundscape*, J. Acoust. Soc. Am., 123, 5, p. 3680. (poster)

Barclay, D.R. and Buckingham, M., (2007) *The effect of grain shape on the porosity of marine sediments*, J. Acoust. Soc. Am., 122, 5, p. 2940.

Barclay D.R. and Buckingham, M.J., (2006), *Doppler spreading of aircraft harmonics in a shallow-water channel off Kauai*, J. Acoust. Soc. Am., 120, 5, p. 3181.

**Awarded Research Funding – Awarded to lab (total award value)**

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| 2018 – 2022 | Department of Fisheries and Oceans, Ocean and Freshwater Science Contributions Program, *Saving Whales with Innovative Monitoring and Mitigation,* co-P.I. | $100k ($1.2M) |
| 2018 - 2022 | Department of Fisheries and Oceans, Oceans and Freshwater Science Contributions Program, *Environmental ocean noise,* P.I. | $189k |
| 2018 | Department of Fisheries and Oceans, *Environmental ocean noise model development*, P.I. | $22k |
| 2018 – 2020 | Geospectrum Technologies Inc., All Domain Situational Awareness Low Frequency Source contract for Defense Research and Development Canada, consultant. | $24k |
| 2018 – 2020 | Geospectrum Technologies Inc., Document review and statement of work development for FORCE, consultant. | $10k |
| 2018 | NRC-IRAP, *Autonomous hovercraft for bathymetric surveying* | $10k |
| 2018 | Innovacorp, Blue Solutions, *Smart Lobster Trap*, co-P.I. | $10k |

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| 2018 – 2020 | Canadian Foundation for Innovation, *Environmental Monitoring, Modelling and Forecasting Infrastructure for Instream Tidal Energy*, co-P.I. | $44k ($2.7M) |
| 2017 – 2021 | Ocean Frontiers Institute, *Safe navigation and environmental protection, Arctic noise subproject,* co-P.I. | $24k/yr ($620k) |
| 2017 – 2018 | Innovacorp – Offshore Energy Research Association, *How does sound travel in high-energy tidal environments?* Joint-P.I. | $12.5k ($65k) |
| 2017 | Innovacorp, Early Stage Commercialization Fund, *Autonomous hovercraft for bathymetric surveying*, P.I. | $21k |
| 2016 – 2021 | NSERC Discovery grant, *Measuring and modeling ambient noise in three-dimensional ocean environments*, P.I. | $34k/yr |
| 2016 | NSERC Engage grant, *Development of a low-frequency high-flow acoustic sensing array for turbulent ocean conditions*, P.I. | $25k |
| 2016 | Canadian Foundation for Innovation, *MERIDIAN: Marine Environmental Research Infrastructure for Data Integration and Application Network*, member of core-scientific team. | ($5M) |
| 2015 - 2017 | Office of Naval Research (USA), Code 32, Ocean Acoustics, *Three dimensional ocean noise modeling*, P.I. | $54k/yr |
| 2015 | Canadian Foundation for Innovation, *Autonomous deep ocean profilers*, P.I. | $300k |

## Professional Activities

Associate Editor (Acoustical Oceanography), Journal of the Acoustical Society of America, Express Letters.

Technical Committee Member, special session organizer, session chair, webmaster, Acoustical Oceanography, Acoustical Society of America.

Structured session organizer, 5th Conference and Exhibition on Underwater Acoustics.

Reviewer for the Journal of the Acoustical Society of America, Journal of the Acoustical Society of America-Express Letters, Applied Acoustics, Acoustics Australia, Sensors, and the Journal of Geophysical Research, Oceans.

Reviewer of Department of Fisheries and Oceans, Canada, Technical Documents

Proposal reviewer for the Schmidt Ocean Institute.

## Institutional Activities

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| 2018 – 2019 | Chair Advisory Committee for the Department of Physics & Atmospheric Science |
| 2018 – | Co-host, *Sciographies*, Faculty of Science podcast. |
| 2018 – | Seminar co-ordinator, Department of Oceanography. |
| 2018 – | Hiring committee, Ocean sandbox instructor, Department of Oceanography |
| 2017 – | Undergraduate research co-ordinator |
| 2017 – | Graduate Oversight committee member, Department of Oceanography |
| 2017 | Chair Advisory Committee for the Department of Physics & Atmospheric Science |

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| 2016 - 2021 | Post-doctoral fellowship program co-ordinator, Ocean Frontiers Institute, Dalhousie University |
| 2015 – 2017 | Curriculum committee member, Department of Oceanography |