

## CURRICULUM VITAE

NICHOLAS R. BATES

Senior Scientist and Director of Research, Bermuda Institute of Ocean Sciences (BIOS)  
Professor of Ocean Biogeochemistry, University of Southampton

### A. EDUCATION and PROFESSIONAL EXPERIENCE

#### A1. Education:

- Ph.D., Chemical Oceanography, 1995, University of Southampton, Southampton, UK. Thesis titled "*Investigation of the Physical and Biological Controls of the Oceanic CO<sub>2</sub> System in the Sargasso Sea*", 276 pp (Dr. Duncan A. Purdie, Advisor).
- M.Sc., Geological Sciences, 1990, Brock University, St. Catherines, Ontario, Canada. Thesis titled "*The Biogeochemistry of Paleozoic Brachiopods from New York State and Southern Ontario*". 254 pp (Dr. Uwe Brand, Advisor).
- B.Sc. (Honours), Geology, 1985, Kings College, University of London, The Strand, London, UK, 1982-1985.
- B.Sc. studies, Pharmacology, Kings College, University of London, The Strand, London, UK, first year studies, 1981-1982.

#### A2. Awards and Honors:

- NASA Group Achievement Award. Group award for accomplishment of the Impacts of Climate Change on the Ecosystem and Chemistry of the Arctic Pacific Environment (ICESCAPE), 2012
- Exxon Corporation Summer Scholarship, 1990, Bermuda Biological Station For Research (BBSR), St. Georges, Bermuda.
- Ontario Graduate Scholarship, 1988-1989, Brock University, St. Catherines, Ontario, Canada.
- Sedimentology Award, 1989, Brock University, St. Catherines, Ontario, Canada.
- Catherine Cookson Award for Academic Achievement, 1980, London, UK.

#### A3. Professional Appointments (\*current positions):

- \*Professor of Ocean Biogeochemistry** (October 2013 onwards), Ocean and Earth Science (OES), National Oceanography Centre Southampton, University of Southampton Waterfront Campus; European Way, Southampton, United Kingdom.
- Interim Director (November 2011 to September 2012), Bermuda Institute of Ocean Sciences (BIOS), St. Georges, Bermuda.
- \*Director of Research** (2005-present), BIOS, St. Georges, Bermuda. My role has been renewed recently as Director of Research from Associate Director of Research.
- \*Senior Scientist** (2002 to present), Associate Research Scientist (1999-2002), Assistant Research Scientist (1996-1999), Post-doctoral Research Scientist (1995), Staff Scientist and Research

Technician (1991-1994), Bermuda Institute of Ocean Sciences and Bermuda Biological Station For Research, St. Georges, Bermuda.

**\*Adjunct Full Professor** (2005-present), Center for Marine and Earth Studies (CMES), Lewes, University of Delaware, Delaware, USA.

Adjunct Full Professor (2004-2007), Adjunct Associate Professor (2001-2004), Nicholas School of the Environment, Duke University, Beaufort, North Carolina, USA.

Sessional Lecturer (1990), Specialist Instructor (1989), Department of Geography, University of Victoria, Victoria, British Columbia, Canada.

Specialist Instructor (1989), Department of Geography, University of Victoria, Victoria, British Columbia, Canada.

Research Assistant and Teaching Assistant (1987-1989), Department of Geological Sciences, Brock University, St. Catherines, Ontario, Canada.

Research Assistant (1986), Bermuda Biological Station For Research, St. Georges, Bermuda.

Petroleum Geologist (1985-1986), Deminex (UK) Oil and Gas Company, London, UK.

#### A4. Professional Affiliations: Past and Present:

Challenger Society UK, Partnership for Observation of the Global Ocean (POGO) member, Consortium for Ocean Leadership (COL) member; North American Marine Laboratories (NAML) member; American Geophysical Union (AGU); American Society of Limnology and Oceanography (ASLO); University National Oceanographic Laboratory System (UNOLS); European Geophysical Society (EGS).

#### A5. External Professional and Service Activities:

##### Current and recent responsibilities:

Scientific Advisory Committee member. *Third ICES/PICES/IOC International Symposium on "Effects of Climate Change on the World's Oceans"*. March 23-27, 2015, Santos, Brazil.

Scientific Advisory Committee member. *International Ocean-Time Series meeting*, Bermuda, November 2012. SAC member, working group leader and rapporteur.

Session Convenor. *"The Great Coccolithophore Belt of the Southern Ocean"*. ASLO meeting, New Orleans 2013. Co-convenors, W.M. Balch and B. Twining (Bigelow Laboratory for Ocean Sciences), and P. Lam (Woods Hole Oceanographic Institution).

Science Advisory Committee, International ocean time-series meeting sponsored by OCB and IOCCP in Bermuda, November 2012.

Session Convenor. *"Coral reefs and ocean acidification"*. ICRS meeting July 2012. Co-convenors, I. Kuffner (USGS) and A.J. Andersson (Scripps Institution of Oceanography)

Session Convener. *"Theme 1: Linkages between Polar Regions and global systems"*. IPY International Oslo Science Conference, Oslo, Norway, 8-12 June 2010. Co-convenors, N. Lovenduski (Colorado State University)

Session Convener. *Session on Arctic Ocean biogeochemistry*. Ocean Sciences 2010 meeting in Portland, Oregon, February, 2010. Co-convenors, J.T. Mathis (UAF)

Pacific Arctic Group (PAG) member. Active service from mid-2009 to present.

Surface Ocean CO<sub>2</sub> Atlas (SOCAT) Project member. Co-sponsored by IOCCP, SOLAS, IMBER, and the Global Carbon Project (GCP), members of SOCAT are working to establish a global surface ocean CO<sub>2</sub> data set that would bring together, in a common format, all publicly available pCO<sub>2</sub>

data for the surface oceans. Focus on the North Atlantic Ocean including the Arctic Ocean.

Active service from 2008 to present.

Interior Ocean Carbon Synthesis. Arctic working group leaders (N. Bates and A. Olsen, University of Bergen). Active service from mid-2009 to present.

Scientific Steering Group Member. Member of the U.S. Carbon Cycle Scientific Steering Group (CCSSG) for the US federal interagency Carbon Cycle Interagency Working Group (CCIWG). Active service from 2007 to present.

Working Group Member. CarboOCEAN WG member for "North" and "Middle" groups for the Atlantic Ocean. Active service from 2007 to 2009.

Lead meeting organizer. Meeting on Arctic Ocean carbon cycle synthesis meeting planned for early 2010 and sponsored by NSF.

Organizing Committee Member. Early planning for ocean time-series meeting held in La Jolla, California, November 2008. Sponsored by IOCCP/OCB.

Journal Reviewer (1995 to present): Marine Chemistry, Deep-Sea Research, Journal of Geophysical Research, Tellus, Journal of Marine Research, Limnology and Oceanography, Global Biogeochemical Cycles, Nature, Biogeochemistry, Biogeosciences, Geophysical Research Letters (at least 6-10 reviews a year for a variety of journals).

Proposal Reviewer (from 1995), NSF Chemical, Physical and Biological Oceanography; Department of Energy; NASA (typically at least 4-7 reviews a year for NSF).

#### Past responsibilities:

Scientific Steering Group Member (2005-2008), IOC-SCOR International Ocean Carbon Coordination Project (IOCCP), Active service from 2005 to 2008.

Working Group Member (2005), SOLAS-IMBER joint carbon implementation planning meeting, Boulder, September 2005.

International Advisory Group Member (2005-2009), CarboOCEANS, EU project.

Scientific Steering Group Member (2005-2007), SOLAS-IMBER Working Group on Surface Ocean Observations, 2005-2007.

Review Panel Member (2004), NOAA Global Climate Program, January 2004.

Working Group Member; SOLAS-IMBER joint carbon implementation planning meeting, Miami, December 2004.

Ad-hoc CARINA Representative at CLIVAR North Atlantic Meetings (2002-2003), Bermuda, June 2002, and Villefranche-sur-Mer, April 2003.

Co-Chair (2002), ASLO-AGU Ocean Sciences session "Oceanic Time-series Measurements: Assessment of the Past and Planning for the Future", Hawaii, February 2002.

Review Panel Member (2002), NSF Chemical Oceanography Panel, May 2002.

Member Scientific Organizing Committee (2002), CARINA (Carbon in the North Atlantic) International Meeting for 2002.

Member Organizing Committee (2002), U.S. JGOFS (Joint Global Ocean Flux) Time-series meeting, Bermuda, April 2002.

Member Organizing Committee (2002), U.S. JGOFS Time-series meeting, Vancouver, B.C., April 2002.

Review Panel Member (2001) NASA Carbon Cycle Science Review Panel, Washington, March 2001.

Member Organizing Committee (2001), Sargasso Sea Ocean Observatory Meeting, Bermuda, March

Member Organizing Committee (2001), CARINA (Carbon in the North Atlantic) Vigo, Spain, April.

Steering Committee Member (1999-2003), CARINA (Carbon in the North Atlantic) Project.

Review Panel Member (1996), U.S. Dept. of Energy (DOE) CO<sub>2</sub> Survey Proposal Review Panel, Dec. 1996.

## B. GRANTSMANSHIP

More than seventy U.S. federal and five non-federal research grants have been awarded to Nicholas Bates as P.I. or Co-P.I. including those from the US National Science Foundation (NSF), National Oceanographic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA) and Office of Naval Research (ONR). A total of \$73.3 million has been awarded with an additional \$2.2 million pending for research (§; total of \$32.8 million) and ship operations (\*; total of \$40.5 million).

### B1. Pending US federal agency and non-federal grant awards (including UK/EU):

§NSF OCE-1433618. *Collaborative Research: GEOTRACES Arctic Section: Seawater dissolved inorganic and organic carbon measurements*. P.I. at BIOS, N.R. Bates \$216,433. Other P.I.'s, D.A. Hansell (Rostenstiel School of Marine and Atmospheric Sciences)

§NSF PLR-1417893. *Collaborative Research: Understanding the biogeochemical dynamics and response to climate change of the Arctic Ocean*. P.I. at BIOS, N.R. Bates \$214,216. Other P.I.'s, M. Manizza, B.G. Mitchel, and M. Kahru (Scripps Institution of Oceanography)

§NSF PLR-1416664. *Collaborative Research: Ocean Acidification: Biogeochemical impacts of OA in the high-latitude Great Calcite Belt*. P.I. at BIOS, N.R. Bates \$369,870. Other P.I.'s, W.M. Balch, B. Twining (Bigelow Laboratory for Ocean Sciences), P. Lam (WHOI)

\*NSF OCE-1360784. *2012 Shipboard Scientific Support Equipment for R/V Atlantic Explorer*. P.I. at BIOS, N.R. Bates \$11,875.

\*NSF OCE-13422615. *2013 Shipboard Scientific Support Equipment for R/V Atlantic Explorer*. P.I. at BIOS, N.R. Bates \$111,244.

§UK NERC. *Seawater dissolved inorganic carbon measurements on the RAPID array* (submitted as part of University of Southampton group); lead PI, Dr. Elaine McDonagh, NOCS, submission February 21<sup>st</sup>, 2014.

§Horizons 2020. *AtlantOS* (submitted as part of NOCS UK group); lead PI, Dr. Richard Lampitt, NOCS, submission March 21<sup>st</sup>, 2014.

### B2. Active US federal agency and non-federal research grant awards:

§NSF OCE-1258622. *Collaborative Research: The Bermuda Atlantic Time-series Study: Sustained Biogeochemical, Ecosystem, and Ocean Change Observations and Linkages in the Subtropical North Atlantic*. P.I.'s. N.R. Bates, M.W. Lomas, R.J. Johnson (BIOS), \$6,002,177, 1 August 2013-30 July 2018.

§NSF OCE-1233706. *Collaborative Research: Seawater Inorganic and Organic Carbon Measurements for the US GEOTRACES Eastern Pacific Zonal Transect*. \$272,076.

- §Two NASA subcontracts through Bigelow Marine Laboratory, \$15,000 and \$32,500 per annum, respectively, over the last four years.
- §NSF OCE-1132566 *Inorganic carbon measurements on the 2011-2011 GEOTRACES North Atlantic Ocean section*. P.I. N.R. Bates, (BIOS), BIOS budget, \$49,696. 1 June 2011-31 May 2012. One-year project.
- §NSF OPP-1107457 *Collaborative Research Pacific-Arctic Carbon Synthesis-Transformations, Fluxes, and Budgets*. J.T. Mathis (SFOS-UAF), N.R. Bates, (BIOS), BIOS budget, ~\$119,606. 1 October 2011-30 September 2014. Three-year project.
- §NSF OCE-0961414. *Collaborative Research: The Great Southern Coccolithophore Belt*. P.I.'s W.M. Balch, B. Twining (Bigelow Laboratory), N.R. Bates (BIOS), P. Lam (WHOI), co-PI at BIOS, N.R. Bates, BIOS budget \$424,917. 1 June 2010-30 May 2014. Four-year project.
- §NOAA NA100AR4310094. *Mg-calcite mineral dynamics in natural subtropical seawater systems: control of the carbonate acid system and relevance to ocean acidification*. P.I.'s A.J. Andersson, N.R. Bates, (BIOS), \$258,000. 1 April 2010-30 March 2013. Three-year project.
- §NASA NNX10AG36G *Controls on and rates of air-sea CO<sub>2</sub> gas exchange in the Beaufort and Chukchi Sea: Investigations of Climate and Environmental Change on Arctic Pacific Shelves (C-ICECAPS)*. N.R. Bates, (BIOS), J.T. Mathis (SFOS-UAF), BIOS budget, ~\$695,000. 1 October 2009-30 September 2014. Four-year project with one year no-cost extension.
- §Exxon (Exxon-Mobil). *Evaluating Carbon Dioxide (CO<sub>2</sub>) Sinks and Sources and Impacts of Ocean Acidification of Key Ecosystems: Contributions from BIOS Research Activities*. P.I.'s, N.R. Bates (BIOS), 1 October 2010-30 September 2014, \$50,000 per annum.
- §NSF OCE-0752366. *The Bermuda Atlantic Time-series Study (BATS): Year 21-25*. P.I.'s N.R. Bates, M.W. Lomas, R.J. Johnson (BIOS), \$5,257,102, 1 August 2008-30 July 2013.
- §NOAA NA080AR4310605. *Ocean Carbon Measurements in Support of the Joint Russian-American Long-term Census of the Arctic (RUSALCA) Research Program in the Bering and Chukchi Seas*. P.I. N.R. Bates (BIOS), 1 April 2008-31 March 2014, \$270,000.
- §NOAA NA-030AR4320179. *The U.S. Network of VOS Surface pCO<sub>2</sub> Sampling*. 1 September 2003-31 August 2013, P.I. N.R. Bates, (BIOS). Other P.I.'s include; R. Wanninkhof (AOML); R. Feely (PMEL); T. Takahashi (LDEO); F. Millero (RSMAS). BIOS budget, approximately \$125,524 per annum.

### B3. Active US federal agency ship-operation grant awards:

- \*NSF OCE-1352929. *Ship Operations. R/V Atlantic Explorer*. P.I. at BIOS, N.R. Bates \$387,648.
- \*NSF OCE-1347847. *Oceanographic Technical Services. R/V Atlantic Explorer, 2012-2016*. P.I. at BIOS, N.R. Bates \$103,821.
- \*NSF OCE-13422378. *2013 Oceanographic Instrumentation R/V Atlantic Explorer*. P.I. at BIOS, N.R. Bates \$33,200.
- \*NSF OCE-1225643. *Ship Operations*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). \$1,139,445.
- \*NSF OCE-1201862. *2012 Shipboard Scientific Support Equipment: R/V Atlantic Explorer*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). \$46,000.
- \*NSF OCE-1216789. *2012 Shipboard Scientific Support Equipment: R/V Atlantic Explorer*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). \$605,300.
- \*NSF OCE-1216572. *2012 Oceanographic Instrumentation R/V Atlantic Explorer*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). \$49,000.

- \*NSF OCE-1216322. *2012 Oceanographic Technical Services R/V Atlantic Explorer*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). \$484,165.
- \*NSF OCE-1212814. *2012 Ship Operations R/V Atlantic Explorer*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). \$3,341,274.

#### B4. Past US federal agency research grant awards:

- §NSF OCE-0928406. *BEACON: Bermuda Ocean Acidification and Coral Reef Investigation*. P.I.'s. A.J. Andersson, N.R. Bates, S. du Putron (BIOS), \$890,000. 1 Sept. 2009-31 Aug. 2013.
- §NSF OPP-0732093. *Collaborative Research: Determining the Present and Future Ocean Carbon Dynamics in the Chukchi Sea and pan-Arctic Ocean: A Contribution to Shelf-Basin Interactions (SBI) Phase III*. P.I.'s, N.R. Bates (BIOS), S.B. Moran (URI), J.T. Mathis (UAF), D.A. Hansell (RSMAS), 1 January 2008-31 December 2011, BIOS budget, \$468,775.
- §NSF OCE-0549750. *Collaborative Research: Development of the Automated Dissolved Inorganic Carbon Analyzer (AMICA) for Seawater DIC Analyses*. P.I.'s, N.R. Bates (BIOS); J. Sharp (University of Delaware), 1 October 2006-30 September 2011, BIOS budget, \$286,000.
- §Vita Foundation. *Ocean carbon cycle studies*. P.I. N.R. Bates (BIOS), \$15,000, May 2009. One-year project awarded in May 2009 for marine carbon cycle research
- §NSF OCE-0623385. *Collaborative Research: CarboMODE: Carbon Dioxide Dynamics in Mode Water of the North Atlantic Ocean*. P.I.'s, N.R. Bates (BIOS), S. Doney (WHOI). 1 October 2006-30 September 2010, BIOS budget, \$415,000.
- §NSF OCE-0424815. *Collaborative Research: Time Series Measurement of Dimethylsulfide Dynamics at BATS*. P.I.'s, N.R. Bates (BIOS). Other P.I.'s are J. Dacey and D. Toole (WHOI). 1 September 2004-31 August 2009, BIOS budget, \$422,000.
- §NOAA FNA-060AR4310233. *Air-sea pCO<sub>2</sub> observations in the North Atlantic*. P.I.'s, N.R. Bates (BBSR), C.L. Sabine (PMEL), 1 September 2006-31 August 2009, BBSR budget, \$32,000.
- §Exxon Mobil. *Carbon Dioxide (CO<sub>2</sub>) and Climate: Determining the Influence of the Oceans on the Global Carbon Cycle*. P.I.'s, N.R. Bates, A.H. Knap, BBSR), 1 January 2008-31 December 2010, \$150,000.
- §NSF OCE-0241399. *Collaborative Research: Impacts of Eddies and Mixing on Plankton Community Structure and Biogeochemical Cycling in the Sargasso Sea*. P.I. N.R. Bates, BBSR. Other P.I.'s included: D. McGillicuddy, K.O. Buesseler, C. Davis, J.R. Ledwell and W.J. Jenkins (WHOI); P. Falkowski (Rutgers); D.A. Hansell (RSMAS); D.A. Siegel (UCSB), 1 December 2003-31 November 2008, BBSR budget, \$379,987.
- §NSF ARC-0124868. *Transport, Modifications and Fluxes of Carbon and Nitrogen in the Western Arctic Ocean: A Contribution to the SBI Project, Phase II*. P.I.'s N.R. Bates, BBSR and D.A. Hansell (RSMAS), 1 January 2002-31 April 2008, BBSR budget, \$449,597.
- §NSF OCE-0326885. *The Bermuda Atlantic Time-series Study (Years 16-20)*. P.I.'s A.H. Knap, N.R. Bates, and M.W. Lomas (BBSR), 1 August 2003-31 August 2008, \$750,000 per annum.
- §Exxon (Exxon-Mobil). *Interannual Variability of the Carbon Cycle in the North Atlantic Ocean*. Exxon-Mobil Corporation, P.I. N.R. Bates, A.H. Knap, (BBSR), 1 January 2004-31 December 2007, \$200,000.
- §NSF OCE-0241662. *Enhanced New Production During Winter Mixing: A Missing Component of Current Estimates*. P.I.'s M.W. Lomas, N.R. Bates, F.J. Lipschultz (BBSR). Other P.I. is D.M. Nelson (OSU), 1 April 2003-31 March 2006, BBSR budget, \$565,616.



- §NSF OCE-0128768. *The Bermuda Atlantic Time-series Study (years 14-15)*, P.I.'s A.H. Knap, N. Bates, M. Lomas (BBSR), 1 September 2001-31 August 2003, P \$1,500,000.
- §NSF OCE-0097337. *Analyzing and Modeling Interannual Variability in the Carbon Cycle of the Subtropical and Subpolar Gyres*. P.I. N.R. Bates, (BBSR). Other P.I.'s include; N. Gruber (UCLA); G. Ganosoboglu and J. McWilliams (NCAR), 1 May 2001-30 April 2004, BBSR budget, \$117,446.
- §NSF OCE-0082166. *Elevated  $N^*$  in the Western Sargasso Sea: Local or Non-local Origin in the Western Sargasso Sea*. P.I. N.R. Bates (BBSR). Other P.I.: D.A. Hansell (RSMAS), 1 March 2001-29 February 2004, \$400,000.
- §Exxon (Exxon-Mobil). *Interannual Variability of the Carbon Cycle in the North Atlantic Ocean*. P.I. N.R. Bates, A.H. Knap (BBSR), BBSR budget, 1 January 2001-31 December 2004, \$150,000.
- §NSF OCE-9903393. *Assessment of Temporal Variability in Global Inorganic Carbon Distributions*. P.I. N.R. Bates (BBSR). Other P.I. C.L. Sabine (University of Washington, then PMEL), 1 June 1999-30 July 2003, BBSR budget, \$250,109.
- §NSF OCE-9726091. *Mass Balance Assessments of Carbon Partitioning: A Contribution to the U.S. JGOFS Synthesis and Modeling Program*. P.I. N.R. Bates (BBSR). Other P.I. is D.A. Hansell (RSMAS), 1 March 1998-29 February 2002, BBSR budget, \$540,000.
- §NSF OCE-9617795. *The Bermuda Atlantic Time-series Study (years 11-13)*. (Co-P.I.). A.H. Knap, N. Bates, D. Steinberg, C.A. Carlson, (BBSR), 1 September 1998-31 August 2001, \$2,800,000.
- §ONR (ONR-NOPP). *Oceanographic Systems for Chemical, Optical and Physical Experiments*. Office of Naval Research (ONR), P.I.'s. T.D. Dickey (UCLA); N.R. Bates (BBSR); R. Byrne (USF); F. Chavez (MBARI), R.A. Feely (NOAA-PMEL); C. Moore (WetLabs Inc.); R. Wanninkhof, (NOAA-AOML), 13 July 1998-12 July 2000, BBSR budget, \$149,475.
- §NSF OCE-9416565. *Investigation of the Seasonal Variability of the Oceanic  $CO_2$  system and Air-sea Flux of  $CO_2$  at the U.S. JGOFS Bermuda Atlantic Time-series Study (BATS) site*. (Co-P.I.). N.R. Bates, A.H. Knap, (BBSR), 1 February 1995-30 January 1999, \$508,505.
- §NSF OCE-9301950. *A Multi-disciplinary Oceanographic Station Southeast of Bermuda: JGOFS component*. (Co-P.I. from 1997). A.H. Knap, A.F. Michaels, N.R. Bates, D. Steinberg, C.A. Carlson, (BBSR), 1 May 1993-30 April 1999, \$3,400,000.

#### B5. Past US federal agency ship-operation grant awards:

- \*NSF OCE-1119817. *2011 Shipboard Scientific Support Equipment: R/V Atlantic Explorer*. P.I. N.R. Bates, (BIOS), BIOS budget, \$59,266. 1 April 2011-30 March 2012.
- \*NSF OCE-1119773. *2011 Oceanographic Instrumentation*. P.I. N.R. Bates, (BIOS), BIOS budget, \$59,000, 1 April 2011-30 March 2012. One-year project.
- \*NSF OCE-1114540. *2011 Oceanographic Instrumentation. Replacement of the 12 Khz R/V Transducer for Atlantic Explorer*. P.I. N.R. Bates, (BIOS), BIOS budget, \$33,460, 1 April 2011-30 March 2012. One-year project.
- \*NSF OCE-1063260. *Ship Operations*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). ~\$2,520,000 per annum.
- \*NSF OCE-1013157. *2010 Oceanographic Instrumentation for R/V Atlantic Explorer*. P.I. N.R. Bates, (BIOS), BIOS budget, \$8,760. 1 March 2010-28 Feb. 2011. One-year project.
- \*NSF OCE-101244. *2010 Shipboard Scientific Support Equipment for R/V Atlantic Explorer*. P.I. N.R. Bates, (BIOS), BIOS budget, \$118,500. 1 March 2010-28 Feb. 2011. One-year project.

- \*NSF OCE-0936341. *Oceanographic Technical Services, 2009: R/V Atlantic Explorer*. P.I.'s. N.R. Bates, R. Harelstad (BIOS), 1 September 2009-31 August 2010. \$340,550.
- \*NSF OCE-0918422. *2009 Shipboard Scientific Support Equipment for R/V Atlantic Explorer*. P.I.'s. N.R. Bates, R. Harelstad (BIOS), 1 September 2009-31 August 2012, \$433,177.
- \*NSF OCE-0943497. *2009 Oceanographic Instrumentation for R/V Atlantic Explorer*. P.I.'s. N.R. Bates, R. Harelstad (BIOS), P.I.'s. N.R. Bates, R. Harelstad (BIOS), BIOS budget, \$229,238. One-year project
- \*NSF OCE-0848211. *Ship Operations*. P.I.'s, N.R. Bates, R. Harelstad (BIOS). ~\$2,200,000 per annum.
- \*NSF OCE-0800847. *2007 Oceanographic Instrumentation for the RV Atlantic Explorer*. P.I.'s, N.R. Bates, L. Black (BBSR). BBSR budget, \$14,920.
- \*NSF OCE-0720530. *2007 Oceanographic Instrumentation for the RV Atlantic Explorer*. P.I.'s, N.R. Bates, L. Black (BBSR), \$153,731.
- \*NSF OCE-0612961. *Oceanographic Technical Services 2006-2008, RV Atlantic Explorer*. P.I.'s, N.R. Bates, L. Black (BBSR), ~\$350,000 per annum.
- \*NSF OCE-0715541. *2007 Shipboard Scientific Support Equipment for the RV Atlantic Explorer*. P.I.'s, N.R. Bates, L. Black (BBSR), \$119,102.
- \*NSF OCE-0752938. *Ship Operations Weatherbird II*. P.I.'s, N.R. Bates, L. Black (BBSR), \$1,000,000.
- \*NSF OCE-0650420. *Ship Operations Weatherbird II*. P.I.'s, N.R. Bates, L. Black (BBSR), \$250,000.
- \*NSF OCE-0505888. *Ship Operations for R/V Ocean Explorer*. P.I.'s, N.R. Bates, L. Black (BBSR). BIOS budget, \$1,850,000 in 2006, and ~\$2,450,000 in 2007, and *Ship Operations Weatherbird II*, N.R. Bates, L. Black, BBSR, 1 January 2006-31 December 2006, \$6,764,757.
- \*NSF OCE-0514841. *2005 Oceanographic Instrumentation for the RV Weatherbird II*, P.I.'s, N.R. Bates, L. Black (BBSR). BBSR budget, \$56,696.
- \*NSF OCE-0423771. *Oceanographic Scientific Support Equipment 2004 RV Weatherbird II*. P.I.'s, N.R. Bates, L. Black, BBSR, 1 January 2004-31 December 2004, \$107,067.
- \*NSF OCE-0331762. *Oceanographic Technical Services 2003-2005 RV Weatherbird II*. N.R. Bates, L. Black, BBSR, 1 January 2003-31 December 2005, \$180,365.
- \*NSF OCE-0307426. *2003 Ship Operations for R/V Weatherbird II*. P.I.'s, N.R. Bates, L. Black, BBSR, 1 January 2003-31 December 2003, \$1,220,575.
- \*NSF OCE-0202932. *Ship Operations R/V Weatherbird II*. P.I.'s, N.R. Bates, L. Black, BBSR, 1 January 2002-31 December 2002, \$1,085,580.
- \*NSF OCE-0200054. *Oceanographic Instrumentation 2002 RV Weatherbird II*. P.I.'s, N.R. Bates, L. Black, BBSR, 1 January 2002-31 December 2002, \$132,130.
- \*NSF OCE-0200813. *Shipboard Scientific Support Equipment 2002 RV Weatherbird II*. P.I.'s, N.R. Bates, L. Black, BBSR, 1 January 2002-31 December 2002, \$17,142.
- \*NSF OCE-0204347. *Oceanographic Technical Services*. P.I.'s, N.R. Bates, L. Black, BBSR, 1 January 2002-31 December 2002, \$168,360.
- \*NSF OCE-0134233. *Oceanographic Instrumentation 2001 RV Weatherbird II*. P.I.'s, N.R. Bates, L. Black, BBSR, 1 January 2001-31 December 2001, \$5,195.

## C. SCIENTIFIC PUBLICATIONS

### C1. Refereed Publications:



Note: The ten most impactful first author publications are denoted by the symbol ¶ below. The papers are available from the publishers but also are listed on the following web page with a link to a page where most of the papers can be viewed as pdf files (<http://bios.edu/research/projects/marine-biogeochemistry-lab/>).

- <sup>124</sup> **Bates, N.R.**, Mintrop, L., and Garley, R., in review. Small volume, high precision measurements of dissolved inorganic carbon for natural water analyses and ocean acidification studies. *Limnology and Oceanography-Methods*.
- <sup>123</sup> **Bates, N.R.**, and Jeffries, M.A., in review. Synthesis of the global ocean carbon cycle I: Empirically based model assessments of global climatological seawater carbonate chemistry variability and air-sea CO<sub>2</sub> gas exchange rates. *Global Biogeochemical Cycles*.
- <sup>122</sup> **Bates, N.R.**, and Jeffries, M.A., in review. Synthesis of the global ocean carbon cycle II: Global estimates of net community production. *Global Biogeochemical Cycles*.
- <sup>121</sup> Cai, W.-J., Chen, B., Chen, L., Gao, L., Gao, Z., Sun, H., Zhang, Y., **Bates, N.R.**, Anderson, L.G., Kirchman, D.L., Lee, S., Jin, M., Wang, Y., Hu, X., Huang, W.J., Chen, J., Gao, S., Xu, S., Kang, J., Sun, X., Ji, W., and Yu, X., in review. Increased biological CO<sub>2</sub> uptake following sea-ice retreat in the northern Arctic Ocean. *Nature Geosciences*.
- <sup>120</sup> Yeakel, K., Andersson, A.J., **Bates, N.R.**, Noyes, T., Collins, A., and Garley, R., 2014. Rapid sub-decadal acidification on the Bermuda coral reef. *Science*, Manuscript Number, 1248699.
- <sup>119</sup> Fry, C., Tyrell, T., and **Bates, N.R.**, in review. A new method for analyzing processes affecting ocean alkalinity. *Global Biogeochemical Cycles*.
- <sup>118</sup> Bakker, D.C.E., Pfeil, B., Smith, K., Hankin, S., Olsen, A., Alin, S.R., Cosca, C., Hales, B., Harasawa, S., Kozyr, A., Nojiri, Y., O'Brien, K.M., Schuster, U., Telszewski, M., Tilbrook, B., Wada, C., Akl, J., Barbero, L., Bates, N., J. Boutin, J., Cai, W.-J., Castle, R.D., Chavez, F.P., Chen, L., Chierici, M., Currie, K., de Baar, H.J.W., Evans, W., Feely, R.A., Fransson, A., Gao, Z., Hardman-Mountford, N., Hoppema, M., Huang, W.-J., Hunt, C.W., Huss, B., Ichikawa, T., Jacobson, A., Johannessen, T., Jones, E.M., Jones, S.D., Jutterstrøm, S., V. Kitidis, V., Körtzinger, A., Landschuter, P., Lauvset, S.K., Lefèvre, N., Manke, A.B., Mathis, J.T., Merlivat, L., Metzl, N., Monteiro, P., Murata, A., Newberger, T., Ono, T., Park, G.-H., Paterson, K., Pierrot, D., Ríos, A.F., Sabine, C.L., Saito, S., Salisbury, J., Sarma, V.V.S.S., Schlitzer, R., Sieger, R., Skjelvan, I., Steinhoff, T., Sullivan, K., Sutherland, S.C., Suzuki, T., Sutton, A.J., Sweeney, C., Takahashi, T., Tjiputra, J., Tsurushima, N., van Heuven, S.M.A.C., Vandemark, D., Vlahos, P., Wallace, D.W.R., Wanninkhof, R., and Watson, A.J., in press. An update to the surface ocean carbon atlas (SOCAT version 2). *Earth System Science Data Discussions*.
- <sup>117</sup> **Bates, N.R.**, Garley, R., Frey, K., Shake, K., and Mathis, J.T., 2014. Sea-ice melt CO<sub>2</sub>-carbonate chemistry in the western Arctic: meltwater contributions to air-sea CO<sub>2</sub> gas exchange, mixed layer properties and rates of net community production. *Biogeosciences*. bg-2014-605.
- <sup>116</sup> Arrigo, K.R., Perovich, D.K., Pickart, R.S., Brown, Z.W., van Dijken, G.L., Lowry, K.E., Mills, M.M., Palmer, M.A., Balch, W.B., **Bates, N.R.**, Benitez-Nelson, C.R., Brownlee, E., Frey, K.E., Laney, S.R., Mathis, J., Matsuoka, A., Mitchell, B.G., Moore, G.W.K., Reynolds, R.A., Sosik, H.M., and Swift, S.H., 2014. Phytoplankton blooms beneath the sea ice in the Chukchi Sea. *Deep-Sea Research*.
- ¶<sup>115</sup> **Bates, N.R.**, Astor, Y.M., Church, M.J., Currie, K., Dore, J.E., Gonzalez-Davila, M., Lorenzoni, L., Muller Karger, F.E., Olafsson, J., and Santana-Casiano, J.M., 2014. Changing ocean chemistry:

A time-series view of ocean uptake of anthropogenic CO<sub>2</sub> and ocean acidification.

*Oceanography*, <http://dx.doi.org/10.5670/oceanog.2014.03>.

- <sup>114</sup>Cross, J.N., Mathis, J.T., Frey, K.E., Cosca, C.E., Danielson, S.L., **Bates, N.R.**, Takahashi, T., and Evans, W., *in press*. Sea-air CO<sub>2</sub> fluxes in the Bering Sea: New insights into late-season dynamics on an ice-covered continental shelf. *Journal of Geophysical Research*
- <sup>114</sup>Cai, W.J., **Bates, N.R.**, Guo, L., Anderson, L.G., Mathis, J.T., Wanninkhof, R., Hansell, D.A., Chen, L., and Semiletov, I., 2014. Carbon fluxes across boundaries in the Pacific Arctic region in a changing environment. In: *The Pacific Arctic Sector: Status and Trends* (J.M. Grebmeier, W. Maslowski and J. Zhao, Editors), Springer.
- <sup>113</sup>Mathis, J.T., Grebmeier, J.M., Hansell, D.A., Hopcroft, R.R., Kirchman, D.L., Lee, S.H., Moran, S.B., and **Bates, N.R.**, 2014. Carbon Biogeochemistry of the Western Arctic: Production, Export, and Ocean Acidification. In: *The Pacific Arctic Sector: Status and Trends* (J.M. Grebmeier, W. Maslowski and J. Zhao, Editors), Springer.
- <sup>112</sup>Andersson, A.J., **Bates, N.R.**, Jeffries, M., Freeman, K., Davidson, C., Stringer, S., Betzler, E., and Mackenzie, F.T., 2013. Clues from current high CO<sub>2</sub> environments on the effects of ocean acidification on CaCO<sub>3</sub> preservation. *Aquatic Geochemistry*, **19**, 353-369.
- <sup>111</sup>Pfeil, P., Olsen, A., Bakker, D.C.E., Hankin, S., Koyuk, H., Kozyr, A., Malczyk, J., Manke, A., Metzl, N., Sabine, C.L., Akl, J., Alin, S.R., **Bates, N.**, Bellerby, R.G.J., Borges, A., Boutin, J., Brown, P.J., Cai, W.-J., Chavez, F.P., Chen, C.T.-A., Cosca, C., Fassbender, A.J., Feely, R.A., González-Dávila, M., Goyet, C., Hales, B., Hardman-Mountford, N., Heinze, C., Hood, M., Hoppema, M., Hunt, C.W., Hydes, D., Ishii, M., Johannessen, T., Jones, S.D., Key, R.M., Körtzinger, A., Landschützer, P., Lauvset, S.K., Lefèvre, N., Lenton, A., Lourantou, A., Merlivat, L., Midorikawa, T., Mintrop, L., Miyazaki, C., Murata, A., Nakadate, A., Nakano, Y., Nakaoka, S., Nojiri, Y., Omar, A.M., Padin, X.A., Park, G.-H., Paterson, K., Perez, F.F., Pierrot, D., Poisson, A., Ríos, A.F., Santana-Casiano, J.M., Salisbury, J., Sarma, V.V.S.S., Schlitzer, R., Schneider, B., Schuster, U., Sieger, R., Skjelvan, I., Steinhoff, T., Suzuki, T., Takahashi, T., Tedesco, K., Telszewski, M., Thomas, H., Tilbrook, B., Tjiputra, J., Vandemark, D., Veness, T., Wanninkhof, R., Watson, A.J., Weiss, R., Wong, C.S., and Yoshikawa-Inoue, H., 2013. A uniform, quality controlled Surface Ocean CO<sub>2</sub> Atlas (SOCAT). *Earth Syst. Sci. Data*, **5**, 125-143, 2013
- <sup>110</sup>Garçon, V., Bell, T.G., Wallace, D.W.R., Arnold, S.R., Baker, A., Bakker, D.C.E., Bange, H., **Bates, N.R.**, Bopp, L., Boutin, J., Boyd, P.W., Bracher, A., Burrows, J.R., Carpenter, L.J., Fennel, K., Font, J., Friedrich, T., Garbe, C.S., Gruber, N., Jaégle, L., Lana, A., Lee, J.D., de Leeuw, G., Liss, P.S., Miller, L.A., Olgun, N., Olsen, A., Pfeil, B., Quack, B., Read, K.A., Reul, N., Rödenbeck, C., Rohekar, S.S., Saiz-Lopez, A., Saltzman, E.S., Schneissing, O., Schuster, U., Seferian, R., Steinhoff, T., Le Traon, P.-Y., and Ziska, F., 2014. Perspectives and Integration in SOLAS Science. In: *Ocean-atmosphere Interaction of Trace Gases*, (Liss, P.S., Simo, R., Johnson, M.T., Editors), Springer Heidelberg; p 251-290, doi: 10.1007/978-3-642-25643-1.
- <sup>109</sup>Poulton, A.J., Painter, S.C., Young, J.R., **Bates, N.R.**, Bowler, B., Drapeau, D., Lyczskowski, E., and Balch, W.M., 2013. The 2008 *Emiliania huxleyii* bloom along the Patagonia Shelf 2: Ecology, biogeochemistry and cellular calcification. *Global Biogeochemical Cycles*, **27**, 1-11, doi: 10.1002/2013GB004641.
- <sup>108</sup>Tanhua, T., **Bates, N.R.**, and Kortzinger, A., 2013. The Marine Carbon Cycle and Ocean Anthropogenic CO<sub>2</sub> Inventories. In: *Ocean Circulation and Climate* (J. Church et al.), **103**, <http://dx.doi.org/10.1016/B978-0-12-391851-2.00030-1>, Elsevier Press.

- <sup>107</sup>Andersson, A.J., **Bates, N.R.**, and de Putron, S., 2013. Future changes in reef metabolism oppose anthropogenic ocean acidification on coral reefs. *Nature Geosciences*.
- ¶<sup>106</sup>**Bates, N.R.**, Orchowska, M.I., Garley, R., and Mathis, J.T., 2013. Summertime calcium carbonate undersaturation in shelf waters of the western Arctic Ocean - how biological processes exacerbate the impact of ocean acidification. *Biogeosciences*, **10**, 5281-5309, doi: 10.105194/bg/bg-10-5281-2013.
- <sup>105</sup>Lomas, M.W., **Bates, N.R.**, Johnson, R.J., Knap, A.H, Steinberg, D.K., Carlson, C.A., 2013. Two decades and counting: 23-years of sustained open ocean biogeochemical measurements in the Sargasso Sea. *Deep-Sea Research II*, **93**, 16-32, doi: 10.1016/j.dsr2.2013.01.008.
- <sup>104</sup>Singh, A., Lomas, M.W., and **Bates, N.R.**, 2013. Revisiting N<sub>2</sub> fixation in the North Atlantic Ocean: Significance of Redfield ratio and climate variability. *Deep-Sea Research II*, **93**, 148-158, doi: 10.1016/j.dsr2.2013.04.008.
- <sup>103</sup>Cross, J.N., Mathis, J.T., **Bates, N.R.**, 2013. Conservative and non-conservative variations of total alkalinity on the southeastern Bering Sea. *Marine Chemistry*, **154**, 100-112 doi: 10.1016/j.marchem.2013.05.012.
- <sup>102</sup>Andersson, A.J., Krug, L.A., **Bates, N.R.**, and Doney, S., 2013. Air-sea CO<sub>2</sub> flux in the North Atlantic subtropical gyre: role and influence of STMW formation. *Deep-Sea Research II*, **91**, 57-70, doi: 10.1016/j.dsr2.2013.02.022.
- <sup>101</sup>Smith, S.R., Sarkis, S., Murdoch, T.J.T., Weil, E.A. Croquer, A., **Bates, N.R.**, Johnson, R.J., de Putron, S.J., and Andersson, A.J., 2013. *Threats to Coral Reefs in Bermuda*. *Environmental Threats to Coral Reefs* (editor, C. Shepard), Springer-Verlag.
- <sup>100</sup>Schuster, U., McKinley, G., **Bates, N.R.**, Chevallier, F., Doney, S., Fay, A., González-Dávila, M., Gruber, N., Jones, S., Landschützer, P., Lefèvre, N., Manizza, M., Mathis, J., Metzl, M., Olsen, A., Rios, A., and Santana-Casiano, J.M., 2013. Atlantic and Arctic air-Sea CO<sub>2</sub> fluxes, 1990-2009. *Biogeosciences*, **10**, 1, 607-627; doi: 10.5194/bg-10-607-2013.
- <sup>99</sup>Letscher, R.T., Hansell, D.A., Kadko, D., and **Bates, N.R.**, 2013. Dissolved organic nitrogen dynamics in the Arctic Ocean. *Marine Chemistry*, **148**, 1-8, doi: 10.1016/j.marchem.2012.10.002.
- <sup>98</sup>Venti, A., Kadko, D., Andersson, A., Langdon, C., and **Bates, N.R.**, 2012. A multi tracer approach to estimate reef residence times. *Limnology and Oceanography*, **10**, 1078-1098; doi: 10.4319/lom.2012.10.1078.
- <sup>97</sup>**Bates, N.R.**, 2012. Multi-decadal uptake of carbon dioxide into subtropical mode waters of the North Atlantic Ocean. *Biogeosciences*, **9**, 2649-2659, doi: 10.105194/bg-9-2649-2012.
- ¶<sup>96</sup>**Bates, N.R.**, Best, M.H., Neely, K., Garley, R., Dickson, A.G., and Johnson, R.J., 2012. Indicators of anthropogenic carbon dioxide uptake and ocean acidification in the North Atlantic Ocean. *Biogeosciences*, **9**, 2509-2522, doi: 10.105194/bg-9-2509-2012.
- <sup>95</sup>Cross, J., Mathis, J.T., and **Bates, N.R.**, 2012. Hydrographic controls on net community production and TOC dynamics on the Bering Sea shelf. *Deep-Sea Research II*, **65-70**, 98-109, doi: 10.1016/j.dsr2.2012.02.003.
- <sup>94</sup>Arrigo, K.J., Perovich, D.K., Pickart, R.S., Brown, Z.W., van Dijken, G.L., Lowry, K.E., Mills, M.M., Palmer, M.A., Balch, W.M., **Bates, N.R.**, Benitez-Nelson, C., Brownlee, E., Ehn, J.K., Frey, K.E., Garley, R., Laney, S.R. Mathis, J.T., Matsuoko, A., Mitchell, B.G., Moore, G.W.K., Ortega-Retuerta, E., Plasshenski, C.M., Reynolds, R.A., and Swift, J.H., 2012. Massive phytoplankton blooms under Arctic sea-ice. *Science*, **336**(6087), 1408-1409, doi: 10.1126/science.1215065.

- <sup>93</sup>Davies, N., Field, D., and GO Network, 2012. A genomic network to measure Earth. *Nature*.
- <sup>92</sup>Friedrich, T., Timmermann, A., Jungclaus, J.H., Heinemann, M., Chikamoto, M., Abe-Ouch, A., Gonzalez-Davila, M., Santana-Casiano, J.M., Church, M.J., **Bates, N.R.**, Gledhill, D.K., McLead, E., and Mouchet, A., 2012. Detecting regional trends in ocean acidification against the background of natural variability. *Nature Climate Change* 2(3), 167-171, doi: 10.1038/NCLIMATE1372.
- <sup>91</sup>Poulton, A.J., Young, J.R., **Bates, N.R.**, and Balch, W.M., 2011. Biometry of *Emiliania huxleyii* coccoliths along the Patagonia shelf. *Marine Ecology Progress Series*, 443, 1-17, doi: 10.3354/meps09445.
- <sup>90</sup>Mathis, J.T., Cross, J., and **Bates, N.R.**, 2011. The role of ocean acidification in systemic carbonate mineral suppression in the Bering Sea. *Geophysical Research Letters*, L19602, doi: 10.1029/2011GL048884.
- <sup>89</sup>Zablocki, J., Andersson, A.J., and **Bates, N.R.**, 2011. Diurnal aquatic CO<sub>2</sub> dynamics in a Bermudian mangrove system. *Aquatic Geochemistry*, 17(6), 841-859, doi: 10.1007/s10498-011-9142-3.
- <sup>88</sup>**Bates, N.R.**, Cai, W.-J., and Mathis, J.T., 2011. The ocean carbon cycle in the western Arctic Ocean: Distributions and air-sea fluxes of carbon dioxide (CO<sub>2</sub>). *Oceanography*. 24(3), 186-201, doi: 10.5670/oceanog.2011.71; <http://dx.doi.org/10.5670/oceanog.2011.71>.
- <sup>87</sup>Levine, N.M., Doney, S.C., Lima I., Wanninkhof, R., Sabine, C.L., Feely, R.A., and **Bates, N.R.**, 2011. The impact of interannual variability on the uptake and accumulation of anthropogenic CO<sub>2</sub> in the North Atlantic. *Global Biogeochemical Cycles*, 25, GB3022, doi:10.1029/2010GB003892
- <sup>86</sup>Sparks, T.H., Butchart, S.H.M., Balmford, A., Bennun, L., Stanwell-Smith, D., Walpole, M., **Bates, N.R.**, Bombard, B., Bruno, J., Buchanan, G., Chenery, A.M., Collen, B., Csirke, J., Diaz, R.J., Dulvey, N.K., Fitzgerald, C., Kapos, V., Mayaux, P., Selig, E., Tierney, M., Waycott, M., Wood, L., and Green, R.E., 2011. Linked indicator sets for addressing biodiversity loss. *Oryx-The International Journal of Conservation*, 45 (3), 411-419, doi:10.1017/S003060531100024X, 21 June 2011.
- <sup>85</sup>**Bates, N.R.**, Jeffries, M.A., and Mathis, J.T., 2011. Air-sea CO<sub>2</sub> fluxes in the Bering Sea. *Biogeosciences*, 8(5), 1237-1253, doi: 10.5194/bg-8-1237-2011.
- <sup>84</sup>Mathis, J.T., Cross, J., and **Bates, N.R.**, 2011. Coupling primary production and terrestrial runoff to ocean acidification and carbonate mineral suppression in the eastern Bering Sea. *Global Biogeochemical Cycles*, 116, C02030, doi: 10.1029/2010JC006453, Feb. 19, 2011.
- <sup>83</sup>Beman, J.M., Chow, C.-E., King, A.L., Feng, Y., Fuhrman, J.A., Andersson, A., **Bates, N.R.**, Popp, B.N., and Hutchins, D.A., 2011. Global oceanic nitrification rates as a consequence of ocean acidification. *Proceedings of the National Academy of Sciences*. 108(1), 208-213, doi: 10.1073/pnas.1011053108, Jan. 4, 2011.
- <sup>82</sup>Saba, V.S., Friedrichs, M.A.M., Carr, M.-E., Antoine, D., Armstrong, R.A., Asanuma, I., Aumont, O., **Bates, N.R.**, Behrenfeld, M.J., Bennington, V., Bopp, L., Bruggeman, J., Buitenhuis, E.T., Church, M.J., Ciotti, A.M., Doney, S.C., Dowell, M., Dunne, J., Dutkiewicz, S., Gregg, W., Hoepffner, N., Hyde, K.J.W., Ishizaka, J., Kameda, T., Karl, D.M., Lima, I., Lomas, M.W., Marra, J., McKinley, G.A., Mélin, F., Moore, J.K., Morel, A., O'Reilly, J., Salihoglu, B., Scardi, M., J. Smyth, T.J., Tang, S., Tjiputra, J., Uitz, J., Vichi, M., Waters, K., Westberry, T.K., and Yool, A., 2010. The challenges of modeling depth-integrated marine primary productivity over multiple decades:

A case study at BATS and HOT. *Global Biogeochemical Cycles*, 24, GB3020, doi: 10.1029/2009GB003655, Sep 15, 2010.

- ¶<sup>81</sup> **Bates, N.R.**, Amat, A., and Andersson, A.J., 2010. The interaction of carbonate chemistry and coral reef calcification: the carbonate chemistry coral reef ecosystem feedback (CREF) hypothesis. *Biogeosciences*, 7 (5), 2509-2530, doi:10.5194/bg-7-2509-2010. Corrigendum: *Biogeosciences*, 7 (10), 3005-3006, doi: 10.5194/bg-7-3005-2010.
- <sup>80</sup> Mathis, J.T., Cross, J., **Bates, N.R.**, Moran, S.B., Lomas, M.W., and Stabeno, P.J., 2010. Seasonal distribution of dissolved inorganic carbon and net community production on the Bering Sea shelf. *Biogeosciences*, 7(5), 1769-1787, doi: 10.5194/bg-7-1769-2010.
- <sup>79</sup> Jutterström, S., Anderson, L.G., **Bates, N.R.**, Bellerby, R., Johannessen, T., Jones, E.P., Key, R.M., Lin, X., Olsen, A., and Omar, A.M., 2010. Arctic Ocean data in CARINA. *Earth System Science Data*, 2, 71-78, Feb. 10, 2010.
- <sup>78</sup> Lomas, M.W., Steinberg, D.K., Dickey, T.D., Carlson, C.A., Nelson, N.B., Condon, R.H., and **Bates, N.R.**, 2010. Increased ocean carbon export in the Sargasso Sea is countered by its enhanced mesopelagic attenuation. *Biogeosciences*, 7 (1), 57-70.
- <sup>77</sup> Watson, A.J, Schuster, U., Bakker, D.C.E., **Bates, N.R.**, Corbiere, A., Gonzalez-Davila, M., Friedrich, T., Hauck, J., Heinze, C., Johannessen, T., Körtzinger, A., Metzl, N., Olafsson, J., Olsen, A., Oschlies, A., Padin, X.A., Pfiel, B., Santana-Casiano, M., Steinhoff, T., Telszewski, M., Rios, A.F., Wallace, D.W.R., and Wanninkhof, R., 2009. Accurately tracking the variation in the North Atlantic sink for atmospheric CO<sub>2</sub>. *Science*, 326, 1391-1393, doi: 10.1126/science.1177394, Dec. 9, 2009.
- <sup>76</sup> Reid, P.C., Fischer, A., Lewis-Brown, E., Meredith, M., Sparrow, M., Andersson, A.J., Antia, A., **Bates, N.R.**, Bathmann, U., Beaugrand, G., Brix, H., Dye, S., Edwards, M., Furevik, T., Gangstø, R., Hátún, H., Hopcroft, R.R., Kendall, M., Kasten, S., Keeling, R., Corinne Le Quéré, C., Mackenzie, F.T., Malin, G., Mauritzen, C., Ólafsson, J., Paull, C., Rignot, E., Shimada, K., Vogt, M., Wallace, C., Wang, Z., and Washington R., 2009. Impacts of the oceans on climate change. *Advances In Marine Biology*, 56, 1-150, doi: 10.1016/S0065-2881(09)56001-4.
- ¶<sup>75</sup> **Bates, N.R.**, and Mathis, J.T., 2009. The Arctic Ocean marine carbon cycle: Evaluation of air-sea CO<sub>2</sub> exchanges, ocean acidification impacts and potential feedbacks. *Biogeosciences*, 6 (11), 2433- 2459.
- <sup>74</sup> Birdsey, R., **Bates, N.R.**, Behrenfield, M., Davis, K., Doney, S.C., Feely, R.A., Hansell, D.A., Heath, L.S., Kasichke, E., Law, B.E., Lee, C., McGuire, D., Raymond, P., and Tucker, C.J., 2009. Carbon cycle observations: Gaps threaten climate mitigation policies. *EOS, Transactions, American Geophysical Union*, 90 (34), 292-293, 25 August 2009, Paper 2009ES002647.
- <sup>73</sup> Marshall, J., Andersson, A., **Bates, N.**, Dewar, W., Doney, S., Edson, J., Ferrari, R., Fratantoni, D., Gregg, M., Joyce, T., Kelly, K., Lozier, S., Lumpkin, R., Samuelson, R., Skillingstad, E., Straneo, F., Talley, L., Toole, J., and Weller, R., 2009. Observing the cycle of convection and restratification over the Gulf Stream system and the subtropical gyre of the North Atlantic Ocean: preliminary results from the CLIMODE field campaign. *Bulletin of the American Meteorological Society*, 90, 1337-1350, doi:10.1175/2009BAMS2706.1, Sep. 2009.
- ¶<sup>72</sup> **Bates, N.R.**, Mathis, J.T., and Cooper, L., 2009. The effect of ocean acidification on biologically induced seasonality of carbonate mineral saturation states in the Western Arctic Ocean. *Journal of Geophysical Research-Oceans*, 114, C11007, doi:10.1029/2008JC004862.



- <sup>71</sup>Lomas, M.W., Roberts, N., Lipschultz, F., Krause, J.W., Nelson, D.M., and **Bates, N.R.**, 2009. Biogeochemical responses to late-winter storms in the Sargasso Sea. IV. Rapid succession of major phytoplankton groups. *Deep-Sea Research I*, 56(6), 892-908, doi:10.1016/j.dsr.2009.03.004.
- <sup>70</sup>Dickey, T.D., **Bates, N.**, Byrne, R.H., Chang, G., Chavez, F.P., Feely, R.H., Hansen, A., Karl, D., Moore, C., Wanninkhof, R., and Sabine C.L., 2009. The NOPP O-SCOPE and MOSEAN Projects: Advanced sensing for ocean observing systems. *Oceanography*, 22 (2), 168-181, June 2009.
- <sup>69</sup>Takahashi, T., Sutherland, S.C., Wanninkhof, R., Sweeney, C., Feely, R.A., Chipman, D.W., Hales, B., Friederich, G., Chavez, F., Watson, A., Bakker, D.C.E., Schuster, U., Metzl, N., Yoshikawa-Inoue, H., Ishii, M., Midorikawa, Nojiri, Y., Kortzinger, A., Steinhoff, T., Hoppema, M., Olafsson, J., Arnarson, T.S., Tilbrook, B., Johannessen, T., Olsen, A., Bellerby, R., Wong, C.S., Delille, B., **Bates, N.R.**, and de Baar, H.J.W., 2009. Climatological mean and decadal change in surface ocean pCO<sub>2</sub>, and net sea-air CO<sub>2</sub> flux over the global oceans. *Deep-Sea Research II*, 56 (8-10), 554-577, doi:10.1016/j.dsr2.2008.12.009.
- <sup>68</sup>Schuster, U., Watson, A.J., **Bates, N.R.**, Corbiere, A., Gonzalez-Davila, M., Metzl, N., Pierrot, D., and Santana-Casiano, M., 2009. Trends in North Atlantic sea-surface fCO<sub>2</sub> from 1990 to 2006. *Deep-Sea Research II*, 56, 620-629, doi:10.1016/j.dsr2.2008.12.011.
- <sup>67</sup>Mathis, J.T., **Bates, N.R.**, Hansell, D.A., and Babila, T., 2009. Net community production in the northeastern Chukchi Sea. *Deep-Sea Research II*, 56(17), 1213-1222, doi:10.1016/j.dsr2.2008.10.017.
- <sup>66</sup>Lomas, M.W., Lipschultz, F., Nelson, D.M. Krause, J.W., and **Bates, N.R.**, 2009. Biogeochemical responses to late-winter storms in the Sargasso Sea. I. Pulses of primary and new production. *Deep-Sea Research I*, 56(6), 843-860, doi: 10.1016/j.dsr.2008.09.002.
- <sup>65</sup>Hood, R.R., Naqvi, W., Wiggert, J., Goes, J., Coles, V., McCreary, J., **Bates, N.R.**, Karuppasamy, P.K., Mahowald, N., Seitzinger, S., and Meyers, G., 2008. Research opportunities and challenges in the Indian Ocean. *EOS, Transactions, American Geophysical Union*, 89(13), 125-126, doi:10.1029/2008EO130001.
- <sup>64</sup>Grebmeier, J.M., **Bates, N.R.**, and Devol, A. 2008. Continental Margins of the Arctic Ocean and Bering Sea. In: *North American Continental Margins: A Synthesis and Planning Workshop*. U.S. Carbon Cycle Science Program, Washington D.C., (Editors, B. Hales, W.-J. Cai., B.G. Mitchell, C.L. Sabine and O. Schofield, 120 pp), p. 61-72.
- <sup>63</sup>Andersson, A.J., Mackenzie, F.T., and **Bates, N.R.**, 2008. Life on the margin: implications of ocean acidification on Mg-calcite, high latitude and cold-water marine calcifiers. *Marine Ecology Progress Series*, 373, 265-273, doi:10.3354/meps07639.
- <sup>62</sup>Li, Q.P., Hansell, D.A., McGillicuddy, D.J., **Bates, N.R.**, and Johnson, R.J., 2008. Tracer-based assessment of the origin and biogeochemical transformation of a cyclonic eddy in the Sargasso Sea. *Journal of Geophysical Research*, 113, C10006, doi:10.1029/2008JC004840.
- <sup>61</sup>Lepore, K., Moran, S.B., Grebmeier, J.M., Cooper, L.W., Lalande, C., Maslowski, W., Hill, V., **Bates, N.R.**, Hansell, D.A., Mathis, J.T., and Kelly, R.P., 2007. Seasonal and interannual changes in particulate organic carbon export and deposition in the Chukchi Sea. *Journal of Geophysical Research*, 112, C10024, doi:10.1029/2006JC003555.
- <sup>60</sup>Mathis, J.T., Hansell, D.A., Kadko, D., **Bates, N.R.**, and Cooper, L.W., 2007. Determining net dissolved organic carbon production in the hydrographically complex western Arctic Ocean. *Limnology and Oceanography*, 52 (5), 1789-1799, doi: 10.4319/lo.2007.52.5.1789, Sep. 2007.

- <sup>59</sup>Andersson, A.J., **Bates, N.R.**, and Mackenzie, F.T., 2007. Dissolution of carbonate sediments under rising pCO<sub>2</sub> and ocean acidification: Observations from Devil's Hole, Bermuda. *Aquatic Geochemistry*, 13 (3), 237-264, doi 10.1007/s10498-007-9018-8.
- <sup>58</sup>**Bates, N.R.**, 2007. Interannual variability of the oceanic CO<sub>2</sub> sink in the subtropical gyre of the North Atlantic Ocean over the last two decades. *Journal of Geophysical Research (Oceans)*, 112 (C9), C09013, doi: 10.1029/2006JC003759, May 4, 2007.
- <sup>57</sup>**Bates, N.R.**, and Peters, A.J., 2007. The contribution of atmospheric acid deposition to ocean acidification in the subtropical North Atlantic Ocean. *Marine Chemistry*, 107 (4), 547-558, doi:10.1016/j.marchem.2007.08.002.
- <sup>56</sup>McGillicuddy, D.J., Anderson, L.A., **Bates, N.R.**, Bibby, T., Buesseler, K.O., Carlson, C.A., Davis, C.S., Ewart, C., Falkowski, P.G., Goldthwait, S.A., Hansell, D.A., Jenkins, W.J., Johnson, R., Kosnyrev, V.K., Ledwell, J.R., Li, Q.P., Siegel, D.A., and Steinberg, D.K., 2007. Eddy/wind interactions stimulate extraordinary mid-ocean plankton blooms. *Science*, 316 (5827), 1016-1021, doi:10.1126/science.1136256.
- <sup>55</sup>Mathis, J.T., Pickart, R.S., Hansell, D.A., Kadko, D., and **Bates, N.R.**, 2007. Eddy transport of organic carbon and nutrients from the Chukchi Shelf: Impact on the upper halocline of the western Arctic Ocean. *Journal of Geophysical Research (Oceans)*, 112, C05011, doi: 10.1029/2006JC003899.
- <sup>54</sup>**Bates, N.R.**, Moran, S.B., Hansell, D.A., and Mathis, J.T., 2006. An increasing CO<sub>2</sub> sink in the Arctic Ocean due to sea-ice loss? *Geophysical Research Letters*, 33, L23609, doi:10.1029/2006GL027028.
- <sup>53</sup>**Bates, N.R.**, 2006. Air-sea CO<sub>2</sub> fluxes and the continental shelf pump of carbon in the Chukchi Sea adjacent to the Arctic Ocean. *Journal of Geophysical Research (Oceans)*, 111, C10013, doi:10.1029/2005JC003083.
- <sup>52</sup>**Bates, N.R.**, Pequignet, A.C., and Sabine, C.L. 2006. Ocean carbon cycling in the Indian Ocean: II. Estimates of net community production. *Global Biogeochemical Cycles*, 20 (3), GB3021, doi:10.1029/2005GB002492.
- <sup>51</sup>**Bates, N.R.**, Pequignet, A.C., and Sabine, C.L. 2006. Ocean carbon cycling in the Indian Ocean: 1. Spatiotemporal variability of inorganic carbon and air-sea CO<sub>2</sub> gas exchange. *Global Biogeochemical Cycles*, 20 (3), GB3020, doi:10.1029/2005GB002491.
- <sup>50</sup>Brix, H., Gruber, N., Karl, D.M., and **Bates, N.R.**, 2006. On the relationships between primary, net community, and export production in subtropical gyres. *Deep-Sea Research II*, 53 (5-7), 698-717, doi:10.1016/j.dsr2.2006.01.024.
- <sup>49</sup>Hood, R.R., Laws, E.A., Armstrong, R.A., **Bates, N.R.**, Brown, C.W., Carlson, C.A., Chai, F., Doney, S.C., Falkowski, P.G., Feely, R.A., Friedrichs, M.A.M., Landry, M.R., Moore, J.K., Nelson, D.M., Richardson, T.L., Salihoglu, B., Schartau, M., Toole, D.A., and Wiggert, J.D., 2006. Pelagic functional group modeling: Progress, challenges and prospects. *Deep-Sea Research I*, 53 (5-7), 459-512, doi:10.1016/j.dsr2.2006.01.025.
- <sup>48</sup>Walsh, J.J., Dieterle, D.A., Maslowski, W., Grebmeier, J.M., Whitley, T.E., Flint, M., Sukhanova, I.N., **Bates, N.R.**, Cota, G.F., Stockwell, D., Moran, S.B., Hansell, D.A., and McRoy, C.P., 2005. A numerical model of neglected spring primary production within the Chukchi/Beaufort Seas. *Deep-Sea Research II*, 52, 3541-3568, doi: 1016/j.dsr2.2005.09.009.

- <sup>47</sup>**Bates, N.R.**, Best, M.H.P., and Hansell, D.A., 2005. Spatio-temporal distribution of dissolved inorganic carbon and net community production in the Chukchi and Beaufort Seas. *Deep-Sea Research II*, 52 (22-24), 3303-3323, doi:10.1016/j.dsr2.2005.10.005.
- <sup>46</sup>Mathis, J.T., Hansell, D.A., and **Bates, N.R.**, 2005. Strong hydrographic controls on spatial and seasonal variability of dissolved organic carbon in the Chukchi Sea. *Deep-Sea Research*, 52 (22-24), 3245-3258, doi:10.1016/j.dsr2.2005.10.002.
- <sup>45</sup>Moran, S.B., Kelly, R.P., Hagstrom, K., Smith, J.N., Grebmeier, J.M., Cooper, L.W., Cota, G.F., Walsh, J.J., **Bates, N.R.**, Hansell, D.A., Maslowski, W., Nelson, R.P., and Mulsow, S., 2005. Seasonal changes in POC export flux in the Chukchi Sea and implications for water column-benthic coupling in Arctic shelves. *Deep-Sea Research*, 52 (22-24), 3427-3451, doi:10.1016/j.dsr2.2005.09.011.
- <sup>44</sup>**Bates, N.R.**, Hansell, D.A., Moran, S.B., and Codispoti, L.A., 2005. Seasonal and spatial distributions of particulate organic matter (POM) in the Chukchi and Beaufort Seas. *Deep-Sea Research II*, 52 (22-24), 3324-3343, doi:10.1016/j.dsr2.2005.10.003.
- <sup>43</sup>Hansell, D.A., Kadko, D., and **Bates, N.R.**, 2004. Degradation of terrigenous dissolved organic carbon in the western Arctic Ocean. *Science*, 304 (5672), 858-861, doi: 10.1126/science.1096175.
- <sup>42</sup>Lomas, M., and **Bates, N.R.**, 2004. Potential controls on interannual partitioning of organic carbon during the winter/spring phytoplankton bloom at the Bermuda Atlantic Time-series Study (BATS) site. *Deep-Sea Research II*, 51 (11), 1619-1636, doi:10.1016/j.dsr.2004.06.007.
- <sup>41</sup>**Bates, N.R.**, and Hansell, D.A., 2004. Temporal variability of excess nitrate in the subtropical mode water of the North Atlantic Ocean. *Marine Chemistry*, 84 (3-4), 225-241, doi:10.1016/j.marchem.2003.08.003, Jan. 2004.
- <sup>40</sup>Hansell, D.A., **Bates, N.R.**, and Olson, D.B., 2004. Excess nitrate and nitrogen fixation in the North Atlantic Ocean. *Marine Chemistry*, 84 (3-4), 243-265, doi:10.1016/j.marchem.2003.08.004, Jan. 2004.
- <sup>39</sup>Karl, D.M., **Bates, N.R.**, Emerson, S., Harrison, P.J., Jeandal, C., Liu, K.K., Marty J.-C., Michaels A.F., Miquel, J.C., Neuer, S., Nojiri, Y., and Wong, C.S., 2003. Temporal studies of biogeochemical processes in the world's oceans during the JGOFS era. In *Ocean Biogeochemistry: The Role of the Ocean Carbon Cycle in Global Climate Change*. (M.R. Fasham, ed.), Springer, pp. 239-265.
- <sup>38</sup>Gruber, N., **Bates, N.R.**, and Keeling, C.D., 2002. Interannual variability in the North Atlantic Ocean carbon sink. *Science*, 298 (5602), 2374-2378, doi: 10.1126/science.1077077, Dec. 20, 2002.
- <sup>37</sup>**Bates, N.R.**, Pequignet, A.C., Johnson, R.J., and Gruber, N. 2002. A short-term sink for atmospheric CO<sub>2</sub> in subtropical mode water of the North Atlantic Ocean. *Nature*, 420 (6915), 489-493, doi:10.1038/nature01253, Dec. 5, 2002.
- <sup>36</sup>Lomas, M., **Bates, N.R.**, Knap, A.H., Karl, D.A., Lukas, R., Landry, M.R., Bidigare, R.R., Steinberg, D.A., and Carlson, C.A., 2002. Refining our understanding of ocean biogeochemistry and ecosystem functioning. *EOS*, November 2002.
- <sup>35</sup>Takahashi, T., Sutherland, S.C., Sweeney, C., Poisson, A., Metzl, N., Tilbrook, B., **Bates, N.**, Wanninkhof, R., Feely, R.A., Sabine, C., Olafsson, J., and Nojiri, Y., 2002. Global sea-air CO<sub>2</sub> flux based on climatological surface ocean pCO<sub>2</sub>, and seasonal biological and temperature effects. *Deep-Sea Research II*, 49 (9-10), 1601-1622, doi:10.1016/S0967-0645(02)00003-6.

- <sup>34</sup>**Bates, N.R.**, 2002. Interannual variability in the global ocean uptake of CO<sub>2</sub>. *Geophysical Research Letters*, 29 (5), 1059-1064, doi:10.1029/2001GL013571, Mar. 1, 2002.
- <sup>33</sup>Lipschultz, F.J., **Bates, N.R.**, Carlson, C.A., and Hansell, D.A., 2002. New production in the Sargasso Sea: History and current status. *Global Biogeochemical Cycles*, 16 (1), 1001, doi:10.1029/2000GB001319, Mar. 2002.
- <sup>32</sup>**Bates, N.R.**, 2002. Seasonal variability of the effect of coral reefs on seawater CO<sub>2</sub> and air-sea CO<sub>2</sub> exchange. *Limnology and Oceanography*, 47 (1), 43-52, Jan. 2002.
- <sup>31</sup>Karl, D.M., Dore, J.E., Michaels, A.F., and **Bates, N.R.**, 2001. The U.S. JGOFS Time-series Observation Programs. *Oceanography*, 14(4), 6-17, November 2001.
- <sup>30</sup>**Bates, N.R.**, and Merlivat, L., 2001. The influence of short-term wind variability on air-sea CO<sub>2</sub> exchange. *Geophysical Research Letters*, 28 (17), 3281-3284, doi: 10.1029/2001GL012897, Sep. 1, 2001.
- <sup>29</sup>**Bates, N.R.**, Samuels, L., and Merlivat, L., 2001. Biogeochemical and physical factors influencing seawater fCO<sub>2</sub> and air-sea CO<sub>2</sub> exchange on the Bermuda coral reef. *Limnology and Oceanography*, 46 (4), 833-846, Jun. 2001.
- <sup>28</sup>Nelson, N.B., **Bates, N.R.**, Siegel, D.A., and Michaels, A.F., 2001. Spatial variability of the CO<sub>2</sub> sink in the Sargasso Sea. *Deep-Sea Research II*, 48 (8-9), 1801-1821, doi:10.1016/S0967-0645(00)00162-4.
- <sup>27</sup>Hood, R.R., **Bates, N.R.**, Capone, D.G., and Olson, D.B., 2001. Modeling the effect of nitrogen fixation on carbon and nitrogen fluxes at BATS. *Deep-Sea Research II*, 48 (8-9), 1609-1648, doi:10.1016/S0967-0645(00)00160-0.
- <sup>26</sup>Ono, S., Ennyu, A., Najjar, R.G., and **Bates, N.R.**, 2001. Shallow remineralization in the Sargasso Sea estimated from seasonal variations in oxygen, dissolved inorganic carbon and nitrate. *Deep-Sea Research II*, 48 (8-9), 1567-1582, doi:10.1016/S0967-0645(00)00154-5.
- <sup>25</sup>**Bates, N.R.**, 2001. Interannual variability of oceanic CO<sub>2</sub> and biogeochemical properties in the Western North Atlantic subtropical gyre. *Deep-Sea Research II*, 48 (8-9), 1507-1528, doi:10.1016/S0967-0645(00)00151-X.
- <sup>24</sup>Steinberg, D.K, Carlson, C.A., **Bates, N.R.**, Johnson, R.J., Michaels, A.F., and Knap, A.H., 2001. Overview of the US JGOFS Bermuda Atlantic Time-series Study (BATS): a decade-scale look at ocean biology and biogeochemistry. *Deep-Sea Research II*, 48 (8-9), 1405-1447, doi:10.1016/S0967-0645(00)00148-X.
- <sup>23</sup>**Bates, N.R.**, Merlivat, L., Beaumont, L., and Pequignet, A.C., 2000. Intercomparison of shipboard and moored CARIOCA buoy seawater fCO<sub>2</sub> measurements in the Sargasso Sea. *Marine Chemistry*, 72 (2-4), 239-255, doi:10.1016/S0304-4203(00)00084-0, Dec. 2000.
- <sup>22</sup>Steinberg, D.K., Carlson, C.A., **Bates, N.R.**, Goldthwait, S.A., Madin, L.P., and Michaels, A.F., 2000. Zooplankton vertical migration and the active transport of dissolved organic and inorganic carbon in the Sargasso Sea. *Deep-Sea Research I*, 47, 137-158, doi:10.1016/S0967-0637(99)00052-7, Jan. 2000.
- <sup>21</sup>Takahashi, T., Wanninkhof, R.H., Feely, R.A., Weiss, R.F., Chipman, D.W., **Bates, N.R.**, Olafsson, J., Sabine, C.L., and Sutherland, S.G., 1999. Net sea-air CO<sub>2</sub> flux over the global oceans: An improved estimate based on the sea-air pCO<sub>2</sub> difference. *Proceedings of the Second International CO<sub>2</sub> in the Oceans Meeting*, Tsukuba, Japan, January 1999, CGER-1037-99, 9-15.

- <sup>20</sup>Carlson, C.A., **Bates, N.R.**, Hansell, D.A., and Ducklow, H.W., 1999. Estimation of bacterial respiration and growth efficiency in the Ross Sea, Antarctica. *Aquatic Microbial Ecology*, 19 (3), 229-244, doi:10.3354/ame019229, Oct. 27, 1999.
- <sup>19</sup>**Bates, N.R.**, and Hansell, D.A., 1999. A high resolution study of surface layer hydrographic and biogeochemical properties between Chesapeake Bay and Bermuda. *Marine Chemistry*, 67, 1-16, doi:10.1016/S0304-4203(99)00045-6, Oct. 1999.
- <sup>18</sup>McGillicuddy, D.J., Johnson, R., Siegel, D.A., Michaels, A.F., **Bates, N.R.**, Knap, A.H., and Michaels, A.F., 1999. Mesoscale variations of biogeochemical properties in the Sargasso Sea. *Journal of Geophysical Research*, 104 (C6), 13,381-13,394, doi: 10.1029/1999JC900021, Jun. 15, 1999.
- <sup>17</sup>**Bates, N.R.**, Takahashi, T., Chipman, D.W., and Knap, A.H., 1998. Variability of pCO<sub>2</sub> on diel to seasonal timescales in the Sargasso Sea near Bermuda. *Journal of Geophysical Research*, 103 (C8), 15,567-15,585, doi: 10.1029/98JC00247, Jul. 15, 1997.
- <sup>16</sup>**Bates, N.R.**, Knap, A.H., and Michaels, A.F., 1998. Contribution of hurricanes to local and global estimates of air-sea exchange of CO<sub>2</sub>. *Nature*, 395, 58-61, doi: 10.1038/25703, Sep. 3, 1998.
- <sup>15</sup>**Bates, N.R.**, Hansell, D.A., Carlson, C.A., and Gordon, L.I., 1998. Distribution of CO<sub>2</sub> species, estimates of net community production, and air-sea CO<sub>2</sub> exchange in the Ross Sea polynya. *Journal of Geophysical Research (Oceans)*, 103 (C2), 2883-2896, doi: 10.1029/97JC02473, Feb. 15, 1997.
- <sup>14</sup>Hansell, D.A., **Bates, N.R.**, and Carlson, C.A., 1997. Predominance of vertical loss of carbon from surface waters of the equatorial Pacific Ocean. *Nature*, 386 (6620), 59-61, doi:10.1038/386059a0, Mar. 6, 1997.
- <sup>13</sup>Hansell, D.A., Carlson, C.A., **Bates, N.R.**, Poisson, A.P., 1997. Horizontal and vertical removal of organic carbon in the equatorial Pacific Ocean: a mass balance assessment. *Deep-Sea Research II*, 45 (9-10), 2115-2130, doi:10.1016/S0967-0645(97)00021-0.
- <sup>12</sup>**Bates, N.R.**, Michaels, A.F., and Knap, A.H., 1996. Seasonal and interannual variability of oceanic carbon dioxide species at the US JGOFS Bermuda Atlantic Time-series Study (BATS) site. *Deep-Sea Research II*, 43 (2-3), 347-383, doi:10.1016/0967-0645(95)00093-3. Corrigendum: 43 (4-6), 1435-1435.
- <sup>11</sup>**Bates, N.R.**, Michaels, A.F., and Knap, A.H., 1996. Alkalinity changes in the Sargasso Sea: Geochemical evidence of calcification? *Marine Chemistry*, 51 (4), 347-358, doi: 10.1016/0304-4203(95)00068-2, Jan. 1996.
- <sup>10</sup>Marchal, O., Monfray, P., and **Bates, N.R.**, 1996. Spring summer imbalance of dissolved inorganic carbon in the mixed layer of the northwestern Sargasso Sea. *Tellus*, 48 (1), 115-134, doi: 10.1034/j.1600-0889.1996.00011.x, Feb. 1996.
- <sup>9</sup>**Bates, N.R.**, 1995. *Investigation of the Physical and Biological Controls of the Oceanic CO<sub>2</sub> System in the Sargasso Sea*. Ph.D. Dissertation, University of Southampton, U.K., 276pp.
- <sup>8</sup>Hansell, D.A., **Bates, N.R.**, and Gundersen, K., 1995. Mineralization of dissolved organic carbon in the Sargasso Sea. *Marine Chemistry*, 51 (3), 201-212, doi:10.1016/0304-4203(95)00063-1, Dec. 1995.
- <sup>7</sup>Ducklow, H.W., Carlson, C.A., **Bates, N.R.**, Knap, A.H., Michaels, A.F., Jickells, T., Williams, P.J.LeB., and McCave, I.N., 1995. Dissolved organic carbon as a component of the biological pump in the North Atlantic Ocean. *Philosophical Transactions of the Royal Society, Series B*, 348, 161-167, May 30, 1995.



- <sup>6</sup>Marchal, O., Monfray, P., and **Bates, N.R.**, 1995. Seasonal cycle of CO<sub>2</sub> and O<sub>2</sub> in the euphotic zone at the U.S. JGOFS station in the Sargasso Sea. In: *Modelling of Marine Biogeochemical Cycles*. JGOFS-France Workshop, Gif-Sur-Yvette, Nov. 23-25, 1994, 27-35.
- <sup>5</sup>Michaels, A.F., **Bates, N.R.**, Buesseler, K.O., Carlson, C.A., and Knap, A., 1994. Carbon system imbalances in the Sargasso Sea. *Nature*, 372, 537-540, doi: 10.1038/372537a0, Dec. 8, 1994.
- <sup>4</sup>**Bates, N.R.**, 1994. Discussion: Early Devonian marine isotopic signatures: brachiopods from the Upper Gaspé limestones, Gaspé Peninsula, Québec, Canada. *Journal of Sedimentary Petrology*, A64(2), 405-407, April 1, 1994.
- <sup>3</sup>**Bates, N.R.**, and Brand, U., 1991. Environmental and physiological influences on isotopic and elemental composition of brachiopod shell calcite: Implications for the isotopic evolution of Paleozoic oceans. *Chemical Geology (Isotope Geoscience Section)*, 94 (1), 67-78, doi: 10.1016/0168-9622(91)90041-T, Nov. 1, 1991.
- <sup>2</sup>**Bates, N.R.**, 1990. *The Biogeochemistry of Paleozoic Brachiopods from New York State and Southern Ontario*. M.Sc. Thesis, Brock University, Canada, 254 pp.
- <sup>1</sup>**Bates, N.R.**, and Brand, U., 1990. Secular variation of calcite mineralogy: an evaluation of ooid and micrite chemistries. *Geologische Rundschau*, 79 (1), 27-46, doi: 10.1007/BF01830446.

## C2. Other Major Publications:

- <sup>9</sup>Feely, R.A (lead author), Aoyama, M., **Bates, N.R.**, Byrne, R.H., González-Dávila, M., Dore, J., Gruber, N., Hydes, D., Karl, D.M., Khatiwala, S., Kleypas, J., Lee, K., Mordy, C., Olafsson, J., Orr, J., Stramma, L., Takahashi, T., Tanhua, T., and Wanninkhof, R., (contributing authors), 2014. *IPCC AR5 Chapter 3 Ocean Observations Subsection 3.7*.
- <sup>6</sup>Laffoley, D.d'A., Roe, H.S.J., Angel, M.V., Ardron, J., **Bates, N.R.**, Boyd, I.L., Brooke, S., Buck, K.N., Carlson, C.A., Causey, B., Conte, M.H., Christiansen, S., Cleary, J., Donnelly, J., Earle, S.A., Edwards, R., Gjerde, K.M., Giovannoni, S.J., Gulick, S., Gollock, M., Hallet, J., Halpin, P., Hanel, R., Hemphill, A., Johnson, R.J., Knap, A.H., Lomas, M.W., McKenna, S.A., Miller, M.J., Miller, P., Ming, F.W., Moffitt, R., Nelson, N.B., Parson, L., Peters, A.J., Pitt, J., Rouja, P., Roberts, J., Roberts, J., Seigel, D.A., Siuda, A., Steinberg, D.K., Stevenson, A., Sumaila, V.R., Swartz, W., Trott, T.M., and Vats. V., 2011. *The protection and management of the Sargasso Sea: The golden floating rainforest of the Atlantic Ocean: Summary Science and Supporting Evidence Case*. Sargasso Sea Alliance, 44 pp (§not peer reviewed).
- <sup>5</sup>Feely, R.A., Fabry, V., Dickson, A., Gattuso, J.-P., Bijma, J., Riebesell, U., Doney, S., Turley, C., Saino, T., Lee, K., Anthony, K., Kleypas, J. (lead authors), Johannessen, T., Bellerby, R., Luchetta, A., Trull, T., Tilbrook, B., Olafsson, J., Watanabe, S., O'Dowd, C., Ward, B., Bakker, D., Hall-Spencer, J., Hardman-Mountford, N., Blackford, J., Send, U., Langdon, C., Hönisch, B., Hernandez-Ayon, J.-M., Ianson, D., Kozyr, A., **Bates, N.R.**, Wanninkhof, R., Robbins, L., Hydes, D., Gledhill, D., Iglesias-Rodriguez, M.D., Lebrato, M., Balch, W.M., Newton, J., Hofmann, G., Brainard, R., Eakin, M., Salm, R., Hill, T., Sabine, C., Alin, S., Hales, B., Juranek, L., Hendee, J., Manzello, D., Musielewicz, S., Mathis, J., Sigler, M., Turk, D., Vandemark, D., Salisbury, J., Coble, P., Azetsu-Scott, K., Miller, L., Lohrenz, S., Thomas, H., and Cai, W.-J., (contributing authors), 2010. *An international observational network for ocean acidification*. Community White Paper, OceanObs09, <http://www.oceanobs09.net/> (\*peer reviewed).
- <sup>4</sup>Borges, A.V., Alin, S.R., Chavez, F.P., Vlahos, P., Johnson, K.S., Holt, J.T. (lead authors), Balch, W.M., **Bates, N.R.**, Brainard, R., Cai, W.-J., Chen, C.T.A., Currie, K., Dai, M., Degrandpre, M.,

Delille, B., Dickson, A., Feely R.A., Friederich, G.E., Hales, B., Hardman-Mountford, N., Hendee, J., Hernandez-Ayon, J.M., Hood, M., Huertas, E., Hydes, D., Ianson, D., Krasakopoulou, E., Litt, E., Luchetta, A., Mathis, J., McGillis, W.R., Murata A., Newton, J., Ólafsson, J., Omar A., Perez, F.F., Sabine, C., Salisbury, J.E., Salm, R., Sarma, V.V.S.S., Schneider, B., Sigler, M., Thomas, H., Turk, D., Vandemark, D., Wanninkhof, R., Ward, B., (contributing authors), 2010. *A global sea surface carbon observing system: inorganic and organic carbon dynamics in coastal oceans*. Community White Paper, OceanObs09, <http://www.oceanobs09.net/> (\*peer reviewed).

<sup>3</sup>**Bates, N.R.**, 2009. Sensitive to climate change. *The Circle*. 3, 2009, p17-18, WWF publications (§not peer reviewed).

<sup>2</sup>**Bates, N.R.**, 2009. *Marine carbon cycle feedbacks*. In *Arctic Climate Feedbacks: Global Implications*. World Wildlife Fund Report (Editors, M. Sommerkorn and S. Hassol), World Wildlife Fund Report, 100 pp, p. 54-68. (\*note: peer-reviewed); [http://wwf.panda.org/what\\_we\\_do/where\\_we\\_work/arctic/publications/?177361/Warming-Arctics-global-impacts-outstrip-predictions](http://wwf.panda.org/what_we_do/where_we_work/arctic/publications/?177361/Warming-Arctics-global-impacts-outstrip-predictions).

<sup>1</sup>Bindoff, N.L., Willebrand, J., Artale, V., Cazenave, A., Gregory, J., Gulev, S., Hanawa, K., Le Quéré, C., Levitus, S., Nojiri, Y., Shum, C.K., Talley, L.D., and Unnikrishnan, A., 2007. *Observations: Oceanic Climate Change and Sea Level*. In: *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. **Bates** was one of 53 contributing authors to this chapter (\*peer reviewed).

### C3. Other Papers, Technical Reports and Data Reports:

<sup>52</sup>**Bates, N.R.**, Lomas, M.W., and Johnson, R.J., 2013. The Bermuda Atlantic Time-series Study (BATS) enters its twenty-fifth year of ocean observations in the North Atlantic that illustrate change in ocean carbon. *Ocean Carbon and Biogeochemistry (OCB) News*, Volume **6** (2), Spring Summer 2013-06-21

<sup>51</sup>Wanninkhof, R., Bakker, D., **Bates, N.**, Olsen, A., Steinhoff, T., and Sutton, A., 2013. Incorporation of alternative sensors into the SOCAT database and adjustments to dataset quality control flags. NOAA-CDIAC report.

<sup>50</sup>Lomas, M.W., **Bates, N.R.**, Buck, K.N. and Knap, A.H., 2011. *Microbial productivity of the Sargasso Sea and how it compares to elsewhere, and the role of the Sargasso Sea in carbon sequestration - better than carbon neutral?* In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 6 pp.

<sup>49</sup>Lomas, M.W., **Bates, N.R.**, Buck, K.N., and Knap, A.H., 2011. *Oceanography of the Sargasso Sea: Overview of Scientific Studies*. BIOS report for the Sargasso Sea Alliance, 94 pp.

<sup>48</sup>Lomas, M.W., and **Bates, N.R.**, 2011. *Food web overview*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 28, 37-42.

<sup>47</sup>Lomas, M.W., and **Bates, N.R.**, 2011. *Phytoplankton research*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 28-31, 37-42.

- <sup>46</sup>**Bates, N.R.**, and Lomas, M.W., N.R., 2011. Marine biogeochemical cycles in the Sargasso Sea. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 43-45, 48-52.
- <sup>45</sup>**Bates, N.R.**, 2011. *The global carbon cycle and observations in the Sargasso Sea*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 45-47, 48-52.
- <sup>44</sup>**Bates, N.R.**, 2011. *Calcium carbonate production*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 47, 48-52.
- <sup>43</sup>**Bates, N.R.**, 2011. *Climate variability, NAO/ENSO influences on the subtropical gyre*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 53, 56-60.
- <sup>42</sup>**Bates, N.R.**, and Peters, A.J., 2011. *Atmospheric deposition and acid precipitation, NAO/ENSO influences on the subtropical gyre*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 53-55, 56-60.
- <sup>41</sup>**Bates, N.R.**, 2011. *Air-sea gas exchange, CO<sub>2</sub> and DMS*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 55, 56-60.
- <sup>40</sup>**Bates, N.R.**, 2011. *Climate change and ocean acidification*. In *Oceanography of the Sargasso Sea: Overview of Scientific Studies* (Lomas, M.W., Bates, N.R., Buck, K.N., and Knap, A.H., editors), BIOS report for the Sargasso Sea Alliance, 61-67.
- <sup>39</sup>EPA, 2010. *Climate Change Indicators in the United States* [Data provider and indicator reviewer], 74 pp, EPA 430-R-10-027.
- <sup>38</sup>Tanhua, T., A. Olsen, M. Hoppema, S. Jutterström, C. Schirnack, S. van Heuven, A. Velo, X. Lin, A. Kozyr, M. Alvarez, D.C.E. Bakker, P. Brown, E. Falck, E. Jeansson, C. Lo Monaco, J. Olafsson, F.F. Perez, D. Pierrot, A.F. Rios, C.L. Sabine, U. Schuster, R. Steinfeldt, I. Stendardo, L.G. Anderson, **Bates, N.R.**, R.G.J. Bellerby, J. Blindheim, J.L. Bullister, N. Gruber, M. Ishii, T. Johannessen, E.P. Jones, J. Köhler, A. Körtzinger, N. Metzl, A. Murata, S. Musielewicz, A.M. Omar, K.A. Olsson, M. de la Paz, B. Pfeil, F. Rey, M. Rhein, I. Skjelvan, B. Tilbrook, R. Wanninkhof, L. Mintrop, D.W.R. Wallace, R.M. Key: 2009. CARINA data Synthesis Project, CDIAC, NDP-091.
- <sup>37</sup>Wanninkhof, R., Feely, R.A., **Bates, N.R.**, Millero, F.J., Takahashi, T., and Cook, S., 2006. Documenting ocean carbon sources and sinks—surface water pCO<sub>2</sub> measurements from ships. In *Annual Report on The State of the Ocean and the Ocean Observing System for Climate*, Annual Report, Fiscal Year 2005, J.M. Levy (ed.), NOAA/Climate Program Office/Office of Climate Observation, 207-216.
- <sup>36</sup>Johannessen, T., Hansell, D.A., and others (including Bates, N.R., 2006. *SOLAS-IMBER joint carbon implementation plan* (draft document; release 2006).
- <sup>35</sup>**Bates, N.R.**, 2005. *Ocean time-series inventory*. IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) document.
- <sup>34</sup>Sweeney, C., Takahashi T., Gnanadesikan, A., Wanninkhof, R., Feely, R.A., Friederich, G.E., Chavez, F., **Bates, N.R.**, Olafsson, J., and Sarmiento, J.L., 2002. Spatial and temporal variability of surface pCO<sub>2</sub> and sampling strategies. In: *A Large Scale CO<sub>2</sub> Observing Plan: In Situ Ocean*

and Atmosphere (Bender, M., Doney, S., Feely, R.A., et al., editors), National Technical Information Service, Springfield, Virginia, USA, p 155-175.

- <sup>33</sup>**Bates, N.R.**, 2001. *Regional testbeds: Interannual variability of the oceanic carbon cycle at the U.S. JGOFS Bermuda Atlantic Time-series Study (BATS) site*. In WOCE International Project Office, Report of the WOCE/JGOFS Ocean Transport Workshop, WOCE Report No. 174/2001, pp. 43-46.
- <sup>32</sup>Carlson, C.A., **Bates, N.R.**, and Hansell, D.A., 2001. *Ocean Carbon Cycling*. In Encyclopedia of Marine Science (2001 edition).
- <sup>31</sup>Gruber, N., **Bates, N.R.**, Keeling, C.D., and Le Quéré, C., 2001. *Interannual variability in the extra-tropical ocean carbon cycle: The role of the North Atlantic*. 6th International CO<sub>2</sub> meeting, Sendai, Japan.
- <sup>30</sup>Erickson, D., and **Bates, N.R.**, 2001. Working Group Report. Short-lived CRC's. US. SOLAS Planning Workshop, Washington DC, May 2001.
- <sup>29</sup>Mintrop, L., and **Bates, N.R.**, 2001. *Carbon in the North Atlantic (CARINA) Meeting Report*, Vigo, Spain, April 2001.
- <sup>28</sup>Doney, S.C., Hood, M., Alexiou, A., **Bates, N.R.**, Bishop, J., Ducklow, H.W., Fine, R., Gruber, N., Jahnke, R., Johnson, K., Lindstrom, E., K.-K. Liu, Mackenzie, F.T., McClain, C., Murphy, P.P., Platt, T., Smith, S.V., Stuart, V., Summerhayes, C., Wallace, D.W.R., and Wanninkhof, R., 2001. *A Global Ocean Carbon Observation System- A Background Report. A Contribution to the Integrated Global Observing System (IGOS)*, UNESCO report.
- <sup>27</sup>Dickey, T.D., **Bates, N.R.**, Byrne, R.H., Chavez, F., Feely, R.A., Moore, C., Wanninkhof, R., 2001. *A review of the NOPP Ocean-Systems for Chemical, Optical and Physical Experiments (OSCOPE) Project*. American Meteorological Society, Fifth Symposium on Integrated Observing Systems, 4 pp.
- <sup>26</sup>Dickey, T.D., **Bates, N.R.**, Byrne, R.H., Chavez, F., Feely, R.A., Moore, C., Wanninkhof, R., 2000. *Ocean-Systems for Chemical, Optical and Physical Experiments (OSCOPE) Project*. Final Workshop Report, 3 pp.
- <sup>25</sup>**Bates, N.R.**, 2000. *Linkages between ocean biogeochemistry and climate variability*. Ocean Carbon Transport, Exchanges and Transformations (OCTET) Meeting Report.
- <sup>24</sup>Dickey, T.D., **Bates, N.R.**, Byrne, R.H., Chavez, F., Feely, R.A., Moore, C., Wanninkhof, R., 2000. *Third Oceanographic-Systems for Chemical, Optical, and Physical Experiments (O-SCOPE)* Monterey Bay Aquarium Research Institute (MBARI), Dec. 1999.
- <sup>23</sup>Dickey, T.D., **Bates, N.R.**, Byrne, R.H., Chavez, F., Feely, R.A., Moore, C., Wanninkhof, R., 1999. *First Oceanographic-Systems for Chemical, Optical, and Physical Experiments (O-SCOPE)*, Workshop Report, PMEL, Seattle, Sept. 1998.
- <sup>22</sup>Dickey, T.D., **Bates, N.R.**, Byrne, R.H., Chavez, F., Feely, R.A., Moore, C., Wanninkhof, R., 1999. *Second Oceanographic-Systems for Chemical, Optical, and Physical Experiments (O-SCOPE)*, Workshop Report, Univ. South Florida, Feb. 1999.
- <sup>21</sup>Najjar, R., Feely, R., Takahashi, T., Tortell, P., Sabine, C.L., Langdon, C., DeConto, R., **Bates, N.R.**, Berelson, W., Peng, T.-H., Rubin, S., Sweeney, C., Hales, B., and Bishop, J., 1999. *Working Group Report: Chemistry. Synthesis and Modelling Project, Ocean Biogeochemical Response to Climate Change*, Durham, NH, 13-17 July 1998, U.S. JGOFS Planning Report Number 22, 15-21.

- <sup>20</sup>**Bates, N.R.**, Knap, A.H., and Michaels, A.F., 1998. *Carbon dioxide, climate change and hurricanes*. The Journal of the Forum for Environmental Law, Science, Engineering and Finance. December Issue, publisher. M.A. Frodl, Washington D.C., U.S.A.
- <sup>19</sup>**Bates, N.R.**, Knap, A.H., Bahr, F., Benson, J., Chipman, D.W., Howse, F., Johnson, R.J., and Takahashi, T., 1998. *Carbon dioxide measurements obtained aboard the R/V Weatherbird II in the Sargasso Sea, June-December 1994*. Bermuda Biological Station For Research Data Report, BBSR CO<sub>2</sub> Data Report 98-1, Ferry Reach, Bermuda.
- <sup>18</sup>**Bates, N.R.**, Knap, A.H., Bahr, F., Benson, J., Chipman, D.W., Howse, F., Johnson, R.J., and Takahashi, T., 1998. *Carbon dioxide measurements obtained from the R/V Weatherbird II in the Sargasso Sea, January-December 1995*. Bermuda Biological Station For Research Data Report, BBSR CO<sub>2</sub> Data Report 98-2, Ferry Reach, Bermuda.
- <sup>17</sup>**Bates, N.R.**, Knap, A.H., Bahr, F., Benson, J., Chipman, D.W., Howse, F., Johnson, R.J., and Takahashi, T., 1998. *Carbon dioxide measurements obtained from the R/V Weatherbird II in the Sargasso Sea, January-December 1996*. Bermuda Biological Station For Research Data Report, BBSR CO<sub>2</sub> Data Report 98-3, Ferry Reach, Bermuda.
- <sup>16</sup>Carlson, C.A., **Bates, N.R.**, and Steinberg, D.K., 1998. BATS time-series celebrates a decade of ocean research. U.S. JGOFS Newsletter, November 1998.
- <sup>15</sup>**Bates, N.R.**, 1997. Determination of total inorganic carbon (C<sub>T</sub>) by the coulometric procedure. in BATS Methods Manual, Version 4, March 1997 (Knap, A.H., et al.), U.S. JGOFS Planning Office, Woods Hole, MA, pp 39-47.
- <sup>14</sup>**Bates, N.R.**, 1997. Seasonal variability of the oceanic CO<sub>2</sub> system and the air-sea flux of CO<sub>2</sub> at the BATS site in the Sargasso Sea. in Second JGOFS North Atlantic Planning Report (Ducklow, H., Marra, J., and Goyet, C. eds.), JGOFS Report Number 20, JGOFS Planning Office, Woods Hole, MA, pp. 7-10.
- <sup>13</sup>Knap, A.H., Michaels, A.F., Steinberg, D.K., Bahr, F., **Bates, N.R.**, Bell, S., Countway, P., Close, A.R., Doyle, A.P., Dow, R.L., Howse, F.A., Gundersen, K., Johnson, R.J., Kelly, R., Little, R., Orcutt, K., Parsons, R., Rathburn, C., Sanderson, M., and Stone, S., 1997. *BATS Methods Manual, Version 4, April 1997*, U.S. JGOFS Planning Office, Woods Hole, 136pp.
- <sup>12</sup>Knap, A.H., Michaels, A.F., Hansell, D.A., Bahr, F., **Bates, N.R.**, Becker, S., Caporelli, E., Close, A.R., Doyle, A.P., Dow, R.L., Johnson, R.J., Kelly, R., Little, R., Gundersen, K., Howse, F.A., and Waterhouse, T., 1997. *U.S. JGOFS Bermuda Atlantic Time-series Study. Data Report for BATS 61-BATS 72, Oct. 1993-Sept. 1994*. U.S. JGOFS Planning and Coordination Office, Woods Hole.
- <sup>11</sup>Doney, S., Wallace, D.W.R., Ducklow, H.W., and **Bates, N.R.**, 1996. *The North Atlantic Carbon Cycle: New perspectives from JGOFS and WOCE*. ICES Annual Science Conference, Reykjavik, Iceland, Sept. 27-Oct. 4, 1996.
- <sup>10</sup>Knap, A.H., Michaels, A.F., Dow, R.L., Johnson, R.J., Gundersen, K., Close, A., Howse, F., **Bates, N.R.**, Hammer, M., Doyle, A., Waterhouse, T., Kelly, R., Becker, S., and Little, B., 1995. *U.S. JGOFS Bermuda Atlantic Time-series Study. Data Report for BATS 49-BATS 60, Oct. 1992-Sept. 1993*. U.S. JGOFS Planning and Coordination Office, Woods Hole.
- <sup>9</sup>Knap, A.H., Michaels, A.F., Dow, R.L., Johnson, R.J., Gundersen, K., Sorensen, J.C., Close, A., Howse, F., Hammer, M., **Bates, N.R.**, Best, M., Doyle, A., and Waterhouse, T., 1994. *U.S. JGOFS Bermuda Atlantic Time-series Study. Data Report for BATS 37-BATS 48, Oct. 1991-Sept. 1992*. U.S. JGOFS Planning and Coordination Office, Woods Hole.



- <sup>8</sup>**Bates, N.R.**, and Knap, A.H., 1993. *Total CO<sub>2</sub> measurements in the Sargasso Sea at the Bermuda Atlantic Time-Series (BATS) Station, May 1991 To May 1993*. Final Technical Report to NOAA, 21pp.
- <sup>7</sup>**Bates, N.R.**, 1993. *Determination of Total Inorganic Carbon (C<sub>T</sub>) by the Coulometric Procedure. in BATS Methods Manual, Version 3, March 1993* (Knap, A.H., et al.), U.S. JGOFS Planning Office, Woods Hole, MA, pp 31-37.
- <sup>6</sup>Galloway, J.N., Michaels, A.F., Prospero, J., Anderson, J., Arimoto, R., **Bates, N.R.**, Church, T., Cutter, G., Dacey, J., Hansell, D., Knap, A.H., Lipschultz, F., and Sholkovitz, E. 1993. *Chemical Exchanges and Feedbacks Across the Sea Surface (CEFSS)*. Report from the AEROCE-BATS Workshop, January 1993, Bermuda, 25pp.
- <sup>5</sup>Knap, A.H., Michaels, A.F., Dow, R.L., Johnson, R.J., Gundersen, K., Sorensen, J.C., Close, A., Howse, F., Hammer, M., **Bates, N.R.**, Doyle, A., and Waterhouse, T., 1993. *BATS Methods Manual*. U.S. JGOFS Planning and Coordination Office, Woods Hole.
- <sup>4</sup>Knap, A.H., Michaels, A.F., Dow, R.L., Johnson, R.J., Gundersen, K., Sorensen, J.C., Close, A., Howse, F., Hammer, M., **Bates, N.R.**, Knauer, G.A., Lohrenz, S.E., Asper, V.A., Tuel, M., Ducklow, H., and Quinby, H., 1993. *U.S. JGOFS Bermuda Atlantic Time-series Study*. BATS 25-BATS 36, Oct, 1990-Sep. 1991. U.S. JGOFS Planning Office, Woods Hole.
- <sup>3</sup>**Bates, N.R.**, 1992. *Earth Materials and Processes at the Earth's Surface*. School of Earth and Ocean Sciences, University of Victoria, Canada, 110 pp.
- <sup>2</sup>**Bates, N.R.**, 1991. *The Earth's Internal Processes and Historical Geology*. University of Victoria Press, University of Victoria, Canada, 85 pp.
- <sup>1</sup>**Bates, N.R.**, 1990. *Earth Materials and Processes at the Earth's Surface*. University of Victoria Press, University of Victoria, Canada, 101 pp.

## D. COMMUNICATION and OUTREACH

### D1. Selected Professional Lectures and Presentations:

- Invited talk, Challenger Society meeting on sustained observations, London, September 2013.
- Invited talk, ASLO-Aquatic Sciences Meeting, Puerto Rico, Feb. 2011.
- Invited talk, Arctic marine carbon cycle, Viterbo, Italy, Oct. 2010.
- Invited talk, Ocean Interior Synthesis Symposium, Monte Verita, Switzerland, July 2009 (could not attend at last minute).
- Invited talk, Gordon Research Conference "Polar Marine Science", Il Ciocca, Italy, March 2009.
- Invited talk, 2008 ASLO/AGU Ocean Sciences Meeting, Orlando, Florida, March 2008.
- Atlantic Meridional Transect (AMT) meeting, Royal Society, July 2006.
- CarboOCEAN meeting, University of East Anglia, September 2006.
- Invited talks, Princeton University, October 2005.
- IOCCP Open House, NACP-OCCC Coastal Carbon Cycle Science, Boulder, September 2005.
- 7th International Carbon Dioxide Conference (ICDC), Boulder, September 2005.
- NACP-OCCC North American Coastal Carbon meeting, Boulder, September 2005.
- Second SOLAS summer school, Cargese, Corsica, September 2005.
- Ocean Carbon Cycle and Climate meeting (OCCC), WHOI, August 2005.
- Winter Mixing New Production workshop, Rutgers University, June 2005.
- SBI (Shelf-Basin Interactions) P.I. Meeting. Monterey, March 2005.

- EDDIES workshop, Miami, January 2005.
- SOLAS-IMBER Carbon Implementation workshop, Miami, November 2004.
- SBI (Shelf-Basin Interactions) P.I. Meeting. Miami, March 2003.
- Invited talks, University of Rhode Island, March 2004.
- Time-series session invited talk, ASLO/TOS meeting, Hawaii, February 2004 (talk given by Dennis Hansell).
- SMP (Synthesis and Modeling Project) P.I. Meeting, Woods Hole, July 2003.
- SOLAS (Surface Ocean-Lower Atmosphere) Summer School, Corsica, July 2003.
- NACP (North American Carbon Program) meeting, Washington DC, May 2003.
- Third International JGOFS (Joint Global Ocean Flux Study) meeting, Washington DC, May 2003
- European Geophysical Society Meeting, Nice, France, April 2003.
- CLIVAR North Atlantic Panel meeting, Villefranche-sur-mer, France, April 2003.
- UK Overseas Territories Conservation Forum (UKOT) Lecture. Bermuda, March 2003.
- SBI (Shelf-Basin Interactions) P.I. Meeting. Miami, March 2003.
- CARINA (Carbon in the North Atlantic) Open Science Meeting, Gran Canaria, March 2003.
- Ocean Carbon Coordination Program (OCCP) Meeting, Paris, February 2003.
- OCEANS Meeting, Paris, February 2003.
- Underway pCO<sub>2</sub> Meeting, AOML, Miami, September 2002.
- Gordon Conference in Chemical Oceanography (Invited Plenary speaker), August 2002.
- European Geophysical Society Meeting, Nice, France, April 2002.
- BATS/HOT Meeting, Vancouver, Canada, April 2002.
- Ocean Carbon Data Management meeting, PMEL, Seattle, October 2001.
- Shelf Basin Interactions (SBI) Meeting, NSF, Washington, September 2001.
- JGOFS SMP Meeting Woods Hole, July 2001.
- JGOFS/WOCE Transport Meeting, Southampton, UK, June 2001.
- U.S. SOLAS meeting, Potomac, Maryland, May 2001.
- Carbon in the North Atlantic, Steering Committee, Vigo, Spain, April 2001.
- Sargasso Sea Ocean Observatory Meeting, Bermuda, March 2001.
- JGOFS Steering Committee Meeting, Santa Barbara February 2001.
- Symposium on North Pacific CO<sub>2</sub> Data Synthesis, Tsukuba, Japan, October 2000.
- North Pacific Carbon Cycling and Ecosystem Dynamics, Hakodate, Japan, October 2000.
- Tropical Atmosphere Science Center (TASC) Air-sea Exchange Meeting, La Parquera, Puerto Rico, July 2000.
- Fourth JGOFS Synthesis and Modelling Project Meeting, WHOI, June 2000.
- JGOFS Steering Committee Meeting, Washington DC, June 2000.
- Second International JGOFS Meeting, Bergen, Norway, April 2000.
- International Surface Ocean Lower Atmosphere Study (SOLAS) Meeting, Damp, Germany, February 2000.

## D2. Public Outreach:

Many science, governmental and fundraising briefings between 2011 and 2014. This also includes press releases and other outreach activities.

- Science briefing on ocean acidification for UK Foreign Secretary David Miliband at BIOS, 25<sup>th</sup> November 2009.
- Panel Discussion with filmmakers on the Ocean Acidification documentary Sea Change, 5 November 2009, BIOS.
- Participation in documentary (2009) on ocean acidification "Altered Ocean-Acid Seas", an OceanVision film, 66 minutes, Dean Schweinler, George Monteiro and Jim Flagg, producers.
- Bermuda TV channel ZBM interview (2009) about WWF report: Arctic Climate Feedback: Global Implications. Numerous interviews for local media in Bermuda (Royal Gazette, Bermuda Sun, Mid-Ocean News) and global media (e.g., see EPOCA website of Ocean Acidification; CBC radio briefing) in the past few months.
- BIOS press release (2009) on WWF report (Arctic Climate Feedbacks) and many other US and international press reports in September 2009
- TV documentary (2008). Primary contributor to 30-minute documentary on global warming for Bermuda channel ZBM special on the Environment "EnviroShorts".
- Press Conference (2008) on "Ocean Acidification". 2008 ASLO/AGU Ocean Sciences meeting, Orlando, Florida, March 2008.
- TV documentary (2007). Scientific interview for Discover Channel/National Geographic documentary (2007) on hurricanes and climate change entitled "Hyper Hurricanes". First US airing on National Geographic Channel (October 18, 2007). Includes footage of the BIOS ship R/V Atlantic Explorer.
- Scientific interview (2007) for independent filmmaker Dean Schweinler's documentary on ocean acidification. Includes footage of the BIOS ship R/V Atlantic Explorer and laboratory activities.
- TV documentary (2007). Footage of our laboratory activities included in James Martin's documentary on climate change and other environmental issues.
- Several local TV interviews (2007) on global climate change, coral reefs and environmental issues for Bermuda TV channel ZBM.
- Scientific interview (2007) on global climate change for a Bermuda TV channel ZBM 30 minute program, part of a series of programs on environmental issues.
- Interview for Sea Education Association publication (2007).
- Presentation (2007) on climate change and ocean acidification for CARILEC (an association of Caribbean and small island nation utility and energy generation companies).
- Scientific advisor (2007) on climate change and ocean acidification issues for Bermuda non-governmental organization Greenrock.
- Presentation (2007) on climate change and ocean acidification for the HSBC Bank of Bermuda foundation.
- Profile for BIOS outreach publication Meridian, (2007).
- Articles (2007) on climate change and ocean acidification for BIOS outreach publication Meridian. This includes a fall special issue on the contribution of BIOS scientists to the study of ocean acidification.
- Advisor for the BIOS sponsored International Partners Program (TIP) in late 2007 on ocean acidification (2007).
- Articles (2006) on "Ocean acidification" and "Arctic Ocean research" for BIOS outreach publication Meridian.
- Advisor for the BIOS sponsored International Partners Program (TIP) on ocean sciences (2006).

Several local TV interviews (2006) on environmental and scientific research issues for Bermuda channel ZBM.

BBSR Annual Report (2005). Article on Arctic Scientific Research at BBSR, October 2005

BBSR Associates Lecture (2005) on Coral Reefs and Ocean Acidification. March 2005.

Bermuda Garden Club Lecture (2005) "Coral Reefs and Ocean Acidification". March 2005.

Dutch Television Interview (2004). Current affairs topic of oceanography and climate change, January 2004.

UK Overseas Territory (UKOT) Lecture (2003). Climate Change Impacts and Implications: The Coral Reef Crisis. UK Overseas Territories Conservation Forum, Bermuda, March 2003.

BBSR Report (2003). The History of Global Geosciences Research at BBSR, BBSR Annual Report for 2002.

BBSR Report (2002). Monitoring BBSR Climate and Weather Station. BBSR Annual Report for 2001.

Discovery Kids Channel television show (2002). Participation in "Bermuda Triangle/Cave Ghost", episode 9 of Mystery Hunters. Apartment 11 Productions, Montreal, Quebec.

BBSR Outreach (2001). Coral and Climate Change. Understanding the Link. BBSR publication Currents, Fall 2001.

BBSR Ocean Symposium (2000), Center for Integrated Ocean Observation (CINTOO), April 2000.

BBSR Associates Lecture (1999), Hurricanes and Global Warming, June 1999.

## E. TEACHING AND MENTORSHIP EXPERIENCE

### E1. Teaching Experience:

Course Curriculum Development and Module (March 2013), Bermuda Institute of Ocean Sciences, St. Georges, Bermuda. Synopsis: Curriculum and lectures planned for a graduate course on the ocean carbon cycle and ocean acidification that was taught for the BIOS Center of Excellence in Observational Oceanography (CofEOO) at BIOS in March 2013.

Course Curriculum Development (December 2008, January 2010, 2011), Bermuda Institute of Ocean Sciences, St. Georges, Bermuda. Synopsis: Contributed to a three week curriculum and lectures for a graduate course on the ocean carbon cycle and ocean acidification for the BIOS POGO Center of Excellence in Observational Oceanography (CofEOO) held at BIOS.

Instructor (2006, 2004, 2003, 2002, 2001, 2000, 1999 and 1998), Primary and sole instructor for accredited course Environmental Principles, Policy and Legislation (ENV140.01), Duke University Nicholas School of Environmental Sciences-Bermuda Biological Station For Research Joint Program in Marine Science. Synopsis: This was a senior undergraduate lecture course on the scientific underpinning of U.S. and global environmental policy. Course and syllabus listed at Duke University, conducted at Bermuda Biological Station For Research, Bermuda.

Lecturer (2005, 2003), Lectures on ocean carbon cycle and time-series for the first and second Surface Ocean-Lower Atmosphere (SOLAS) Summer School. Cargese, Corsica, France, September 2005 and June 2003, (<http://www.uea.ac.uk/env/solas/summerschool/talks.html>).

Instructor (2000, 1999), Co-instructor for accredited course Marine Microbial Ecology (BIO 127L.01), Duke University Nicholas School of Environmental Sciences-Bermuda Biological Station For Research Joint Program in Marine Science. Synopsis: This was a senior undergraduate lecture and laboratory course on the marine microbial ecology and ocean

biogeochemistry. Course and syllabus listed at Duke University, conducted at Bermuda Biological Station For Research, St. Georges, Bermuda.

Instructor (1997), Co-instructor for accredited course Marine Biogeochemistry (ENV134L.01). Duke University Nicholas School of Environmental Sciences-Bermuda Biological Station For Research Joint Program in Marine Science. Synopsis: This was a senior undergraduate lecture and laboratory course on marine biogeochemistry. Course and syllabus listed at Duke University, conducted at Bermuda Biological Station For Research, St. Georges, Bermuda.

Lecturer (1993-1997), on topics ranging from Carbon Cycling and Climate Change to Geology of Bermuda, Elderhostel Program, Bermuda Biological Station For Research, St. Georges, Bermuda.

Instructor (1990), Sole instructor for accredited courses Sedimentology and Stratigraphy (similar to EOS 201), and Introduction to Mineralogy (similar to EOS 205), Department of Geography, University of Victoria, Victoria, British Columbia, Canada. Updated versions of these undergraduate courses are listed at University of Victoria (<http://web.uvic.ca/eos>). Synopsis: undergraduate lecture and laboratory courses on the geology of sedimentary formations and mineralogy.

Teaching Assistant (1989), for accredited undergraduate courses Structural Geology (similar to EOS 202), and Introduction to Mineralogy (similar to EOS 205), Department of Geography, University of Victoria, Victoria, British Columbia, Canada. Synopsis: undergraduate lecture and laboratory courses on structural geology and mineralogy.

Lab Manual Development (1989), Laboratory manual preparation for accredited undergraduate courses Earth Materials and Processes at the Earth's Surface, and Introduction to Mineralogy (GEOL or EOS 100A) and The Earth's Internal Processes and Historical Geology (GEOL or EOS 100B), Department of Geography, University of Victoria, Victoria, British Columbia, Canada.

Teaching Assistant (1987-1989), for accredited undergraduate course Introduction to Geology (GEOL 195), Dept. of Geological Sciences, Brock University, St. Catherines, Ontario, Canada.

## E2. Academic Supervision and Mentorship:

John Zablocki (2007), University of Montana at Missoula, Research Experience for Undergraduate (REU) student, Bermuda Institute of Ocean Sciences, St. Georges, Bermuda.

Dr. Andreas Andersson (2006-2008), Postdoctoral Fellow, Bermuda Institute of Ocean Sciences, St. Georges, Bermuda.

Andreas Andersson (2006), Ph.D. Graduate Committee, School of Earth and Oceans Sciences and Technology, University of Hawaii, Manoa, Hawaii (Defense 8 December 2006).

Jeremy Mathis (2006), Ph.D. Graduate Committee, Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, Florida (Defense 17 November 2006).

Justin Ossolinski (2006), M.Sc. Graduate Committee, Center for Marine and Earth Studies (CMES), Lewes, University of Delaware, Delaware (Defense 12 October 2006).

Ben Daly (2003), Hobart and William Smith College, NSF REU student, Bermuda Biological Station For Research, St. Georges, Bermuda.

Dr. Alexandra Amat (2001-2004), Postdoctoral Fellow, Bermuda Biological Station For Research, St. Georges, Bermuda.

Alex Gagnon (2001), University of California Santa Barbara, NSF REU student, Bermuda Biological Station For Research, St. Georges, Bermuda.



Rodney J. Johnson (2000-2003), ad hoc advisor, Ph.D. student, University of Southampton, and Bermuda Biological Station For Research, St. Georges, Bermuda.

Leone McCleary (1998), Columbia University, REU student, Bermuda Biological Station For Research, St. Georges, Bermuda.

Melanie Gates (1997), Maine Maritime Academy, REU student, Bermuda Biological Station For Research, St. Georges, Bermuda.