

RESEARCH EXPERTISE

biogeochemical tracers, chemical oceanography, dissolved gases, isotope geochemistry, groundwater chemistry, mass spectrometry, biogeochemical instrument development, in situ instrumentation

EDUCATION

- PhD, Chemical Oceanography** 2016
- Massachusetts Institute of Technology/Woods Hole Oceanographic Institution Joint Program in Oceanography
- **Thesis:** Insight into chemical, biological, and physical processes in coastal waters from dissolved oxygen and inert gas tracers. <https://doi.org/10.1575/1912/8589>
- BSc, Combined Honors, Chemistry and Earth and Ocean Sciences** (with distinction) 2010
- University of Victoria, Canada
- **Thesis:** Investigation of the nitrous oxide cycle within an anoxic coastal pond in Cape Cod, MA

EXPERIENCE

- Earth Observation Scientist**, Plymouth Marine Laboratory 2020–present
- Using biogeochemical Argo data to study the ocean carbon pumps
- NSERC Postdoctoral Research and Teaching Fellow**, UBC 2017–2020
- Investigated greenhouse gas cycling in the Canadian Arctic and groundwater geochemistry in British Columbia. Co-instructor for Field Methods in Groundwater Hydrology. *Publications 8-10, 12-21.*
- Graduate Research Assistant** supervised by Rachel Stanley and David Nicholson, WHOI 2011–2016
- Developed a gas equilibration mass spectrometer for on-site measurement of dissolved noble gases in water. Participated in three field experiments to quantify air-sea gas exchange (from inert gases) and biological productivity (from the triple oxygen isotope composition of O₂). *Publications 4-7, 11.*
- Research Assistant** supervised by Scott McIndoe, UVictoria 2010–2011
- Contributed to development of novel mass spectrometer-based techniques for real-time reaction monitoring. Applied techniques to study mechanisms of palladium-catalyzed cross-coupling reactions. *Publication 2.*
- Summer Student Fellow** supervised by Karen Casciotti, WHOI 2009
- Studied N cycling in an anthropogenically-influenced anoxic lake by measuring the concentration and isotopic composition of N₂O and nutrients. Investigated biological pathways to N₂O production through incubations.
- Research Assistant** supervised by Roberta Hamme, UVictoria 2008
- Quantified denitrification rates in a seasonally-anoxic estuary by interpreting an annual time series of O₂ concentration and O₂/N₂/Ar ratio data. *Publications 1 and 3.*

PEER-REVIEWED PUBLICATIONS

7 as first author, h-index 8 ([Google Scholar](#))

14) Oxygen and triple oxygen isotope measurements provide different insights into gross oxygen production in a shallow salt marsh pond

EM Howard, AC Spivak, JS Karolewski, KM Gosselin, ZO Sandwith, **CC Manning**, RHR Stanley (2020)
Estuaries and Coasts, <http://doi.org/10.1007/s12237-020-00757-6>

13) River inflow dominates methane emissions in an Arctic coastal system

CC Manning, VL Preston, SF Jones, APM Michel, DP Nicholson, PJ Duke, M Ahmed, K Manganini, BGT Else, and PD Tortell (2020)
Geophysical Research Letters, 47, e2020GL087669, <https://doi.org/10.1029/2020GL087669>

- 12) **A new method for tracing denitrification in riparian groundwater**
A Popp, **CC Manning**, M Brennwald, and R Kipfer (2020)
Environmental Science & Technology, 54(3), 1562-1572, <https://doi.org/10.1021/acs.est.9b05393>
- 11) **Changes in gross oxygen production, net oxygen production, and air-water gas exchange during seasonal ice melt in Whycocomagh Bay, a Canadian estuary in the Bras d'Or Lake system.**
CC Manning, RHR Stanley, DP Nicholson, B Loose, A Lovely, P Schlosser, and BG Hatcher (2019)
Biogeosciences, 17, 3351-3376, <https://doi.org/10.5194/bg-16-3351-2019>
- 10) **Advancing knowledge of gas migration and fugitive gas from energy wells in northeast British Columbia, Canada.**
AG Cahill, R Beckie, B Ladd, E Sandl, M Goetz, J Chao, J Soares, **C Manning**, C Chopra, N Finke, I Hawthorne, A Black, KU Mayer, S Crowe, T Cary, R Lauer, B Mayer, A Allen, D Kirste, L Welch (2019)
Greenhouse Gases: Science and Technology, 9, 134-151, <https://doi.org/10.1002/ghg.1856>
- 9) **An intercomparison of oceanic methane and nitrous oxide measurements.**
ST Wilson and 31 others including **CC Manning** (2018)
Biogeosciences, 15, 5891-5907, <https://doi.org/10.5194/bg-15-5891-2018>
- 8) **Refined estimates of net community production in the Subarctic Northeast Pacific derived from $\Delta O_2/Ar$ measurements with N_2O -based corrections for vertical mixing**
RW Izett, **CC Manning**, RC Hamme, and PD Tortell (2018)
Global Biogeochemical Cycles, 32, <http://doi.org/10.1002/2017GB005792>
- 7) **Revising estimates of aquatic gross oxygen production by the triple oxygen isotope method to incorporate the local isotopic composition of water**
CC Manning, EM Howard, DP Nicholson, B Ji, ZO Sandwith, and RHR Stanley (2018)
Geophysical Research Letters, 44, <http://doi.org/10.1002/2017GL074375>. Software: <http://doi.org/10.5281/zenodo.376786>
- 6) **Impact of recently upwelled water on productivity investigated using in situ and incubation-based methods.**
CC Manning, RHR Stanley, DP Nicholson, JM Smith, JT Pennington, MR Fewings, ME Squibb, and FP Chavez (2017)
Journal of Geophysical Research: Oceans, 122, <http://doi.org/10.1002/2016JC012306>.
- 5) **Quantifying air-sea gas exchange using noble gases in a coastal upwelling zone.**
CC Manning, RHR Stanley, DP Nicholson, and ME Squibb (2016)
IOP Conference Series: Earth and Environmental Science. 35, 012017, 13 pages,
<http://doi.org/10.1002/2017GL074375>. Software: <http://doi.org/10.5281/zenodo.594531>
- 4) **Continuous measurements of dissolved Ne, Ar, Kr, and Xe with a field-deployable gas equilibration mass spectrometer.**
CC Manning, RHR Stanley, and DE Lott (2016).
Analytical Chemistry 88, 3040–3048, <http://doi.org/10.1021/acs.analchem.5b03102>
- 3) **Nitrate elimination and regeneration as evidenced by dissolved inorganic nitrogen isotopes in Saanich Inlet, a seasonally anoxic fjord.**
A Bourbonnais, MF Lehmann, RC Hamme, **CC Manning**, and SK Juniper (2013)
Marine Chemistry 157, 194-207, <http://doi.org/10.1016/j.marchem.2013.09.006>
- 2) **Powerful insight into catalytic mechanisms through simultaneous monitoring of reactant, products and intermediates**
KL Vikse, Z Ahmadi, **CC Manning**, DA Harrington, and JS McIndoe (2011)
Angewandte Chemie International Edition 50(36), 8304-8306, <http://doi.org/10.1002/anie.201102630>

1) Impact of deep-water renewal events on fixed nitrogen loss from seasonally-anoxic Saanich Inlet

CC Manning, RC Hamme, and A Bourbonnais (2010)

Marine Chemistry 122, 1-10, <http://doi.org/10.1016/j.marchem.2010.08.002>

PEER-REVIEWED TECHNICAL REPORTS

16) Controlled natural gas release experiment in a confined aquifer, northeastern British Columbia: activity report 2018-2019

AG Cahill, B Ladd, J Chao, J Soares, T Cary, N Finke, **C Manning**, AL Popp, C Chopra, KU Mayer, A Black, R Lauer, C van Geloven, L Welch, S Crowe, B Mayer and RD Beckie (2020)

Geoscience BC Summary of Activities 2019: Energy and Water, Geoscience BC, Report 2020-02, p. 145-160.

<http://www.geosciencebc.com/s/SummaryofActivities.asp>

15) Implementation and operation of a multidisciplinary field investigation involving a subsurface controlled natural gas release, northeastern British Columbia

AG Cahill, B Ladd, J Chao, J Soares, T Cary, N Finke, **C Manning**, C Chopra I Hawthorne, ON Forde, KU Mayer, A Black, S Crowe, B Mayer, R Lauer, C van Geloven, C., L Welch, and RD Beckie (2019)

Geoscience BC Summary of Activities 2018: Energy and Water, Geoscience BC, Report 2019-2, p. 95–104.

<http://www.geosciencebc.com/s/SummaryofActivities.asp>

SUBMITTED MANUSCRIPTS

21) Biological characterization of a High Arctic seabed hydrocarbon seep at Scott Inlet, Baffin Bay

MA Cramm, B de Moura Neves, **CC Manning**, TB Oldenburg, P Archambault, A Chakraborty, A Cyr-Parent, EN Edinger, A Jaggi, A Mort, PD Tortell, and CR Hubert (2020)

Science of the Total Environment, submitted 4 Sept 2020

20) First estimation of the diffusive methane flux and concentrations from Lake Winnipeg, a large, shallow and eutrophic lake

R Mandryk, DW Capelle, **CC Manning**, PD Tortell, RD McCulloch, and T Papakyriakou (2020)

Journal of Great Lakes Research, submitted 31 July 2020

19) Ideas and perspectives: A strategic assessment of methane and nitrous oxide measurements in the marine environment

ST Wilson and 35 others including **CC Manning** (2020)

Biogeosciences Discussions, in revision, <https://doi.org/10.5194/bg-2020-270>

18) Technical note: Effects of iron(II) on fluorescence properties of dissolved organic matter at circumneutral pH

K Jia, **CC Manning**, A Jollymore, and RD Beckie (2020)

Hydrology and Earth System Sciences Discussions, in revision, <https://doi.org/10.5194/hess-2020-150>

17) Standard protocols for N₂O and CH₄ data reporting and archiving

A Kock, **CC Manning**, and T Steinhoff (2020)

IODE/IOC Ocean Best Practices Repository, in revision, <https://www.oceanbestpractices.org/>

GRANTS, SCHOLARSHIPS AND FELLOWSHIPS

2018–2020	NSERC Postdoctoral Fellowship (\$90 000)
2014	WHOI Ocean Ventures Fund for graduate student research (\$6000)
2014	WHOI Coastal Ocean Institute award for graduate student research (\$1294)
2012–2015	NSERC Post-Graduate Scholarship D (\$63 000)
2012–2014	Canadian Meteorological and Oceanographic Society scholarship (\$10 000)
2011–2012	NSERC Post-Graduate Scholarship M (\$17 300)
2009	Woods Hole Oceanographic Institution Summer Student Fellowship (\$8000)
2008	NSERC Undergraduate Student Research Award (\$4500)

OTHER ACTIVITIES

- 2019–2020 Co-instructor for Field Methods in Groundwater Hydrology (UBC undergrad and graduate course)
- 2019 Canadian Arctic research cruise on CCGS Amundsen (22 days)
- 2018 Canadian Arctic research cruise on CCGS Amundsen (21 days)
- 2018 Coastal fieldwork in Cambridge Bay, Nunavut (10 days)
- 2018 Hydrogeological fieldwork in Hudson's Hope, BC (15 days)
- 2018 UBC Instructional Skills Workshop, run by the the Centre for Teaching, Learning and Technology
- 2018 Mitacs Foundations of Project Management workshop
- 2017 Canadian Arctic research cruise on CCGS Amundsen (42 days)
- 2015–2017 Developed open access policies for scientific publications at WHOI and MIT
- 2015 9th Annual Graduate Climate Conference, program designer and biogeochemistry session chair
- 2015 MIT/Imperial College London Global Fellows Program
- 2014 Communicating Ocean Sciences (semester long course on teaching methods at WHOI)
- 2014–2016 WHOI Women's Committee, member and webmaster
- 2008– seventeen presentations as first author at research conferences, and nine departmental seminars