

CURRICULUM VITAE

Dr. William McKay Balch
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DATE: 16 June, 2020

PERSONAL

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Current Position: Senior Research Scientist

Citizenship: U. S. A.

INTERESTS Phytoplankton physiological ecology, bio-optics, ocean acidification and remote sensing.

HIGHER EDUCATION

Institutional: Cornell University, B.A., 1980. *Cum laude* in biology
Scripps Institution of Oceanography, Ph.D., 1985

Certification, licensure: Univ. of Miami Radioisotope License, 1988-1995
Bigelow Laboratory Radioisotope License, 1995-present

HONORS

Elected Councilor to the Oceanography Society (2015-2017; three-year term)

Invited keynote speaker, Schulich Ocean Studies Initiative Conference, Eilat, Israel. October 2017

Invited plenary speaker, 20th anniversary of the Atlantic Meridional Transect Conference. June 2015. "Contributions of the AMT program to knowledge about coccolithophore distributions at the basin scale, their optical properties and decadal trends"

14th Annual Gordon Riley Memorial Lecture – Dalhousie University November 2012; established in 1999 to honor the memory of the late Gordon A. Riley,

Professor of Oceanography and Director of the Institute of Oceanography (now Department of Oceanography)

Invited plenary speaker, 14th International Nanoplankton Association, Reston, VA; September, 2013

EXPERIENCE

Academic:

Senior Research Scientist , Bigelow Laboratory for Ocean Sciences, 1995-present,
External Graduate Faculty member, School of Marine Sciences, University of Maine,
Orono, ME; 2017-2022

Research Faculty, Colby College, 2010-present.

Adjunct Scholar, Dalhousie University, Halifax Nova Scotia (2014)

Undergraduate Education Coordinator with University of New England 1995-2005

Adjunct Professor. Division of Life Sciences, University of New England, Biddeford, ME. 1996 to 2005

Associate Professor. Division of Marine Biology and Fisheries, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, Florida. 1992-1995. Tenure awarded June 1994. Leave of absence from U. Miami from 5/95-8/97.

Assistant Professor. Division of Marine Biology and Fisheries, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, Florida. 1988-1992.

Post-doctoral Investigator. Institute of Marine Resources, Scripps Institution of Oceanography, San Diego, California. 1986-1987.

Non-Academic:

Research Associate. Joint program between Bigelow Laboratory for Ocean Sciences and the Instituto Español de Oceanografía, Vigo, Spain. 1986.

Contract Scientist with Dr. W.G. Harrison. Marine Ecology Laboratory, Bedford Institute of Oceanography, Dartmouth, N.S., Canada. 1985-1986.

Visiting Investigator with Dr. P.M. Holligan, Marine Biological Association, Plymouth, England. 1980.

Laboratory Technician for Drs. C.S. Yentsch and C.M. Yentsch, Bigelow Laboratory for Ocean Science, Boothbay Harbor, Maine. 1974-1979.

Laboratory Technician for Drs. C.S. Yentsch and Dr. C.M. Yentsch. University of Massachusetts Marine Station, Gloucester, Massachusetts. 1972-1973.

PUBLICATIONS (A total of 136 journal articles, book chapters and monographs, 7 papers in preparation, submitted, or in revision and 18 published technical reports; Google Scholar h-index = 50; 8701 citations; SCOPUS h-index=40; 5355 citations)

JOURNAL ARTICLES

- 136) ADDIN EN.REFLIST Collister, B. L., Zimmerman, R. C., Hill, V. J., Sukenik, C. I., and **Balch, W. M.**, 2020, Polarized lidar and ocean particles: Insights from a mesoscale coccolithophore bloom: *Applied Optics*, v. 59, no. 15, p. 4650-4662.
- 135) Godrijan, J., D. Drapeau, **W.M. Balch.** (2020), *Mixotrophic uptake of organic compounds by coccolithophores. **Limnology and Oceanography**, 20, 1410-1421 doi: 10.1002/lno.*
- 134) Hopkins, J., S. A. Henson, A. J. Poulton, and **W. M. Balch*** (2019), *Regional influences on temporal variability in global particulate inorganic carbon inventory, **Global Biogeochem. Cycles**, 33, HYPERLINK "https://doi.org/10.1029/2019GB006300" [HTTPS://DOI.ORG/10.1029/2019GB006300](https://doi.org/10.1029/2019GB006300). *Corresponding author.*
- 133) **Balch, W.M.**, Bowler, B.C., Drapeau, D.T., Lubelczyk, L.C., Lyczkowski, E. Mitchell, C. and Wyeth, A. 2019 Coccolithophore distributions of the North and South Atlantic Ocean. **Deep-Sea Research 1**. HYPERLINK "https://doi.org/10.1016/j.dsr.2019.06.012" <https://doi.org/10.1016/j.dsr.2019.06.012>.
- 132) Boss, E., Haëntjens, N., Ackleson, S., **Balch, W.M.**, Chase, A., Dall'Olmo, G., Freeman, S., Liu, Y., Loftin, J., Neary, W., Nelson, N., Novak, M., Slade, W., Proctor, C., Tortell, P., and Westberry, T. (2019). Inherent Optical Property Measurements and Protocols: Best Practices for the Collection and Processing of Ship-Based Underway Flow-Through Optical Data. IOCCG Protocol Series, *IOCCG Ocean Optics and Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation*, Volume 4.0, edited by A. R. Neeley and A. Mannino, IOCCG, Dartmouth, NS, Canada. <http://dx.doi.org/10.25607/OBP-664>
- 131) ADDIN EN.REFLIST Valente, A., S. Sathyendranath, V. Brotas, S. Groom, M. Grant, M. Taberner, D. Antoine, R. Arnone, **W.M. Balch**, K. Barker and others. 2019. A compilation of global bio-optical in situ data for ocean-colour satellite applications - Version two. *Earth System Science Data*. 11:1037-1068.
- 130) Record, N.R., J. A. Runge, D.E. Pendleton, **W.M. Balch**, K.T.A. Davies, A.J. Pershing, C.L. Johnson, K. Stamieszkin, R. Ji, Z. Feng, S.D. Kraus, R.D.

- Kenney, C. Hudak, C.A. Mayo, C. Chen, J. Salisbury, C.R.S. Thompson. (2019) Rapid climate-driven circulation changes threaten conservation of endangered North Atlantic right whales. **Oceanography**.
<https://doi.org/10.5670/oceanog.2019.201>
- 129) Record, N. R., **W. M. Balch**, and K. Stamieszkin (2019), Century-scale changes in phytoplankton phenology in the Gulf of Maine, *PeerJ*. 7:cc6735
<http://doi.org/10.7717/peerj.6735>.
- 128) Mitchell, C., H. R. Gordon, B. C. Bowler, D. T. Drapeau, and **W. M. Balch** (2018), Optical inversions of the water column based on glider measurements., **Optics Express**, 26(25), 32824-32838.
- 127) Daniels, C.J., A. J. Poulton, **W. M. Balch**, E. Marañón, T. Adey, B. C. Bowler, P. Cermeño, A. Charalampopoulou, D. W. Crawford, D. Drapeau, Y. Feng, A. Fernandez, E. Fernandez, G. M. Fragoso, N. Gonzalez, L. M. Graziano, J. Harlay, R. Heslop, P. M. Holligan, J. Hopkins, M. Huete-Ortega, D. A. Hutchins, P. J. Lam, M. S. Lipsen, D. C. Lopez-Sandoval , S. Loucaides, A. Marchetti, K. Mayers, A. P. Rees, C. Sobrino, E. Tynan, T. Tyrrell and A. Wyeth . 2018. A global compilation of calcite production rates by coccolithophores. **Earth System Science Data**. 10: 1-18.
- 126) White, M. M., J. D. Waller, L. C. Lubelczyk, D. T. Drapeau, B. C. Bowler, **W. M. Balch**, and D. M. Fields* (2018), Coccolith dissolution within copepod guts affects fecal pellet density and sinking rate, **Scientific Reports**, 8(1), 9758.
*Corresponding author
- 125) White, M. M., D. T. Drapeau, L. C. Lubelczyk, V. C. Abel, B. C. Bowler, and **W. M. Balch*** (2018), Calcification of an estuarine coccolithophore increases with ocean acidification when subjected to diurnally fluctuating carbonate chemistry. **Marine Ecology Progress Series**. 61: 59-76. HYPERLINK
"<https://doi.org/10.3354/meps12639>" <https://doi.org/10.3354/meps12639>.
*Corresponding author.
- 124) Collister, B.L. Zimmerman, R.C., Sukenik, C.I., Hill, V.J., **Balch, W.M.** 2018. Remote Sensing of Optical Characteristics and Particle Distributions of the Upper Ocean Using Shipboard Lidar. **Remote Sensing of the Environment**. 215: 85-96.
- 123) Hopkins, J. and **Balch, W.M.** 2018. A new approach to estimating coccolithophore calcification rates from space. **J. Geophys. Res.-Biogeosciences**. 123: 1447-1459. doi 10.1002/2017JG004235.
- 122) **Balch, W.M.**, B. Bowler, D. Drapeau, L. Lubelczyk, and E. Lyczkowski. 2018. Vertical distributions of coccolithophores, PIC, POC, biogenic silica and

- chlorophyll *a* throughout the global ocean. **Global Biogeochemical Cycles**, 32(1):2-17.
- 121) **Balch, W.M.** Ecology, Biogeochemistry, and Optical Properties of Coccolithophores. 2018. **Annual Reviews in Marine Science**. 10:71-98.
- 120) Cao, X., Aiken, G. R. , Butler, K. D. , Huntington, T. G., **Balch, W. M.**, Mao, J., Schmidt-Rohr, K. 2018. Carboxyl-rich alicyclic molecules as major structural components in dissolved organic matter along a river to sea transect, **Organic Geochemistry**.116: 62-76
- 119) Mitchell, C., C. Hu, B. Bowler, D. Drapeau and **W. M. Balch**, 2017. Estimating particulate inorganic carbon concentration from ocean color measurements using a reflectance difference approach. **Journal of Geophysical Research Oceans**. 122. <https://doi.org/10.1002/2017JC013146>
- 118) Smith, H. E. K., **Balch, W. M.**, Twining, B. Bates, N. Hopkins, J. Poulton, A. J. 2017. "The Influence of Environmental Variability on the Biogeography of Coccolithophores and Diatoms in the Great Calcite Belt." **Biogeosciences**. 14, 4905–4925, <https://doi.org/10.5194/bg-14-4905-2017>.
- 117) Randolph, K., H. M. Dierssen, A. Cifuentes-Lorenzen, **W. M. Balch**, E. C. Monahan, C. Zappa, D. Drapeau, and D. Bowler. 2017, Novel methods for optically measuring whitecaps under natural wave breaking conditions, **Journal of Atmospheric and Oceanic Technology**, doi: 10.1175/JTECH-D-16-0086.1.
- 116) Huntington, T., **Balch, W.M.**, Aiken, G., Sheffield, J., Luo, L., Roesler, C., Camill, P., 2016. Climate change and dissolved organic carbon export to the Gulf of Maine. **Journal of Geophysical Research Biogeosciences**; DOI: 10.1002/2015JG003314.
- 115) **Balch, W. M.**, Bates, N. R., Lam, Phoebe J., Twining, B. S. , Rosengard, S. Z., Bowler, B.C., Drapeau, D.T., Garley, R., Lubelczyk, L., Mitchell, C. E., Rauschenberg, S. (2016), Factors regulating the Great Calcite Belt in the Southern Ocean and its biogeochemical significance, **Global Biogeochem. Cycles**, 10.1002/2016GB005414.
- 114) Marañón, Emilio, **W. M. Balch**, Pedro Cermeño, Natalia González, Cristina Sobrino, Ana Fernández, María Huete-Ortega, Daffne C. López-Sandoval, Maximino Delgado, Marta Estrada, Marta Álvarez, Elisa Fernández-Guallart, Carles Pelejero. 2016. Pelagic calcification and carbonate chemistry in the tropical ocean. **Limnology and Oceanography**. 61(4):1345-1357.
- 113) Valente, A., S. Sathyendranath, V. Brotas, S. Groom, M. Grant, M. Taberner, D. Antoine, R. Arnone, **W. M. Balch**, K. Barker, R. Barlow, S.

- Bélangier, J.-F. Berthon, S. Besiktepe, V. Brando, E. Canuti, F. Chavez, H. Claustre, R. Croux, R. Frouin, C. García-Soto, S. W. Gibb, R. Gould, S. Hooker, M. Kahru, H. Klein, S. Kratzer, H. Loisel, D. McKee, B. G. Mitchell, T. Moisan, F. Muller-Karger, L. O'Dowd, M. Ondrusek, A. J. Poulton, M. Repecaud, T. Smyth, H. M. Sosik, M. Twardowski, K. Voss, J. Werdell, M. Wernand, and G. Zibordi. 2015. A compilation of global bio-optical in situ data for ocean-colour satellite applications. **Earth System Science Data**. 8:235-252. doi:10.5194/essd-8-235-2016
- 112) **Balch WM**, Huntington T, Aiken G, Drapeau DT, Bowler BC, Lubelczyk L, Butler K (2016b) Towards a quantitative and empirical dissolved organic carbon budget for the Gulf of Maine, a semi-enclosed shelf sea. **Global Biogeochem Cycles** 30:doi: 10.1002/2015GB005332
- 111) Rivero-Calle, S., DelCastillo, C.E., Gnanadesikan, A., **Balch, W.M.**, Guikema, S.D., 2015. Increase of coccolithophorids in the North Atlantic over recent decades. **Science**. 350:6267, 1533-1537. DOI: 10.1126/science.aaa8026.
- 110) Rosengard, S.Z., Lam, P.J., **Balch, W.M.**, Auro, M.E., Pike, S.M., Drapeau, D.T., Bowler, B.C., 2015. Carbon export and transfer to depth across the Southern Ocean Great Calcite Belt. **Biogeosciences**. 12: 3953–3971, 2015
www.biogeosciences.net/12/3953/2015/ ; doi:10.5194/bg-12-3953-2015
- 109) Salisbury, J., Jonsson, B., **Balch, W.M.**, Chakraborty, S., Chapron, B., Hales, B., Lohrenz, S., Mannino, A., Mathis, J., Reul, N., Signorini, S., Vandemark, D., Wanninkhof, R., Yates, K., 2015. How can present and future satellite missions support scientific studies that address ocean acidification? **Oceanography**. 28(2): 108-121. HYPERLINK "<http://dx.doi.org/10.5670/oceanog.2015.35>"
<http://dx.doi.org/10.5670/oceanog.2015.35> .
- 108) **Balch, W. M.**, Drapeau, D. T., Bowler, B. C., Lyczkowski, E., Lubelczyk, L. C., Poulton, A. J., and Painter, S. C., 2014, Surface biological, chemical and optical properties of the Patagonian Shelf coccolithophore bloom, the brightest waters of the Great Calcite Belt: **Limnology and Oceanography**. 59 (5): 1715-1732.
- 107) **Balch, W.M.**, Bowler, B.C., Lubelczyk, L.C. and Stephens, M., 2014. Aerial extent, composition, bio-optics and biogeochemistry of a massive under-ice algal bloom in the Arctic. **Deep-Sea Research II**, 105: 42-58.
- 106) ADDIN EN.REFLIST 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.M.**, Bates, N.R., Benitez-Nelson, C., Brownlee, E., Frey, K.E., Laney, S.R., Mathis, J.T., Matsuoka, A., Mitchell, B.G., Moore, G.W.K., Reynolds, R.A., Sosik, H.M., Swift, J.H., 2014. Phytoplankton blooms under the sea ice in the Chukchi Sea. **Deep-Sea Research II** 105, 1-16.

105) Muller-Karger, F.E., Kavanaugh, M.T., Montes, E., **Balch, W.M.**, Breitbart, M., Chavez, F. P., Doney, S.C., Johns, E.M., Letelier, R.M., Lomas, M.W., Sosik, H.M. and White, A.E. 2014. A framework for a marine biodiversity observing network within changing continental shelf seascapes. **Oceanography**. 27(2), 18-23. HYPERLINK "<http://dx.doi.org/10.5670/oceanog.2014.56>"
<http://dx.doi.org/10.5670/oceanog.2014.56>

104) ADDIN EN.REFLIST Valiadi, M., Painter, S.C., Allen, J.T., **Balch, W.M.** and Iglesias-Rodriguez, M.D., 2014. Molecular detection of bioluminescent dinoflagellates in surface waters of the Patagonian Shelf during early austral summer, 2008. **PLoS ONE**, 9(6): e98849. doi:10.1371/journal.pone.0098849

103) Poulton, A.J., Painter, S., Young, J.R., Bates, N.R., Bowler, B.C., Drapeau, D.T., Lyczskowski, E., **Balch, W.M.** 2013. The 2008 *Emiliania huxleyi* bloom along the Patagonian Shelf: Ecology, biogeochemistry and cellular calcification. **Global Biogeochemical Cycles**. 27: 1-11. DOI: 10.1002/2013GB004641

102) 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.M.**, and others (2012) Massive phytoplankton blooms under Arctic sea ice. **Science**. 336: 1408.

101) **Balch, W.M.**, Drapeau, D.T., Bowler, B.C., Huntington, T., 2012. Step-changes in the physical, chemical and biological characteristics of the Gulf of Maine, as documented by the GNATS time series. **Marine Ecology - Progress Series**, 450, 11–35. doi: 10.3354/meps09555.

100) Codiga, D.L., **W.M. Balch**, SM Gallager, PM Holthus, HW Paerl, JH Sharp. 2012. Ferry-based Sampling for Cost-Effective, Long-Term, Repeat Transect Multidisciplinary Observation Products in Coastal and Estuarine Ecosystems. Community White Paper, IOOS Summit, Herndon, VA (November, 2012).

99) Brown, M.S., Craig, S.E., Franz, B.A., Werdell, P.J., Zhang, X., Grant, J., Lewis, M., **Balch, W.M.**, 2012. Quantification of the Contribution of Coccolithophores to Reflectance Spectra in the Southern Ocean. Ocean Optics. The Oceanography Society, Glasgow, Scotland, p. 9.

98) Poulton AJ, Young JR, Bates NR, **Balch WM** (2011) Biometry of detached *Emiliania huxleyi* coccoliths along the Patagonian Shelf. **Marine Ecology Progress Series**, 443: 1-17 doi: 10.3354/meps09445

97) **Balch WM**, Drapeau DT, Bowler BC, Booth ES, Lyczskowski E, Alley D (2011) The contribution of coccolithophores to the optical and inorganic carbon budgets during the Southern Ocean Gas Experiment: New evidence in support of the "Great Calcite Belt" hypothesis. **Journal of Geophysical Research-Oceans**

Special Issue. VOL. 116, C00F06, doi:10.1029/2011JC006941.

- 96) **Balch W**, Poulton A., Drapeau D, Bowler B, Windecker L. and Booth. E.S. (2011) Zonal and meridional patterns of phytoplankton biomass and carbon fixation in the Equatorial Pacific Ocean, between 110°W and 140°W. **Deep -Sea Research II**. 58: 400-416. doi:10.1016/j.dsr2.2010.08.004.
- 95) Baines, S. B., B.S. Twining, S. Vogt, **W.M. Balch**, N. S. Fisher. (2011) Control of diatom silicification by silicic acid and iron in the eastern Equatorial Pacific. **Deep Sea Research II**. 58: 512-523. doi:10.1016/j.dsr2.2010.08.003.
- 94) Landry, M.R., Selph, K.E., Taylor, A.G., Decima, M., **Balch, W.M.**, Bidigare, R.R.R., (2011). Phytoplankton growth, grazing and production balances in the HNLC equatorial Pacific. **Deep -Sea Research II**. 58: 524-535 doi:10.1016/j.dsr2.2010.08.011.
- 93) Brzezinski, M., S.B. Baines, **W.M. Balch**, Charlotte Beucher, F. Chai, R.C. Dugdale, J.W. Krause, M.R. Landry, A. Marchi, C. Measures, D.M. Nelson, A. Parker, A. Poulton, K.E. Selph, P.G. Strutton, A.G. Taylor and B.S. Twining (2011), Co-limitation of diatoms by iron and silicic acid in the equatorial Pacific, **Deep -Sea Research II**, 58: 493-511. doi:10.1016/j.dsr2.2010.08.005.
- 92) Painter, S.C., A.J. Poulton, J.T. Allen, R. Pidcock, and **W.M. Balch** (2010), The COPAS'08 expedition to the Patagonian Shelf: Physical and environmental conditions during the 2008 coccolithophore bloom., **Continental Shelf Research**, 30 (18), 1907-1923. doi:10.1016/j.csr.2010.08.013
- 91) **Balch, W.M.**, Bowler, B.C., Drapeau, D. T., Poulton, A., and Holligan, P. Biominerals and the vertical flux of particulate organic carbon from the surface ocean. (2010) **Geochemical Research Letters**. 37 (L22605), 1-6doi:10.1029/2010GL044640.
- 90) Borges A.V., Alin S.R., Chavez F.P., Vlahos P., Johnson K.S., Holt J.T., **Balch W.M.**, Bates N., Brainard R., Cai W.-J. and others., "A global sea surface carbon observing system: inorganic and organic carbon dynamics in coastal oceans", in Proceedings of the "OceanObs'09: Sustained Ocean Observations and Information for Society" Conference (Vol. 2), Venice, Italy, 21-25 September 2009, Hall, J., Harrison D.E. and Stammer, D., Eds., ESA Publication WPP-306, 2010.
- 89) Sieracki, M.E., M. Benfield, A. Hanson, C. Davis, C. Pilskaln, D. Checkley, H.M. Sosik, C. Ashjian, P. Culverhouse, R. Cowen, R. Lopes, **W.M. Balch**, and X. Irigoien "Optical plankton imaging and analysis systems for ocean observation", in Proceedings of the "OceanObs'09: Sustained Ocean Observations and Information for Society" Conference (Vol. 2), Venice, Italy,

21-25 September 2009, Hall, J., Harrison D.E. and Stammer, D., Eds., ESA Publication WPP-306, 2010.

- 88) Fabry, V.J., and **W.M. Balch**, 2010, Direct measurements of calcification rates in planktonic organisms, in Riebesell U., Fabry V. J., Hansson L. & Gattuso J.-P. (Eds.), 2010. *Guide to best practices for ocean acidification research and data reporting*, 260 p. Luxembourg: Publications Office of the European Union.
- 87) Vaughn, J.M., Novotny, J.F., **Balch, W.M.**, Vining C.L., Drapeau D.T., Booth E., Kneifel D. M., Bell A.L. 2010. Isolation of *Emiliana huxleyi* viruses from the Gulf of Maine. **Applied Environmental Microbiology**. 58: 109-116. doi: 10.3354/ame01375.
- 86) Doney , S.C., **Balch, W.**, Fabry, V.J., Feely, R., 2009. Ocean acidification: A critical emerging problem for the ocean sciences. **Oceanography** 22 (4), 16-25.
- 85) **Balch, W.**, Utgoff, P., 2009. Potential interactions among ocean acidification, coccolithophores and the optical properties of seawater. **Oceanography** 22 (4), 146-159.
- 84) Gordon, H.R, T. J. Smyth, **W.M. Balch**, G. C. Boynton, and G. A. Tarran, 2009. Light scattering by coccoliths detached from *Emiliana Huxley*. **Applied Optics**. 48 (31): 6059-6072.
- 83) **Balch, W. M.**, D. Drapeau, B. Bowler, E. Booth, A. Plueddeman. 2009. Chalk-ex –The fate of CaCO₃ Particles in the Mixed Layer: Evolution of patch optical properties . **Journal of Geophysical Research- Oceans**. 2009. 114 (C07020), DOI:10.1029/2008JC004902.
- 82) Fabry, V., Langdon, C., **Balch, W.**, Dickson, A., Feely, R., Hales, B., Hutchins, D., Kleypas, J., and Sabine, C. 2008. Ocean Acidification's Effects on Marine Ecosystems and Biogeochemistry Ocean Carbon and Biogeochemistry Scoping Workshop on Ocean Acidification Research; La Jolla, California, 9–11 October 2007. **EOS**. 89(15): 143-144.
- 81) **Balch, W.M.** and V. Fabry. 2008 Ocean acidification: documenting its impact on calcifying phytoplankton at basin scales. **Marine Ecology Progress Series**. 373: 239–247, doi: 10.3354/meps07801
- 80) **Balch, W.M.**, Drapeau, D.T., Bowler, B. C., Booth, E.S., Windecker, L.A. and Ashe, A. 2008. Space-time variability of carbon standing stocks and fixation rates in the Gulf of Maine, along the GNATS transect between Portland, ME and Yarmouth, NS. **Journal of Plankton Research**. 30(2): 119-140. doi: 10.1093/plankt/fbm097.
- 79) **Balch, W. M.**, J. M. Vaughn, J.I. Goes, J. Novotny, D. Drapeau, E. Booth,

- and C. Vining. 2007. Bio-optical consequences of viral infection of phytoplankton: I. Experiments with the cyanobacterium, *Synechococcus* sp. **Limnology and Oceanography**. 52: 727-738.
- 78) Poulton, A. J., Adey, T. R., **Balch, W. M.** & Holligan, P. M. 2007. Relating coccolithophore calcification rates to phytoplankton community dynamics: regional differences and implications for carbon export. **Deep-Sea Res II** (Chapman Calcification Conference- Special Volume). Vol. 54, no. 5-7, pp. 538-557.
- 77) **Balch, W. M.**, Drapeau, D. T., Bowler, B. C. & Booth, E. 2007. Prediction of pelagic calcification rates using satellite-measurements. **Deep -Sea Research II** (Chapman Calcification Conference Special Volume). Vol. 54, no. 5-7, pp. 478-495. DOI:10.1016/J.DSR2.2006.12.006.
- 76) Berelson, W. M., **W. M. Balch**, R. Najjar, R. A. Feely, C. Sabine, and K. Lee. 2007. Relating estimates of CaCO₃ production, export and dissolution in the water column to measurements of CaCO₃ rain into sediment traps and dissolution on the sea floor: A revised global carbonate budget. **Global Biogeochemical Cycles**. 21, GB1024, DOI:10.1029/2006GB002803.
- 75) **Balch, W. M.** 2007. Coccolithophores and the “sea of milk”. In “*Our Changing Planet: The View From Space*”. Editors Michael King, Claire Parkinson, Kim Partington, and Robin Williams. Cambridge University Press. Cambridge, U.K.
- 74) ADDIN EN.REFLIST Blaschko, M.B., G. Holness, M.A. Mattar, D. Lisin, P.E. Utgoff, A.R. Hanson, H. Schultz, E.M. Riseman, M.E. Sieracki, **W.M. Balch**, and B. Tupper 2005, Automatic in situ identification of plankton, in *Proceedings - Seventh IEEE Workshop on Applications of Computer Vision, WACV 2005*, pp. 79-86.
- 73) **Balch, W. M.**, Howard Gordon, B. C. Bowler, D. T. Drapeau, E. S. Booth. 2005. Calcium carbonate measurements in the surface global ocean based on MODIS Data. **Journal of Geophysical Research-Oceans**. 110, C07001 doi:10.1029/2004JC002560.
- 72) Goes, J.I., **W.M. Balch**, J.M. Vaughn, and H.R. Gomes, Dynamics of Dissolved Organic Matter and Microbes in Seawater through Sub-Micron Particle Size Analyses, in *Marine Microbiology: Research Facets, Opportunities and Directions*, edited by N. Ramiah, and P.A. Lokabharati, Oxford University Press, London, U.K., 2005.
- 71) **Balch, W. M.** Re-evaluating the physiological ecology of coccolithophores. Chapter for: “COCCOLITHOPHORES - FROM MOLECULAR PROCESSES TO GLOBAL IMPACT”. Editors: Hans R. Thierstein and Jeremy R. Young.

Springer-Verlag pp. 165-190. 2004.

- 70) ADDIN EN.REFLIST **Balch WM** and Drapeau DT (2004) Backscattering by Coccolithophorids and Coccoliths: Sample Preparation, Measurement and Analysis Protocols. In: Mueller JL, Fargion GS, McClain CR (eds) Ocean Optics Protocols For Satellite Ocean Color Sensor Validation, Revision 5: Biogeochemical and Bio-Optical Measurements and Data Analysis Protocols. National Aeronautical and Space administration, Goddard Space Flight Space Center, Greenbelt, Maryland, pp 27-37.
- 69) **Balch, W. M.**, D. Drapeau, B. Bowler, E. Booth, J. Goes, A. Ashe, and J. Frye. 2004. A multi-year record of optical properties in the Gulf of Maine: I. Spatial and temporal variability. **Progress in Oceanography**. 63: 57-98.
- 68) Knobelspiesse, K.D., C. Pietras, G.S. Fargion, M. Wang, R. Frouin, M.A. Miller, A. Subramaniam and **W.M. Balch**. 2004. Maritime aerosol optical properties measured by handheld sun photometers. **Remote Sensing of Environment**. 93:87-106.
- 67) Vaillancourt, R.D., C.W. Brown, R.R.L. Guillard, **W. M. Balch**. 2003. Light backscattering by phytoplankton algae and a heterotrophic bacterium measured with a multi-wavelength, fixed-angle backscattering meter. **J. Plankton Res.** 26: 191-212.
- 66) Broerse, A.T.C., Tyrell, T., Young, J. R., Poulton, A. J., Merico, A. and **W. M. Balch**. 2003. The cause of bright waters in the Bering Sea in winter. **Continental and Shelf Research**. 23: 1579-1596.
- 65) James L Mueller, Giulietta S Fargion, Charles R McClain, J.L. Mueller, R.R. Bidigare, C. Trees, **W.M. Balch**, J. Dore, D.T. Drapeau, D. Karl, L. Van, J. Perl. 2003. Ocean Optics Protocols for Satellite Ocean Color Sensor Validation, Revision 4: Radiometric measurements and data analysis protocols. Goddard Space Flight Center, Greenbelt, MD. Volume 3, 7pp.
- 64) **Balch, W.M.**, Vaughn, J.M., Novotny, J.F., Drapeau, D.T., Goes, J.I., Lapierre, J.M., Scally, E, Vining, C.L., Ashe, A., and Vaughn, J.M. Jr. 2002. Fundamental changes in light scattering associated with infection of marine bacteria by bacteriophage. **Limnology and Oceanography**. 47(5): 1554-1561.
- 63) Campbell, J.W., D. Antoine, R. Armstrong, K. Arrigo, **W.M. Balch**, R. Barber, M. Behrenfeld, R. Bidigare, J. Bishop, M.-E. Carr, W. Esaias, P. Falkowski, N. Hoepffner, R. Iverson, D. Kiefer, S. Lohrenz, J. Marra, A. Morel, J. Ryan, V. Vedernikov, K. Waters, C. Yentsch, and J. Yoder. 2002. Comparison of algorithms for estimating ocean primary productivity from surface chlorophyll,

- temperature, and irradiance. **Global Biogeochemical Cycles**, 16(3), 10.1029 / 2001GB001444.
- 62) Goes, J.I., H.R. Gomes, A. Limsakul, **W.M. Balch**, T. Saino. 2001. El Nino related interannual variations in biological production in the North Pacific as evidenced by satellite and ship data. **Progress in Oceanography** 49: 211-224.
- 61) **Balch, W. M.**, D. Drapeau, J. Fritz, B. Bowler, and J. Nolan. 2001. Optical backscattering in the Arabian Sea- Continuous underway measurements of particulate inorganic and organic carbon. **Deep Sea Res. I.** 48: 2423-2452.
- 60) Gordon, H. R., G. C. Boynton, **W.M. Balch**, S. B. Groom, D. S. Harbour , and T. J. Smyth. 2001. Retrieval of Coccolithophore Calcite Concentration from SeaWiFS Imagery. **Geophysical Research Letters**, 28: 1587-1590.
- 59) **Balch, W.M.**, Vaughn, J., Novotny, J., D. T. Drapeau, R.D. Vaillancourt, J. Lapierre, and A. Ashe, 2000. Light scattering by viral suspensions. **Limnology and Oceanography**. 45:492-498.
- 58) Vaillancourt, R. D. and **W.M. Balch**. 2000. Size distribution of coastal sub-micron particles determined by flow, field flow fractionation. **Limnology and Oceanography**. 45: 485-492.
- 57) Graziano, L., **W.M. Balch**, D. Drapeau, B. Bowler, and S. Dunford. 2000. Organic and inorganic carbon production in the Gulf of Maine. **Cont. Shelf Res.** 20: 685-705.
- 56) **Balch, W. M.**, D. Drapeau, and J. Fritz. 2000. Monsoonal forcing of calcification in the Arabian Sea **Deep Sea Research II**, 47: 1301-1333.
- 55) Goes, J.I., H.D.R. Gomes,, A. Limsaku, **W. M. Balch**, T. Saino. 2000. El-Nino mediated changes in biological productivity in the subarctic Pacific Ocean - Results from satellite and ship data. The Fifth Pacific Ocean Remote Sensing Conference (PORSEC), 5-8 December 2000. Proceedings. Vol. 2, pp. 537-542. Natl. Inst. of Oceanography, Dona Paula, Goa (India).
- 54) Milliman, J., P.J. Troy, **W.M. Balch**, A.K. Adams, Y.-H. Li, and F.T. MacKenzie . 1999. Biologically-mediated dissolution of calcium carbonate above the chemical lysocline? **Deep-Sea Res. I.** 46: 1653-1669.
- 53) **Balch, W. M.**, David T. Drapeau, Terry L. Cucci, and Robert D. Vaillancourt, Katherine A. Kilpatrick, Jennifer J. Fritz. 1999. Optical backscattering by calcifying algae-Separating the contribution by particulate inorganic and organic carbon fractions **J. Geophys. Res.** 104: 1541-1558.

- 52) Esaias, W. E., M. R. Abbott, O. W. Brown, J. W. Campbell, K. L. Carder, D. K. Clark, R. L. Evans, F. E. Hoge, H. R. Gordon, **W. M. Balch**, R. Letelier, and P. Minnett. 1998. An overview of MODIS Capabilities for Ocean Science Observations. **IEEE Transactions on Geoscience and Remote Sensing**, EOS-AM Special Issue. 36(4): 1250-1265.
- 51) Voss, K., **W. M. Balch**, and K. A. Kilpatrick. 1998. Scattering and attenuation properties of *Emiliana huxleyi* cells and their detached coccoliths. **Limnol. Oceanogr.** 43: 870-876.
- 50) Archer, D., J. Aiken, **W. M. Balch**, R. Barber, J. Dunne, P. Flament, W. Gardner, C. Garside, C. Goyet, E. Johnson, D. Kirchman, M. McPhaden, J. Newton, E. Peltzer, L. Welling, J. White, J. Yoder. 1997. A Meeting Place of Great Ocean Currents: Shipboard Observations of a Convergent Front at 20°N in the Pacific. **Deep-Sea Res. II**, 44: 1827-1849.
- 49) **Balch, W. M.**, B. Bowler, and C.F. Byrne. 1997. Sea surface temperature gradients, baroclinicity, and vegetation gradients in the sea. **J. Plank. Res.** 19: 1829-1858.
- 48) Bidigare, R. R., M. Latasa, Z. Johnson, R. T. Barber, C. C. Trees, and **W. M. Balch**. 1997. Observations of a *Synechococcus*-dominated cyclonic eddy in open-oceanic waters of the Arabian Sea. **Society of Photo-Optical Instrumentation Engineers**, Vol. 2963. pp. 260-265.
- 47) **Balch, W. M.**, J. J. Fritz, and E. Fernandez. 1996. Decoupling of calcification and photosynthesis in the coccolithophore *Emiliana huxleyi* under steady-state light-limited growth. **Marine Ecology Progress Series**. 142: 87-97.
- 46) **Balch, W. M.**, K. A. Kilpatrick, P. M. Holligan and C. Trees. 1996. The 1991 coccolithophore bloom in the central north Atlantic I- Optical properties and factors affecting their distribution. **Limnology and Oceanography**. 41: 1669-1683.
- 45) **Balch, W. M.**, K. Kilpatrick, P. M. Holligan, D. Harbour, and E. Fernandez. 1996. The 1991 coccolithophore bloom in the central north Atlantic II- Relating optics to coccolith concentration. **Limnology and Oceanography**. 41: 1684-1696.
- 44) Fernandez, E., J. J. Fritz and **W. M. Balch**. 1996. Growth-dependent chemical composition of the coccolithophorid *Emiliana huxleyi* in light-limited chemostats. **J. Exp. Mar. Biol. Ecol.** 207: 149-160.
- 43) Fritz, J. J. and **W. M. Balch**. 1996. A coccolith detachment rate determined from chemostat cultures of the coccolithophore *Emiliana huxleyi*. **J. Exp. Mar. Biol. Ecol.** 207: 127-147.
- 42) **Balch, W., M.** and K. A. Kilpatrick. 1996. Calcification rates in the equatorial Pacific along 140°W. **Deep Sea Research**. 43: 971-993.

- 41) Fernandez, Emilio, E. Maranon and **W. M. Balch**. 1996. Intracellular carbon partitioning in the coccolithophore *Emiliana huxleyi*. **J. Marine Systems**. 9: 57-66.
- 40) **Balch, W. M.** 1995. Underwater bio-optics - Review of *Light and Photosynthesis in Aquatic Ecosystems, Second Edition*. **Bulletin of Marine Science**. 57: 297-299.
- 39) Fernandez, Emilio, **W. M. Balch**, E. Maranon, and P. M. Holligan. 1994. High rates of lipid biosynthesis in cultured, mesocosm and coastal populations of the coccolithophore *Emiliana huxleyi*. **Marine Ecology Progress Series**. 114: 13-22.
- 38) Yoder, J. A., S. G. Ackleson, R. T. Barber, P. Flament, and **W. M. Balch**. 1994. A line in the sea. **Nature**. 371: 689-692.
- 37) **Balch, W.M.** and C.F. Byrne. 1994. Factors affecting the estimate of primary production from space. **J. Geophys. Res. Oceans**. 99: 7555-7570.
- 36) Ackleson, S.G., **W.M. Balch**, and P.M. Holligan. 1994. The response of CZCS and SeaWIFS Visible-band water-leaving radiance to particulate calcite and pigment concentration within *Emiliana huxleyi* blooms. **J. Geophys Res. Oceans**. 99: 7483-7499.
- 35) Townsend, D.W., M.D. Keller, P.M. Holligan, S.G. Ackleson, and **W.M. Balch**. 1994. Blooms of the coccolithophore *Emiliana huxleyi* with respect to hydrography in the Gulf of Maine. **Cont. Shelf Res.** 14: 979-1000.
- 34) Paull, C.K., and **W.M. Balch**. 1994. Oxygen isotopic disequilibrium in coccolith carbonate from phytoplankton blooms. **Deep Sea Research**. 41: 223-228.
- 33) Kilpatrick, K. A., Y. Ge, **W. M. Balch**, and K. Voss. 1994. The "Ge Meter": A photometer for the continuous measurement of calcite-dependent light scatter in seawater. **Society of Photo-Optical Instrumentation Engineers**, Vol. 2258. pp. 512-521.
- 32) Holligan, P.M., E. Fernandez, J. Aiken, **W.M. Balch**, P. Boyd and others. 1993. A geochemical study of the coccolithophore *Emiliana huxleyi*, in the North Atlantic Global Biogeochemical Cycles. 7(4): 879-900.
- 31) Matrai, P.A., **W.M. Balch**, D.J. Cooper, and E.S. Saltzman. 1993. Ocean Color and Atmospheric DMS: on their Mesoscale Variability. **J. Geophys. Res.** 98 (D12): 23,469-23,476.

- 30) **Balch, W.M.**, K.A. Kilpatrick, and P.M. Holligan. 1993. Coccolith formation and detachment by *Emiliana huxleyi* (Prymnesiophyceae). **J. Phycol.** 29: 566-575.
- 29) **Balch, W.M.** 1993. Sophisticated models of primary production: Performance versus complexity- Reply to Platt and Sathyendranath. **J. Geophys. Res.** 98: 16585-16587.
- 28) **Balch, W. M.** and K. A. Kilpatrick. 1992. Particulate reflectance measurements of phytoplankton. **J. Plank. Res.** 14:721-735.
- 27) **Balch, W. M.**, R. Evans, J. Brown, G. Feldman, C. McClain and W. Esais. 1992. The remote sensing of ocean primary productivity—use of a new data compilation to test satellite algorithms. **Journal Geophysical Research.** 97:2279-2293.
- 26) **Balch, W. M.**, P. M. Holligan and K. A. Kilpatrick. 1992. Calcification, photosynthesis and growth of the bloom - forming coccolithophore. *Emiliana huxleyi*. **Cont. Shelf Res.** 12:1353-1374.
- 25) Keller, M. D., D. W. Townsend, S. G. Ackleson, P. M. Holligan, **W. M. Balch**, and P. A. Matrai. 1992. Observations of coccolithophore blooms in the Gulf of Maine. in "Proceedings of the Gulf of Maine Scientific Workshop, Woods Hole, MA Jan. 8-10, 1991". ed. J. Wiggan and C. Mooers. Urban Harbors Inst: Univ. Mass at Boston. pp. 259-263.
- 24) **Balch, W. M.**, P. M. Holligan, S. Ackleson, and K. Voss. 1991. Biological and optical properties of mesoscale coccolithophore blooms in the Gulf of Maine. **Limnology and Oceanography.** 36:629-643.
- 23) Holligan, P. M. and **W. M. Balch**. 1991. From the ocean to cells: coccolithophore optics and biogeochemistry in "Particle Analysis in Oceanography, ed. Serge Demers Proceedings of the NATO Advanced Study Institute on Individual Cell and Particle Analysis in Oceanography. Acquafredda di Maratona, Italy. Springer-Verlag: New York. pp. 301-324.
- 22) Weiler, C. S., **W. M. Balch**, S. W. Shisholm, J. J. Cullen, W. G. Harrison, P. A. Matrai, M. M. McCarthy, J. R. Nelson, M. J. Perry. 1990. Richard W. Eppley's contributions to phytoplankton physiology and biological oceanography. **Oceanography.** 3 (2): 42-46.
- 21) **Balch, W. M.**, M. Abbott, R. W. Eppley, and F. M. H. Reid. 1989. Bias in satellite-derived pigment measurements due to coccolithophorids and dinoflagellates. **Journal of Plankton Research.** 11:575-581.

- 20) **Balch, W. M.**, R. W. Eppley, and M. Abbott. 1989. Remote sensing of primary production I. a comparison of empirical and semi-analytical algorithms. **Deep Sea Research**. 36:281-295.
- 19) **Balch, W. M.**, R. W. Eppley, and M. Abbott. 1989. Remote sensing of primary production II. introduction of a semi-analytical algorithm. **Deep Sea Research**. 36: 1201-1217.
- 18) Ackleson, S., **W. M. Balch** and P. M. Holligan. 1988. White waters of the Gulf of Maine. **Oceanography**. 1: 18-22.
- 17) **Balch, W. M.**, C. M. Yentsch and B. Reguera. 1988. Examining nitrate reduction by phytoplankton with an immunoassay. In: C.M. Yentsch and F. Mague, (Eds.), **Immunochemical Approaches to Estuarine, Coastal and Oceanographic Questions**. Springer-Verlag:New York.
- 16) **Balch, W. M.** 1987. Studies of nitrate transport of marine phytoplankton using $^{36}\text{Cl-CIO}_3$ as a transport analogue. I. Physiological findings. **J. Phycol.** 23:107-118.
- 15) **Balch, W. M.**, C. Garside, and E. Renger. 1987. Studies of nitrate transport of marine phytoplankton using $^{36}\text{Cl-CIO}_3$ as a transport analogue. II. Field observations. **Deep-Sea Res.** 34:221-236.
- 14) **Balch, W. M.** 1986. Exploring the mechanism of ammonium uptake in marine phytoplankton with an ammonium analogue, methylamine. **Mar. Biol.** 92:163-171.
- 13) Yentsch, C. M., P. M. Holligan, **W. M. Balch**, and A. Tvirbutas. 1986. Tidal stirring vs. stratification: microalgal dynamics with special reference to toxic dinoflagellates. pp. 224-252. In: M. Bowman, W. Peterson, and C. M. Yentsch (eds.), **Tidal Mixing and Plankton Dynamics**, Vol. 17. Springer-Verlag, New York.
- 12) **Balch, W. M.** 1986. Are red tides correlated to spring-neap tidal mixing?: use of a historical record to test mechanisms responsible for dinoflagellate blooms, pp. 191-223. In: M. Bowman, W. Peterson, and C. M. Yentsch (eds.), **Tidal Mixing and Plankton Dynamics**. Vol. 17. Springer-Verlag, New York.
- 11) **Balch, W. M.** 1985. Exploring the ammonium and nitrate transport of marine phytoplankton with nutrient analogues. Ph. D. Thesis, University of California at San Diego, 211 pp.
- 10) **Balch, W. M.** 1985. Differences between dinoflagellates and diatoms in the uptake of $^{36}\text{Cl-CIO}_3$, an analogue of NO_3 . pp. 121-124. in D. Anderson, A.

- White and D. Baden (Eds.) **Toxic Dinoflagellates**. Elsevier Science Publishing Co., Inc., New York.
- 9) **Balch, W. M.** 1985. The effect of light on methylamine uptake by phytoplankton. **Limnol. Oceanogr.** 30:665-674.
- 8) Holligan, P. M., **W. M. Balch**, and C. M. Yentsch. 1984. Significance of subsurface chlorophyll, nitrate, and ammonium maxima in relation to the supply of nitrogen for phytoplankton growth in stratified waters of the Gulf of Maine. **J. Mar. Res.** 42:1051-1073.
- 7) **Balch, W. M.** and F. T. Haxo. 1984. Spectral properties of *Noctiluca miliaris* Suriray, a heterotrophic dinoflagellate. **J. Plankton Res.** 6:515-525.
- 6) Townsend, D. W., C. M. Yentsch, C. E. Parker, **W. M. Balch**, and E. D. True. 1983. An island mixing effect in the coastal Gulf of Maine. **Helgolander Meeresuntersuchungen** 36:347-356.
- 5) **Balch, W. M.**, P. C. Reid, and S. C. Surrey-Gent. 1983. Spatial and temporal variability of dinoflagellate cyst abundance in a tidal estuary. **Can. J. Fish Aquat. Sci.** 40:244-261.
- 4) Reid, P.C., **Balch, W.M.**, Surreygent, S.C., John, A.W.G. 1981 Resuspension Of Dinoflagellate Cysts During 1980 From Bottom Muds In Plymouth Sound. **British Phycological Journal**, 16 (2), 140-140.
- 3) **Balch, W.M.** 1981. An apparent lunar cycle of phytoplankton blooms and community succession in the Gulf of Maine. **J. Exper. Mar. Biol. and Ecol.** 55:65-77.
- 2) **Balch, W. M.** 1979. Gulf Stream rings as a mechanism of patch formation. pp. 275-278. In: H. Seliger and D. Taylor (eds.), **Proceedings of the Second International Conference on Toxic Dinoflagellate Blooms**. Elsevier-North Holland.
- 1) Yentsch, C. M. and **W. M. Balch**. 1975. Lack of secondary intoxicification by red tide poison in the American lobster, *Homarus americanus*. **Environmental Letters.** 9:246-254.

OTHER WORKS IN REVISION, SUBMITTED, AND/OR IN PREPARATION

- 7) Godrijan, Jelena, D. T. Drapeau, and W.M. Balch. (2020) Coccolithophore osmotrophic uptake of acetate, mannitol, and glycerol in darkness. **Limnology and Oceanography**. *In preparation*.

- 6) Balch, W.M., Drapeau, D.T. and Godrijan, J. (2020). Uptake of dissolved organic molecules by coccolithophores in the natural environment. **Marine Ecology Progress Series**. In preparation.
- 5) **Balch, W.M.**, Dave Drapeau, Bruce Bowler, Rebecca Garley & Nicholas R. Bates. 2020. Temperature and ocean acidification changes along the 21-year GNATS transect across the Gulf of Maine. **Continental Shelf Research**, In preparation.
- 4) **Balch, W.M.**, Catherine Mitchell, David Drapeau, Bruce Bowler, Colin Fischer. 2020. Improvements to the global PIC algorithm with a variable backscattering cross-section. **Remote Sensing of the Environment**. In preparation.
- 3) Randolph, K., H. M. Dierssen, M. S. Twardowski, X. Zhang, **W. M. Balch**, and V. Lance (2019), Biological and physical sources of optical backscattering in the Southern Ocean, **Journal Geophys. Res.**, *In preparation*
- 2) **Balch, W.M.**, B. Bowler, L. Lubelczyk, D. Drapeau, M. Stephens. 2019. Standing stock and production rate of particulate inorganic carbon in the Western Arctic Ocean. Deep-Sea Research II. **Deep Sea Research II**. In preparation
- 1) **Balch, W. M.**, Bates, N., Drapeau, D.T., Bowler, B.C., Lyczkowski, E. Response of coccolithophores of the Great Calcite Belt to ocean acidification. 2019. **Limnology and Oceanography**. In preparation.

TECHNICAL REPORTS

- 19) Steinmetz, H., Staudinger, M, **Balch, W.M.** 2019. Analyzing the Effects of Coccolithophore Concentration on the Relationship Between Vertical Absorption Coefficient and Secchi Disk Depth. University of Massachusetts Amherst ScholarWorks.
- 18) ADDIN EN.REFLIST Mannino, Antonio, Maria Tzortziou, Carlos E. Del Castillo, Joseph Salisbury, Chuanmin Hu, Anastasia Romanou, Dave Schimel, Cecile S. Rousseaux, Frank Muller-Karge, John Dunne, Matthew Long, Mike Behrenfeld, Paty Matrai, Raymond Najjar, Anthony Freeman, Galen McKinley, Jorge Sarmiento, Mitchell Roffer, Paula Bontempi, Robert Arnone, Steven G. Ackleson, Colleen Mouw, Zhongping Lee, Steven E. Lohrenz, Heidi Sosik, Joaquim Goes, Ryan A. Vandermeulen, **William Balch**, Kevin Arrigo, John R. Moisan, Nima Pahlevan, P. Jeremy Werdell, Ajit Subramaniam, Carol Robinson, Xiaodong Zhang, Marlon Lewis, Susanne Craig, Carolyn Jordan, Charles Gatebe,

- Menghua Wang, Susanne Menden-Deuer, Wilford D. Gardner, David Halpern, Richard W. Gould J, Andrew Barnard, Goni M (2016) Rate Processes and Fluxes of Marine Biogeochemical Cycles, Ecosystem Functioning, and Natural Resources--A white paper submitted in response to a request for information by The National Academies of Sciences, Engineering, and Medicine – Space Studies Board: Decadal Survey on Earth Science and Applications from Space -2017. National Academy, Washington, D.C. 12 pp.
- 17) Turpie, K., **Balch, W.M.**, Bowler, B.C., Franz, B., Frouin, R., Gregg, W., McClain, C., Rousseaux, C., Siegel, D., Wang, M., Eplee, G., and Robinson, W.. 2013 “Quality assessment of the visible infrared imaging radiometer suite (VIIRS) ocean color environment data records (EDR)”³; NASA Ocean Discipline Team Report. Submitted to the NASA Science Mission Directorate’s Earth Science Division and Joint Polar Satellite System (JPSS) Project Science Element (PSE). Funded under NASA grant NNH10ZDA001N: Research Opportunities in Space and Earth Science (ROSES-2010), Appendix A.22 – NPP Science Team for Climate Data Records.
- 16) Del Castillo, C.E., Platnick, S., Antoine, D., **Balch, W.M.**, Beherenfeld, M., Boss, E. et al., 2012. Pre-Aerosol, Clouds, and ocean Ecosystem (PACE) Mission Science Definition Team Report, NASA Headquarters, Washington, D.C. 274 pages.http://decadal.gsfc.nasa.gov/pace_documentation/PACE_SDT_Report_final.pdf; October, 2012.
- 15) Heinze, C., Schlitzer, R., **Balch, W.**, Bishop, J., Buesseler and K., Dutkiewicz, S. 2010. Combining water column data with sediment trap and satellite observations for improved marine carbon export estimates. *Report of the COCOS (Coordination Action Carbon Observation System) workshop*. 23-26 June 2010 at the University of Bergen, Bergen, Norway.
- 14) Joint, I., Karl, D.M., Doney, S.C., Armbrust, E.V., **Balch, W.M.**, Beman, M., Bowler, C., Church, M., Dickson, A., Heidelberg, J., Iglesias-Rodriguez, D., Kirchman, D., Kolber, Z., Letelier, R., Lupp, C., Maberly, S.C., Park, S., Raven, J.A., Repeta, D.J., Riebesell, U., Steward, G., Tortell, P.D., Zeebe, R.E., Zehr, J.P., 2009. Consequences of high CO₂ and ocean acidification for microbes in the global ocean. Plymouth Marine Laboratory and Center for Microbial Oceanography: Research and Education (C-MORE), Univ. Hawaii, Honolulu, 23 pp.
- 13) Roesler, C. S., A. H. Barnard, G. Aiken, T. Huntington, **W. M. Balch**, and H. Xue. 2006. Using optical proxies for biogeochemical properties to study land coverage and terrestrial inputs of organic carbon into coastal waters from the Penobscot Watershed to the Gulf of Maine. Proceeding of Ocean Optics XVIII, 9-13 October, Montreal.

- 12) Orrico, C.M., A. Barnard, C. Roesler, **W.M. Balch**, H. Franklin, and D. Abraham. 2006 Seasonal Variability of Ocean Color Remote Sensing Reflectance in Penobscot Bay, ME. Proceeding of Ocean Optics XVIII, 9-13 October, Montreal.
- 11) Barnard, A., C. Orrico, C. Roesler, **W.M. Balch**, H. Franklin, and D. Abraham. 2006. Using Temporal and Spatial Variability in Optical Signals Measured from a Network of Moorings within the Penobscot Bay and River System to Discern Between Coastal and Riverine CDOM Sources Proceeding of Ocean Optics XVIII, 9-13 October, Montreal.
- 10) **Balch, W.M.** 2001. Validation of surface bio-optical properties in the Gulf of Maine as a means for improving satellite primary production estimates. in "SIMBIOS Project 2000 Annual Report. McClain, C.R. and Fargion, G. S. eds. NASA Technical Memorandum #2001-209976.
- 9) **Balch, W.M.** 2000. Narrowing the uncertainty in calcification and PIC standing stock estimates. In "OCTET-ocean Carbon Transport, Exchanges and Transformations". Proceedings of the OCTET workshop, Airlie House, Warrenton, VA. pp. 58-61.
- 8) **Balch, W.M.** 1999. Validation of surface bio-optical properties in the Gulf of Maine as a means for improving satellite primary production estimates. in "SIMBIOS Project 1999 Annual Report. McClain, C.R. and Fargion, G. S. eds. NASA Technical Memorandum #1999-209486. Chapter 4; pp. 30-35.
- 7) **Balch, W.M.** 1999 Validation of surface bio-optical properties in the Gulf of Maine as a means for improving satellite primary production estimates. in "SIMBIOS Project 1998 Annual Report. McClain, C.R. and Fargion, G. S. eds. NASA Technical Memorandum #1999-208645. Chapter 5; pp. 32-34.
- 6) **Balch, W. M.**, Vaughn, J., Novotny, J., D. T. Drapeau, R.D. Vaillancourt, J. Lapierre, and A. Ashe,. 1999. Light scattering by viral suspensions. Proceedings of Ocean Optics XIV, Volume 3. Kailua-Kona, Hawaii, Nov. 10-13, 1998.
- 5) Falkowski, P.G., M. J. Behrenfeld, W. E. Esaias, **W. M. Balch**, J. W. Campbell, R. L. Iverson, D. A. Kiefer, A. Morel, and J. A. Yoder. 1998. Satellite primary productivity data and algorithm development: A science plan for mission to planet earth. SeaWiFS Technical Report Series, NASA/TM-1998-104566, Vol. 42. Goddard Space Flight Center, Greenbelt, MD. 37pp.
- 4) **Balch, W.M.** 1997. Accuracy of historical primary production measurements. *in* Proceedings of the International Workshop on Oceanographic Biological and Chemical Data Management. Eds. Syd Levitus and Iouri Oliouline. U.S. Dept of Commerce, NOAA/NESDIS Technical Report 87, Washington, D.C. pp.

137-146.

3) Gordon, H.R. and **W.M. Balch**. 1994. MODIS Detached coccolith concentration algorithm theoretical basis document. NASA Report Under Contract Number NAS5-31363. Feb. 28, 1994. 17pp.

2) **Balch, W.** (1993), Calcification and photosynthesis measurements from 12°N to 12°S along 140°W *Rep.*, 59 pp, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, U.S. JGOFS Planning and Coordination Office.

1) Ackleson, S.G., P.M. Holligan, **W.M. Balch**, D.W. Townsend, K.J. Voss, C. Paull, J. Brown and A. Chapin. 1989. Gulf of Maine Coccolithophore Cruise 20-25 June 1989. Bigelow Laboratory Reference #70. Office of Naval Research, Contract N00014-88-J-1183.

PRESENTATIONS AT MEETINGS (SINCE 1997 ONLY)

Balch, W. M. 1997. Validation of surface bio-optical properties in the Gulf of Maine as a means for improving satellite primary production estimates. Part I SIMBIOS Meeting, Solomons, MD Aug 6-8, 1997

Balch, W. M. 1998. Phytoplankton optical properties. SeaWiFS Meeting, Baltimore January 6-8 1998

Balch, W. M. 1998. Backscattering of Light by Calcium Carbonate and Organic Matter in the Sea. AGU/ASLO 9-13 February, 1998

Balch, W. M., Drapeau, D. T., Bowler, B., Ashe, A., Vaillancourt, R., and Dunford, S., 1998. Sea truth validation measurements in the Gulf of Maine Bigelow Laboratory for Ocean Sciences, NOAA Coastal Ocean Program Meeting, Wash D.C. 2-3 Sept, 1998

Balch, W. M. 1998. Validation of surface bio-optical properties in the Gulf of Maine as a means for improving satellite primary production estimates. Part II. 1998. SIMBIOS Meeting, La Jolla, CA 22-24, 1998

Balch, W. M., Drapeau, D. T., Bowler, B., Ashe, A., Vaillancourt, R., and Dunford, S., 1999. Backscattering probability and calcite-dependent backscattering in the Gulf of Maine. ASLO Santa Fe, 1-5 February, 1999

Balch, W. M., Drapeau, D. T., Bowler, B., Ashe, A., Vaillancourt, R., 1999. Error in SeaWiFS-derived chlorophyll in Case 1 vs. Case 2 waters of the Gulf of Maine. Case II Mini Workshop, Monterey 17 May, 1999.

- Balch, W. M.**, Drapeau, D. T., Bowler, B., Ashe, A., Vaillancourt, R. 1999. SeaWiFS validation results from the M/S Scotia Prince Ferry.) SeaWiFS Team Meeting, Monterey, 18-20 May, 1999
- Balch, W. M.** 1999. Optical Properties of Coccolithophores. Coccolithophore Meeting, Sponsored by the Office of Naval Research. Plymouth England 23-25 August, 1999
- Balch, W. M.** 1999. Validation of surface bio-optical properties in the Gulf of Maine as a means for improving satellite primary production estimates. SIMBIOS Team Meeting, Annapolis, 13-15 September, 1999.
- Balch, W. M.** , H. R. Gordon, D. T. Drapeau, B. C. Bowler, A. L. Ashe, J. I. Goes, and H. M. Gomes. 2000. PIC:POC and the Remote Sensing of Biogenic Carbon in the Sea. AGU/ASLO, January 2000 San Antonio
- Balch, W. M.**, David Drapeau, Bruce Bowler, Amanda Ashe, Joaquim Goes, Emily Scally. 2000. Anatomy of a Coccolithophore Bloom. Presented at Oceans from Space "Venice 2000" 9-13 October, Scuola Grande Confraternita di San Teodoro, Venice, Italy.
- Balch, William M.**, Vaughn, James M., Novotny, James F. , Drapeau, David T., Goes, Joaquim I., Lapierre, Janeen M., Ashe, Amanda, Vining, Kathy L., and Vaughn, James. 2000. Virus-mediated "clarification" of marine bacterial suspensions. Presented at Ocean Optics XV Meeting. 16-20 October, 2000. Musee Oceanographique, Monaco.
- H.R. Gordon, G.C. Boynton, **W.M. Balch**, S.B. Groom, D.S. Harbour, and T.J. Smyth, "An algorithm for retrieval of coccolithophore calcite concentration from Sea WiFS imagery", *Oceans from Space "Venice 2000"*, Scuola Grande Confraternita di San Teodoro, Venice, Italy, October.
- Campbell, J. W., Timothy S. Moore, and **William M. Balch**. 2000. Dynamic Patterns of Particle Backscattering in the Ocean. Presented at Ocean Optics XV Meeting. 16-20 October, 2000. Musee Oceanographique, Monaco.
- Balch, W. M.**, B. Bowler, D. Drapeau, J. Goes, and E. Booth. 2001. MODIS coccolith algorithm: Results from Chalk-Ex and SIMBIOS. December 2001 MODIS Meeting. Greenbelt, MD.
- Balch, W.** D. Drapeau, B. Bowler, E. Scally, J. Goes and A. Ashe. 2001. A retrospective analysis of the SIMBIOS Gulf of Maine ferry data; 1998-2000. Presented at the May 2001 Ocean Color Meeting, San Diego, CA.
- Balch, W. M.** D. Drapeau, B. Bowler, J. Goes, E. Scally, and A. Ashe. 2001. Anatomy of a coccolithophore bloom. Presented at the Aquatic Sciences Meeting

of the American Society of Limnology and Oceanography. Albuquerque, NM. February 2001.

Goes, J. I., **W. Balch**, and J. Vaughn. 2001. Using particle size analysis to understand the fate of extracellular products released by phytoplankton. Presented at the Aquatic Sciences Meeting of the American Society of Limnology and Oceanography. Albuquerque, NM. February 2001.

Balch, W. M., D. Drapeau, B. Bowler, J. Goes, E. Scally, H. Gordon, G.C. Boynton, and K. Kilpatrick. 2001. MODIS coccolith algorithm Results from Chalk-Ex and SIMBIOS. Presented at the January 2001 MODIS Team Meeting. Greenbelt, MD.

Balch, W. M., D. Drapeau, B. Bowler, J. Goes, E. Scally. 2001. The Black and White Ocean Carbon Cycle. Presented at the University of New Hampshire.

Balch, W. M. 2002. New observations of coccoliths from satellites, ferries, towed vehicles, and balloons. Keynote address presented at "Coccolithophores-from molecular processes to global impact. Centro Stefano Franscini, Monte Verita, Ascona, Switzerland, 10-15 February 2002.

Balch, W. M., B. Bowler, D. Drapeau, J. Goes, and E. Booth. 2002. Optical Results from the November '01 Chalk-Ex. Presented at University of New Hampshire, Chalk-Ex Synthesis Meeting. August 2002.

Drapeau, D.T. , **W.M. Balch**, B.C. Bowler, E. Scally, J. Goes, A. Ashe. 2002. A multi-year record of bio-optical properties in the Gulf of Maine. Presented at AGU meeting, Honolulu, Hawaii. February 2002.

Balch, W.M., B. Bowler, D. Drapeau, H. Gordon, E. Scally, A. Ashe. 2002. Quantitative, space-based measurements of oceanic suspended ocean calcium carbonate with MODIS and SeaWiFS. Presented at AGU meeting, Honolulu, Hawaii. February 2002.

Vaughn, J. M., **W. M. Balch**, J. F. Novotny, D. T. Drapeau , J. I. Goes , J. M. Lapiere , E. Scally, C. L. Vining , A. Ashe, and J. M. Vaughn Jr. 2002. Fundamental changes in light scattering associated with infection of marine bacteria by bacteriophage. Presented at AGU meeting, Honolulu, Hawaii. February 2002.

Balch, W. M., H. Gordon, B. Bowler, D. Drapeau, J. Goes, and E. Booth. 2002.

Suspended chalk and ocean optics. Ocean Optics XVI. Presented November 2002. Sponsored by Office of Naval Research. *Program and Abstracts*. p. 27.

Goes, J. I., **W. M. Balch**, J. Vaughn. Optical properties of submicron particles in seawater using flow field flow fractionation. Ocean Optics XVI. Presented November 2002. Presented November 2002. Sponsored by Office of Naval Research. *Program and Abstracts*. P.50.

Balch, W. M., Plueddemann, A. Pilskaln, C., Dam, H., McManus, G. 2002. Chalk-Ex: An Ocean Optics Manipulation Experiment on the Fate of Calcite Particles. Presented at the December '02 AGU Meeting in San Francisco, *EOS Transactions*, 83, No. 47, p. 679.

Bowler, B., **W. M. Balch**, D. Drapeau, J. Goes, and E. Booth. 2002. Optical Results From the November '01 "Chalk-Ex" Ocean Optics Manipulation Experiment. Presented at the December '02 AGU Meeting in San Francisco, *EOS Transactions*, 83, No. 47, p. 680.

Plueddemann, A. J., **W.M. Balch**, C.H. Pilskaln. 2002. Evolution of stratification and shear during ChalkEx-2001. Presented at the December '02 AGU Meeting in San Francisco, *EOS Transactions*, 83, No. 47, p. 680.

Goes, J. I., **W.M. Balch**, B. Bowler, D. Drapeau, E. Booth. 2002. Evidence of DOM removal by Cretaceous CaCO₃ particles during Chalk-Ex 2001. Presented at the December '02 AGU Meeting in San Francisco, *EOS Transactions*, 83, No. 47, p. 680.

Balch, W. M., Drapeau, D. T., Bowler, B. C., Booth, E. S., Goes, J. I., Gordon, H. R. Remote sensing calcium carbonate from space- use of a five-year coastal time series to understand coccolithophore ecology. American Society of Limnology and Oceanography, 2003 Aquatic Sciences Meeting, Salt Lake City, Utah. February 8-14, 2003.

Novotny, Sr, J. F., J. M. Vaughn, **W.M. Balch**, D. T. Drapeau, C. L. Vining, and E. S. Booth. 2003. The isolation of viral agents infecting *Emiliana huxleyi* from the Gulf of Maine. 103rd General Meeting of the American Society for Microbiology, May 18-22, 2003, Washington, D.C.

Balch, W. M. Viral control of mesoscale coccolithophore blooms in the Gulf of Maine...host culturing and optical results. Maine EPSCOR Review, July 2003.

Balch, W. M., Albert Plueddemann, Cindy Pilskaln- Bigelow Lab, Hans Dam, George McManus, Joaquim Goes. Chalk-Ex: Transport of optically active particles from the surface mixed layer. University of Rhode Island, November, 2003.

- Balch, W. M.**, Vaughn, J. M., Drapeau, D. T., Bowler, B. C., Booth, E., Vining, C. L., Novotny, J. F. Goes, J. I. Case I/Case II ambiguities in algal blooms - The case for minerals and viruses. Presented at the ASLO/TOS 2004 Ocean Research Conference, February 15-20, 2004, Honolulu, HI.
- Balch, W. M.** Plans for NASA-IDS sampling in 2004. IDS Team Meeting. April 1-2, 2004. Bigelow Laboratory for Ocean Sciences.
- Balch, W. M.** The MODIS Ocean Product for Particulate Inorganic Carbon (MOD 25): Refinement of calcium carbonate estimates in the global ocean. MODIS-Oceans Meeting. July 2004. Washington D.C.
- Balch, W. M.** Update on NASA-IDS sampling in 2004. IDS Team Meeting. September 2, 2004. Bigelow Laboratory for Ocean Sciences.
- Balch, W. M.** Summary of NASA-IDS 2004 activities. IDS Team Meeting. February 9, 2005. Bigelow Laboratory for Ocean Sciences
- Balch, W.M.** MODIS PIC Algorithm update **Balch, W. M.**, C. Roesler, T. Huntington, A. Barnard, G. Aiken, H. Xue Land-sea carbon coupling in the Gulf of Maine along a continuum of scales.
- Balch, W. M.**, B. C. Bowler, D. T. Drapeau, E. S. Booth. Synthesizing a 7-year NASA-funded ship of opportunity program. NASA Ocean Color Meeting, April 12-14, 2005. Portland, OR, USA
- Balch, W. M.** Remote Sensing of suspended calcium carbonate. Workshop on the Impacts of Increasing Atmospheric CO₂ on Coral Reefs and Other Marine Calcifiers. St. Petersburg, FL USA 18-20 April, 2005
- Balch, W. M.**, D. T. Drapeau, B. C. Bowler, and E. S. Booth. Coccolithophores, calcium carbonate and light scattering along the Atlantic Meridional Transect. ASLO Meeting, Santiago de Compostela, Spain, 19-24 June, 2005.
- Balch, W. M.** Results from the Atlantic Meridional Transect cruises on the light scattering from suspended calcite. AGU Chapman Conference, Woods Hole, MA 24-26 July 2005.
- Balch, W. M.** Results from recent NASA IDS studies of the Penobscot Bay and Gulf of Maine. Bigelow Laboratory for Ocean Sciences, 2 December 2005.
- Balch, W. M.** Ocean Carbonate Dynamics- "Finding a cure for POC envy". Plenary talk, MODIS team meeting. Baltimore MD. 4-6 January 2006.
- Balch, W. M.** Results from MODIS PIC algorithm work. MODIS team meeting. Baltimore MD. 4-6 January 2006.

- Balch, W.M.**, D. Drapeau, B. Bowler, E. Booth, L. Windecker, P. Utgoff. Light Scattering by Suspended Calcium Carbonate Particles in the Coastal and Central Atlantic Ocean- Increasing Relative Importance of CaCO₃ Backscattering With Increasing Oligotrophy. AGU Oceans Meeting, Honolulu, HI 20-24 February, 2006.
- D. Drapeau, **Balch, W.M.**, B. Bowler, A. Poulton, L. Windecker, J. Zima, E. Booth, K. Weber, Calcification and photosynthesis rates in the Equatorial Pacific Ocean between 110°W and 140°W. AGU Oceans Meeting, Honolulu, HI 20-24 February, 2006.
- Vaughn, J. M., J. F. Novotny, C. L. Vining, **Balch, W.M.**, P. Matrai, J.J. Goes, D. T. Drapeau, D. Kneifel. Isolation of *Emiliania huxleyi* viruses from the Gulf of Maine. AGU Oceans Meeting, Honolulu, HI 20-24 February, 2006.
- Balch, W.M.**, J. Vaughn, P. Matrai, J. Novotny, Viral control of Gulf of Maine phytoplankton. Meeting of the Technical Advisory Committee, Maine Space Grant, Portland, ME 25 January 2006.
- Balch, W.M.**, C. Roesler, A. Barnard, T. G. Huntington, H. Xue, G. R. Aiken. An interdisciplinary study of land-sea carbon coupling between the Penobscot River and Gulf of Maine. NASA Ocean Color Research Team meeting. Narragansett, RI April 11-13, 2006.
- Balch, W.M.**, D. Drapeau, B. Bowler, A. Poulton, L. Windecker and E. Booth. New results on calcification and photosynthesis from the Equatorial Pacific biocomplexity program. NSF Biocomplexity Review Meeting, Tiburon, CA September 2006.
- Balch, W.M.**, James Vaughn, Jim Novotny, Joaquim Goes David Drapeau, Laura Windecker, Emily Booth, Cathy Vining. The effect of viral infection on phytoplankton optical properties. Oral presentation and poster. Ocean Optics XVIII meeting, Montreal, Canada. October 2006.
- Balch, W.M.**, D. Drapeau, B. Bowler, E. Booth, A. Poulton, L. Windecker. Indices of coccolithophore calcification. American Society of Limnology and Oceanography meeting, Santa Fe, NM Feb 2007.
- Balch, W.M.**, C. Roesler, A. Barnard, T. G. Huntington, H. Xue, G. R. Aiken. Non-conservative DOC transformations in Maine watersheds: “Can you tell the tea by its color?” NASA Ocean Color Research Team meeting. Seattle, WA April 11-13, 2007.
- Balch, W.M.**, D. Drapeau, B. Bowler, E. Booth, L. Windecker, Changes in absorption and backscattering in the Gulf of Maine associated with precipitation extremes. NASA Ocean Color Research Team meeting. Poster. Seattle, WA April 11-13,

2007.

Balch, W.M. Use of remote sensing in assessing the impacts of ocean acidification. Ocean Carbon and Biogeochemistry Scoping Workshop on Ocean Acidification Research. Scripps Institution of Oceanography, La Jolla, CA. 9-11 October, 2007.

Balch, W.M., B.C. Bowler, D.T. Drapeau, E.S. Booth. How on earth will we measure the impact of ocean acidification over basin scales? AGU/ASLO/TOS meeting. Orlando, FL, 3-7 March 2008.

Balch, W.M., D. T. Drapeau, B. C. Bowler, E. S. Booth, L. A. Windecke and A. Ashe Space-time variability of carbon standing stocks and fixation rates in the Gulf of Maine, along the GNATS transect between Portland, Maine, USA, and Yarmouth, Nova Scotia, Canada. 3 April 2008, Meeting “From cells to ecosystems”. Conference at University of Plymouth, Plymouth, U.K.

Balch, W.M., G. Aiken, D. Drapeau, B. Bowler, E. Booth. Long-term changes in the pelagic carbon cycle of the Gulf of Maine, as documented by GNATS (Gulf of Maine North Atlantic Time Series). NASA Carbon Cycle and Ecosystems Meeting, Univ. Maryland, Adelphi, MD 28 April-1 May 2008.

Balch, W.M. The Gulf of Maine GNATS program. Gulf of Maine workshop, University of New Hampshire, Alumni Center, Durham, NH. 2 May 2008.

Balch, W.M. Carboy Results from the Equatorial Biocomplexity Experiment. 19-20 May 2008. Tiburon Center, Univ. San Francisco, San Francisco, CA. I participated in the meeting remotely and presented the above talk via video conference.

Balch, W.M., A.J. Plueddeman, B. C. Bowler, D. T. Drapeau. On the mechanisms of thin layer formation: Evidence from Chalk-ex. 2008 Ocean Optics Meeting XIX, Tuscany Italy, October 2008.

Cuhel, R., C. Aguilar-Diaz, **W.M. Balch**. 2008. Midwest Flood of 2008: Lake Michigan Basin-Wide Summer Plankton Bloom is not due to Nutrient Injection. AGU Fall Meeting. San Francisco, December 2008.

Balch, W.M. 2008. Pelagic Calcification. Workshop on Best Practices for Ocean Acidification Research, Kiel, Germany, November 19-21, 2008.

Dierssen, H.M., K. Randolph, C. Buonassisi, M. Twardowski, S. Freeman, **W.M. Balch**, and D. Drapeau. 2009. Differentiating sources of backscattering in the Southern Ocean for ocean color remote sensing: calcite, bubbles and phytoplankton. ASLO Meeting. Nice France (January 2009).

Balch, W.M., G. Aiken, A. Barnard, T. Huntington, C. Roesler, H. Xue. 2009. Land to ocean carbon coupling between the Penobscot watershed and Gulf of Maine. North American Carbon Program Meeting, Town and Country Hotel, San Diego, Feb 17-20, 2009.

Balch, W.M. 2009. Ocean acidification: documenting its impact on calcifying phytoplankton at basin scales. Presented at “Rising CO₂, ocean acidification and their impacts on marine microbes” organized by the Plymouth Marine Laboratory and the Center for Microbial Oceanography: Research and Education (C-MORE) at the East-West Center on the Campus of the University of Hawaii 24 – 26 February 2009.

Balch, W.M. 2009. Coastal Time Series: Documenting change across the land-sea transition zone. Ocean Color Research Team Meeting, New York, NY. May 4-6, 2009.

Balch W. M. 2009. The MODIS time series of suspended calcium carbonate in the global ocean. IGARRS Meeting, Cape Town, South Africa. July 13-17, 2009.

Balch, W.M. 2009. Ocean Acidification: Another Facet of the Global CO₂ Problem. Café Scientifique. Boothbay Opera House, W. Boothbay Harbor, ME 28 July 2009.

Balch, W.M. 2009. The Gulf of Maine North Atlantic Time Series, **GNATS**: A retrospective of the productivity of the Gulf of Maine. Gulf of Maine Symposium St. Andrews, New Brunswick, NB, Canada. 4-9 October 2009.

Balch, W.M., Drapeau, D.T., Bowler, B.C. and Alley, Danielle. 2009. Gas-Ex III results. Univ. Connecticut Progress Meeting, SoGasExIII. 6 November 2009

Balch, W.M. 2009. The Gulf of Maine North Atlantic Time Series, **GNATS**: A retrospective of the productivity of the Gulf of Maine. University of Connecticut Departmental Seminar. 6 November 2009.

Balch, W.M. 2009. Radioisotope Techniques for measuring coccolithophore calcification NSF-sponsored course on Ocean Acidification, Marine Biological Laboratory, Woods Hole, MA Nov 7, 2009.

Balch, W.M. 2010. Viewing the ocean's carbonate cycle with MODIS. Plenary Talk. MODIS meeting. Washington, D.C. 25-28 January 2010.

Balch, W.M. 2010. MODIS PIC algorithm (mod 23). MODIS meeting. Washington, D.C. 25-28 January 2010.

Balch, W.M. 2010. **GNATS** (The Gulf of Maine North Atlantic Time Series)—combining synoptic in situ and space-based observations to evaluate long-term change in coastal waters. Ocean Sciences Meeting, Portland Oregon. 22-26 February, 2010.

Poulton, A.J., A. Charalampopoulou, **W.M. Balch**, and S. Painter (2010), Contrasting Coccolithophore Dynamics from the Iceland Basin (North Atlantic) and Patagonian Shelf (South Atlantic), in *From observation to prediction in the 21st century: 2010 Ocean Sciences Meeting*, pp. 68, AGU, ASLO and TOS, Portland, OR.

Lee, P., **W.M. Balch**, T. Cyronak, D. Drapeau, E. Lyczkowski, M. Saggiomo, V. Saggiomo, I. Santarpia, A. Strand, and G.R. DiTullio (2010), Potential impact of increased pCO₂ on particulate DMSP and the production of dissolved DMSP through microzooplankton grazing, in *From observation to prediction in the 21st century: 2010 Ocean Sciences Meeting*, pp. 61, AGU, ASLO and TOS, Portland, OR.

Balch, W.M., Drapeau, D.T., Bowler, B.C., Lyczkowski, E., Alley, D. 2010. The “Great Calcite Belt”: Are there really coccoliths down there? NASA Ocean Color Research Team Meeting, New Orleans, LA 10-13 May 2010.

Balch, W.M. Estimating the standing stock of CaCO₃ from space-based measurements. COCOS Meeting (Coordination Action Carbon Observation System), “Combining water column data with sediment trap and satellite observations for improved marine carbon export estimates”, Bergen Norway. June 2010.

Balch, W., D. Drapeau, B. Bowler, E. Lyczkowski, D. Alley, E. Booth, T. Huntington, C. Roesler, A. Barnard, G. Aiken. 2010. Insights from the Gulf of Maine North Atlantic Time Series (GNATS)- II-An optical window into the changing carbon cycle of the coastal ocean. Ocean Optics XX, Anchorage, AK. September 2010.

Balch, W., D. Drapeau, B. Bowler, E. Lyczkowski, D. Alley and E. Booth, 2010. Insights from the Gulf of Maine North Atlantic Time Series (GNATS) I- An optical window into the changing biogeochemistry of the coastal ocean. Ocean Optics XX, Anchorage, AK. September 2010.

Balch, W. 2011. Coccolithophore studies for 2011 Healy Cruise to Arctic. NASA planning meeting Stanford University 7-8 March 2011.

Balch, W. 2011. The Gulf of Maine North Atlantic Time Series, **GNATS**: Documenting a coastal ecosystem in transition. Invited departmental seminar, Dalhousie University, Oceanography Dept. April 7-9, 2011.

- Balch, W.** 2011. Science Data Analysis for the MODIS Ocean Product for Particulate Inorganic Carbon (PIC). MODIS team meeting. Univ. Maryland. 18-19 May, 2011.
- Balch, W.** 2011. A sharp, step-decrease in the carbon fixation of the Gulf of Maine...but why? NASA ACE OCEAN PRODUCTIVITY AND CARBON CYCLE (OPCC) WORKSHOP - JUNE 6, 7 & 8 - UC SANTA BARBARA
- Balch, W.** 2011. Coastal Processes and Biogeochemical Fluxes at the Land-Ocean Interface. Invited talk presented at the NASA Ocean Carbon Meeting, October 3-7, 2011. Alexandria, Virginia.
- Balch, W.** 2011. Participant in NASA Science Direction Team for the new PACE mission. Crystal City, Virginia. November 2011.
- Balch, W.** 2012. Proposal Review Panel. Washington D.C.
- Balch, W.M.** 2012. High Reflectance Waters of the Southern Ocean- Recent observations from the 'Great Calcite Belt'. Invited plenary talk. NASA Ocean Color Research Team Meeting, 23-27 April, 2012, Seattle, WA.
- Balch, W.M.,** B.C. Bowler, D.T. Drapeau, L.C. Lubelczyk and E. Lyczkowski. 2012 Shipboard validation and refinement of the MODIS particulate inorganic carbon (PIC) algorithm [MOD 23]. Presentation at NASA MODIS workshop, Silver Spring, MD. 7-9 May, 2012.
- Brown, Michael S., **W. M. Balch**, S. Craig, B. Bowler, D. Drapeau, J. Grant. Optical closure within a Patagonian Shelf coccolithophore bloom. ACCESS'12. Atlantic Canada Coastal & Estuarine Science Society. Dalhousie University, Halifax, Nova Scotia. 10-13 May, 2012.
- Balch, W.M.,** B.C. Bowler, D.T. Drapeau, and L.C. Lubelczyk. 2012 Work in support of VIIRS calibration and validation. Presentation at NASA NPP workshop (poster and oceans discipline talk), Greenbelt, MD. 10-11 May, 2012.
- Balch, W.** 2012. The Gulf of Maine North Atlantic Time Series, GNATS: Documenting a coastal ecosystem in transition. Presented at "The Gulf of Maine in a Changing Climate" June 12-13. Invited talk. Bowdoin College, Brunswick, ME.
- Balch, W.** 2012. Coccolithophores: the "Tums" of the sea. CATT presentation, Bigelow Laboratory for Ocean Sciences for *Nestlé PURINA*. 18 June, 2012
- Balch, W.** 2012. Participant in NASA Science Direction Team Meeting for the new PACE mission. Washington, D.C. June 25-27, 2012.

Balch, W. 2012. Poster Presentation, “The first direct measurements of ^{14}C calcification by coccolithophores in the Arctic Ocean”, Joint ICESCAPE/MALINA meeting on Arctic biological oceanography, Ville Franche Sur Mer, France. 19-21 September, 2012

Balch, W.M. 2012. GNATS progress. NASA IDS Meeting, Bigelow Laboratory, 27-28 September, 2012.

Balch, W.M. 2012. Optical observations from the Great Calcite Belt- Likely the largest coccolithophore feature showing elevated reflectance in the global ocean, Ocean Optics XXI, Glasgow, Scotland. 8-12 October, 2012.

Balch, W.M. 2012. In search of the “sea of milk”: Coccolithophores, optics, the marine carbon cycle (and why you should care!). Riley Memorial Lecture. Dalhousie, CA. 14 November 2012.

Balch, W.M. 2012. The Great Calcite Belt- “Read my liths!”. Dalhousie Oceanography Department Seminar. 16 November, 2012

Balch, W.M. 2012. The Gulf of Maine North Atlantic Time Series, **GNATS**: Documenting a coastal ecosystem in transition. Invited talk, Environmental Sciences Dept., U.Mass Boston. 28 November, 2012.

Balch, W.M. and B.C. Bowler. 2013. Generating Environmental Data Records of Ocean Particulate Inorganic Carbon with NPP/NPOESS, NASA VIIRS Meeting, Greenbelt, MD. 23 January, 2013.

Balch, W.M., B.S. Twining, D.T. Drapeau, B.C. Bowler, L.C. Lubelczyk, N.R. Bates, P. J. Lam, H.E.K. Smith, A.J. Poulton. 2013. The Great Calcite Belt: A circum-global coccolithophore feature in the Southern Ocean ASLO Aquatic Sciences Meeting, New Orleans, LA. 18-21 February, 2013.

Bates, N.R., Rebecca Garley, **W. M. Balch**, Benjamin S. Twining, Phoebe J. Lam. 2013. Feedbacks between air-sea CO_2 and coccolithophores: the *Great Belt* of the Southern Ocean. ASLO Aquatic Sciences Meeting, New Orleans, LA. 18-21 February, 2013. (Talk presented by WMB as Bates could not attend).

Rosengard, S.Z., Lam, P., **Balch, W.M.** 2013. Organic carbon export across the Great Calcite Belt ASLO Aquatic Sciences Meeting, New Orleans, LA. 18-21 February, 2013.

Balch, W.M. 2013. The Gulf of Maine: A coastal ecosystem in transition. Invited talk. Colby College meeting on *Changing Oceans and the Future of the Gulf of Maine: Solutions, Successes, and Sustainability*. 8 March, 2013.

- Balch, W.M.** 2013. ICESCAPE'11: Coccolithophores and bio-optics. Polar Gordon Conference, Ventura, CA 11-15 March, 2013.
- Balch, W.M.** and D.T. Drapeau. 2013. R/V Tangaroa Cruise Results- Balch Laboratory. Presentation for Workshop on GEOTRACES cruise from New Zealand. 8 April 2013
- Balch, W.M.** 2013. Particulate Inorganic Carbon Algorithm. Plenary talk for NASA MODIS meeting, 15-17 April, 2013.
- Balch, W.M.** 2013. NASA Ocean Color Research Team Meeting, Frankfurt, Germany. 6-8 May, 2013.
- Balch, W.M.** 2013. Maine EPSCOR meeting. Represented Bigelow Laboratory and their potential participation in the EPSCOR Aquaculture initiative. Point Look Out, Lincolnville, ME
- Balch, W.M.** 2013. Coccolithophores and calcification. NASA-COOPEX Experiment planning meeting, U. California Santa Barbara, CA. 3-5 June 2013.
- Balch, W.M.** 2013. ICESCAPE'11: Coccolithophores and bio-optics during ICESCAPE '11. Stanford University; ICESCAPE Meeting. Sept. 2013
- Balch, W.M.** 2013. Mental meanderings of a biological oceanographer about multi-tasking coccoliths. Workshop on the function of coccoliths. National Oceanography Centre, Southampton, U.K. Sept 2013.
- Balch, W.M.** 2013. The Great Calcite Belt- "Read my liths!". Plenary presentation. Fourteenth Meeting of the International Association of Nanoplankton. Reston, VA. Sept. 2013.
- White, M., Drapeau, D. Lubelczyk, L., Bowler, B., **Balch, W.** 2013. Coccolithophore growth, photosynthesis, calcification, and culture dynamics in response to increased $p\text{CO}_2$. National Science Foundation Meeting on Ocean Acidification. Gallaudet University, Washington, D.C. Sept. 2013.
- Balch, W.**, D. Drapeau, B. Bowler, L. Lubelczyk, M. White. NASA IDS progress--Balch Lab-GNATS. Univ. Massachusetts Boston. Sept 2013.
- Balch, W.** 2014. Oceanographic variability across the Gulf of Maine as measured by GNATS (**G**ulf of Maine **N**orth **A**tlantic **T**ime **S**eries). Northeastern Coastal Acidification Network (NE-CAN) Webinare, Rye, NH. Jan. 2014.
- Smith, H.E.K., **Balch, W.M.**, Sanders, R., Poulton, A. Controls on coccolithophore and diatom distribution in the great calcite belt. 2014. Ocean Sciences Meeting.

Honolulu, HI. Feb 2014

Balch, W.M., Drapeau, D.T., Bowler, B.C., Lubelczyk, L.S., Smith, H.E.K., Twining, B. Bates, N., Lam, P. The Great Calcite Belt and the saga of residual nitrate. 2014. Ocean Sciences Meeting. Honolulu, HI. Feb 2014

Bowler, B.C., Lubelczyk, L.S., Drapeau, D.T., **Balch, W.M.** Coccolithophores and calcification in the Western Arctic during the ICESCAPE expedition of 2011. 2014. Ocean Sciences Meeting. Honolulu, HI. Feb 2014

Abel, V. E., **Balch, W. M.** and White, M. 2014. Light dependency of calcification and impacts of varying pH levels in the coccolithophorid, *Pleurochrysis carterae*. Ocean Sciences Meeting. Honolulu, HI. Feb 2014.

White MM, Drapeau DT, Lubelczyk LC, Bowler BC, **Balch WM.** Calcification of an estuarine coccolithophore increases under increased $p\text{CO}_2$. Ocean Sciences Meeting, Honolulu, HI. Oral presentation. Feb 2014.

Balch. W.M. 2014. Particulate Inorganic Carbon. Plenary talk, MODIS Meeting, Columbia, MD. 29 April to 1 May.

Balch, W.M., K. Arrigo, N. Bates, C. Benitez-Nelson, F. Chavez, L. Cooper, K. Frey, S. Freeman, R. Frouin, S. Hooker, S. Laney, P. Matrai, A. Matsuoka, B.G. Mitchell, E. Ortega-Retuerta, D. Perovitch, B. Pickart, R. Reynolds, H. Sosik, M. Steel, D. Stramski, J. Swift, J. Werdell, S. Yvon, J. Zhang. 2014. Plenary presentation. NASA Ocean Color Research Team Meeting, Silver Spring, MD. 5-7 May, 2014

Balch, W.M. The Gulf of Maine North Atlantic Time Series, **GNATS**: Documenting a coastal ecosystem in transition. NEAMGLL Meeting, Bigelow Laboratory for Ocean Sciences. 26 June, 2014.

Balch, W.M., Huntington, T., Aiken, G., Drapeau, D., Bowler, B., Lubelczyk, L., White, M. and Butler, K. Coastal bio-optical change in the Gulf of Maine during the Anthropocene. International Ocean Optics Meeting. Portland, Maine October 2014.

Aiken, G., Xiaoyan Cao, Jingdong Mao, Klaus Schmidt-Rohr, Robert Spencer, Simon Belanger, **William Balch**, and Thomas Huntington. The Influences of Riverine Dissolved Organic Matter in the Gulf of Maine. Fall AGU meeting, San Francisco, CA 2014.

White MM, Lubelczyk L, Waller JD, Drapeau DT, Bowler BC, Vermont A, Fields DM, **Balch WM.** Dissolution of *Pleurochrysis carterae* coccoliths in *Acartia tonsa* guts: Testing the Tums hypothesis. Aquatic Sciences Meeting, Granada, Spain.

Oral presentation. Feb. 2015.

Balch, W.M., Bates, N.R., Lam, P.J. and Twining, B.S., Small coccolithophores with a big impact: The Great Calcite Belt. Aquatic Sciences Meeting, Granada, Spain. Oral presentation. Feb. 2015.

Balch, W.M. Tom Huntington, George Aiken, David Drapeau, Bruce Bowler, Laura Lubelczyk and Kenna Butler, 2015 Yellowing coastal seas in the Anthropocene. Princeton University. April 2015. Invited talk.

Balch, W.M. Tom Huntington, George Aiken, David Drapeau, Bruce Bowler, Laura Lubelczyk and Kenna Butler, 2015 Yellowing coastal seas in the Anthropocene. NASA CC&E meeting April 2015. Keynote talk.

Balch, W.M. 2015. Plates, fishing reels, chalk and the global cycle of particulate inorganic carbon: Read Howard's liths. Invited talk. University of Miami Symposium on the career of Howard Gordon. April, 2015.

White, M., Fields, D., Drapeau, D., Lubelczyk, L, **Balch, W.** Ocean acidification and its impacts on a simple predator prey system. NSF-sponsored OA meeting, Woods Hole, MA. June, 2015

Balch, W.M. Optical properties of the Great Calcite Belt. NASA Ocean Color Research Team meeting. San Francisco, CA June 2015.

Balch, W.M., D. T. Drapeau, B. C. Bowler, E. Lyczkowski and L. Lubelczyk. Contributions of the AMT program to knowledge about coccolithophore distributions at the basin scale, their optical properties and decadal trends. Celebrating 20 years of Atlantic Meridional Transect (AMT research), 23-25 June, 2015. Plymouth Marine Laboratory.

Mitchell, C., Bowler, B., Drapeau, D., Lubelczyk, L., Hopkins, J. & **Balch, W. M.** (2015) Validation of the VIIRS particulate inorganic carbon algorithm. International Ocean Colour Science Meeting, San Francisco.

Balch, W.M. 2015. The biogeochemistry of coccolithophore blooms. Invited talk for special session on *Blooms*. OCB Summer Meeting WHOI, July 2015.

Balch, W.M. 2015 "Gulf of Maine North Atlantic Time-Series (GNATS): Documenting change in a coastal marine ecosystem". Invited talk for *Time Series* Special Session. OCB Summer Meeting WHOI, July 2015.

Maine, Julia, White, Meredith M., **Balch, William** and Milke, Lisa. 2016. Effect of Ocean Acidification on the Food Quality of the Coccolithophore *E. huxleyi*. Poster. 2016 Ocean Sciences Meeting, New Orleans, LA Feb. 21-26, 2016.

W.M. Balch, D. T. Drapeau, B. C. Bowler, E. Lyczkowski and L. Lubelczyk, 2016. Scaling from Surface Satellite Measurements of PIC to Integrated Euphotic Estimates over the Global Ocean: Do Vertical Profiles of Coccolithophores Look Like Vertical Profiles of Chlorophyll? Talk. 2016 Ocean Sciences Meeting, New Orleans, LA Feb. 21-26, 2016.

Hopkins, J, **W. Balch**, S. Henson, A. Poulton, D. Drapeau, B. Bowler, L. Lubelczyk. 2016. Inter-annual variability in global suspended particulate inorganic carbon inventory using space-based measurements, Poster. 2016 Ocean Sciences Meeting, New Orleans, LA Feb. 21-26, 2016.

White, M., Waller, J., Lubelczyk, L., Drapeau, D., Bowler, B., Wyeth, A., Fields, D., and **Balch, W.** 2016. Calcium Carbonate Dissolution Above the Lysocline: Implications of Copepod Grazing on Coccolithophores. Talk. 2016 Ocean Sciences Meeting, New Orleans, LA Feb. 21-26, 2016.

Zimmerman, R., V. Hill, C. Sukenik, B. Collister, A. Flouros, **W. Balch**. 2016. Exploiting In Situ Lidar To Retrieve Particle Distributions and Characteristics Of The Upper Ocean. Talk. 2016 Ocean Sciences Meeting, New Orleans, LA Feb. 21-26, 2016.

Balch, W.M., Bowler, B.C., Drapeau, D.T. 2016. Combining high-tech glider optical, hydrographic and chemical measurements with canonical observations of Redfield (1934) to derive water column productivity. Ocean Optics XXIII. Victoria, B.C., Canada. Oct. 23-28, 2016.

Boss, E., **W.M. Balch**, B. Bowler, G. Dall'Olmo, S. Freeman, W. Neary, N. Nelson, M. Novak, C. Proctor, W. Slade, T. Westberry. 2016. Collecting and processing in-line optical data. Ocean Optics XXIII. Victoria, B.C., Canada. Oct. 23-28, 2016.

Balch, W.M., Drapeau, D.T., Bowler, B.C., Lubelczyk, L., Mitchell, C.M. and Lyczkowski, E.R. 2017. Biogeography, biogeochemistry, transport and fate of particulate carbon associated with the Great Calcite Belt. Aquatic Sciences Meeting. ASLO 2017. Honolulu, HI. 26 February-3 March, 2017.

Onos, A. A. and **W.M. Balch**. 2017. Mixotrophy in the coccolithophores, Pleurochrysis and Emiliana. Aquatic Sciences Meeting. ASLO 2017. Honolulu, HI. 26 February-3 March, 2017.

Balch, W.M., B.C. Bowler, D.T. Drapeau. 2017. Combining glider optical, hydrographic and chemical measurements to derive water column net primary production and net community production. International Ocean Optics Meeting, 15-18 May, 2017, Lisbon, Portugal.

Collister, B; Zimmerman, R., Sukenik, C. I, Hill, V. J., **Balch, W. M.** 2017. Remote Sensing of Optical Characteristics and Particle Distributions of the Upper Ocean Using Shipboard Lidar. June, Ocean Carbon and Biogeochemistry Meeting, Woods Hole, MA Poster presentation.

Balch, W.M. Changing climate, carbon cycles and tea steeping in the Gulf of Maine. 2017. Schulich Ocean Studies Initiative in Eilat, Inter-university Institute for Marine Sciences. Joint Israel-Canada meeting, Keynote talk. October 2017 Eilat Israel.

Balch, W.M. and N. Bates. 2017. Friends of Casco Bay MOCA meeting 18 December, 2017, Bigelow Laboratory. GNATS Gulf of Maine Surface Phytoplankton, blooms and potential links to OA

Balch, W.M., D. Drapeau, A. Wyeth and J. Godrijan. 2018. Uptake of DOC by mixotrophic coccolithophores. Ocean Sciences Meeting, Portland, Oregon. February, 2018.

Bird, Clara, **W.M. Balch**, C. Mitchell. 2018. Seasonal Gulf of Maine CDOM variability as determined by satellites and ships. Ocean Sciences Meeting, Portland, Oregon. February, 2018.

Balch, W.M. The Great Calcite Belt. NASA Hyperwall presentation. Ocean Sciences Meeting, Portland, Oregon. February, 2018.

Mitchell, C, H.R. Gordon, B. Bowler, D. Drapeau and **W.M. Balch**. 2018. The use of gliders to investigate phytoplankton populations throughout the water column at high spatial scales: a case-study in the Gulf of Maine. Ocean Sciences Meeting, Portland, Oregon. February, 2018.

Balch, W.M. 2018 BESO(ME): Biogeochemistry and Ecology of the Southern Ocean (and Mode water Export). OCB Summer Meeting, Woods Hole Oceanographic Inst. 6/27/18. Woods Hole, MA. HYPERLINK "<https://www.youtube.com/watch?v=4HmdbmAfMUU>"

Balch, W. M., David T. Drapeau, Bruce C. Bowler and Catherine Mitchell. 2018. Persistent UV reflectance signals in the Gulf of Maine observed using above-water, hyperspectral radiometry: New observations from the Gulf of Maine North Atlantic Time Series (GNATS) “MAAs Smoking Gun?” International Ocean Optics Meeting XXIV. Dubrovnik, Croatia. October 2018.

Balch, W.M. 2018. Particulate Inorganic Carbon from MODIS and VIIRS. MODIS/VIIRS Science Team Meeting. Silver Spring, MD. October 2018.

Steinmetz, H., Mitchell, C.; **Balch, W.** Using multispectral versus hyperspectral radiometry to predict Forel-Ule ocean color. ASLO 2019 Aquatic Sciences Meeting Planet Water: Challenges and Successes, 23 February-2 March 2019, San Juan, Puerto Rico.

Balch, W.M., Catherine Mitchell, David Drapeau, Bruce Bowler, Jelena Godrijan, Collin Fischer. 2019. "Meeting an old friend after 3 decades: The 2018 New England mesoscale coccolithophore bloom, but viewed with new glasses!" International Ocean Color Symposium, Busan, South Korea. April, 2019.

Balch, W.M., Dave Drapeau, Bruce Bowler, Rebecca Garley & Nicholas R. Bates. Temperature and ocean acidification changes along the 21-year GNATS transect across the Gulf of Maine. Gulf of Maine 2050 International Symposium. Portland ME. 4-7 November, 2019.

Balch, W.M., Catherine Mitchell, David Drapeau, Bruce Bowler, Colin Fischer. 2019. What's new with the PIC algorithm? NASA MODIS/VIIRS Team Meeting. University of Maryland, College Park, MD. 18-21 November, 2019.

Martinez, G. and **Balch, W.M.** 2020. Gulf of Maine Temperature-Salinity Curves From the Early 1900s (Henry Bigelow) Compared to the Present (GNATS). Ocean Sciences Meeting. San Diego, CA. February 16-21, 2020.

Brian Collister, Richard Carl Zimmerman, Victoria J Hill, Charles I Sukenik and **William M Balch**. 2020. What can polarized oceanographic lidar reveal about ocean particle assemblages? Insights from a mesoscale coccolithophore bloom. Ocean Sciences Meeting. San Diego, CA. February 16-21, 2020

SCIENTIFIC MEETINGS HOSTED (since 2012)

NASA IDS meeting, Bigelow Laboratory for Ocean Sciences, Sept 2012
NASA IDS meeting, Bigelow Laboratory for Ocean Sciences, October 2014
NASA PACE Underway Optical Measurement Protocols Workshop. Bigelow Laboratory for Ocean Sciences, March, 2015

OUTREACH (since August 2008)

W. Balch 2008. The long view. Boston Globe article. Interviewed by Beth Daley. August 18, 2008.
http://www.boston.com/news/science/articles/2008/08/18/the_long_view/

W. Balch. 2009. Acidification takes growing toll on ocean life. Portland Press Herald article. Interviewed by John Richardson. 24 November 2009

W. Balch 2010. Ocean Acidification- a looming problem in the sea. Bristol

Area Lions talk. 1 February 2010.

W. Balch.2010 Ocean Acidification Overview. Café Scientifique. Boothbay Opera House, Boothbay Harbor, ME. 6 July 2010.

W. Balch. 2010 The Global Challenge of Ocean Acidification: A Brief Introduction. Friends Meeting House, Damariscotta, ME, 27 October 2010.

W. Balch, 2010. Radio segment for “Our Ocean World” on ocean acidification.

W. Balch 2011. “Scientists set sail to study vital plankton” Interviewed at sea by Beth Quimby while at sea aboard R/V Melville. Portland Press Herald 18 January 2011. 50,000 circulation/day

W. Balch 2011. “Maine oceanographer studies climate change” Interviewed on Maine Public Radio by Tom Porter. Interviewed while at sea on R/V Melville. <http://www.mpbnnet.com/Home/tabid/36/ctl/ViewItem/mid/3478/ItemId/15049/Default.aspx> 27000 listeners/day

W. Balch 2011 9 August. Bigelow Café Scientifique talk on our Arctic studies on coccolithophores and climate change. Boothbay Opera House. ~100 participants

W. Balch 2011 11 August. Lecture on our Arctic studies on coccolithophores and climate change. Claremont Hotel, Southwest Harbor, ME 40 Participants

W. Balch, January 2012. Assembled materials for VIIRS poster on the PIC product and coccolithophores produced by NASA

W. Balch, May 2012. Interviewed by L. Betz (NASA Goddard Science Writer for special piece on VIIRS PIC product.

W. Balch, May 2012. Interviewed by T. Porter (Maine Public Radio) for our recent GNATS paper. <http://www.mpbnnet.com/News/MPBNNews/tabid/1159/ctl/ViewItem/mid/3762/ItemId/21990/Default.aspx> . Listenership 27,000/day

W. Balch, May 2012. Interviewed by Chris Cousins (Bangor Daily News) for our recent GNATS paper. <http://bangordailynews.com/2012/06/10/environment/study-finds-potentially-disastrous-threat-to-single-celled-plants-that-support-all-life-on-earth/>

W. Balch, May 2012. Interviewed by David Able (Boston Globe) for our recent GNATS paper. http://articles.boston.com/2012-06-11/news/32177503_1_marine-food-food-chain

-phytoplankton Circulation 245,500

W. Balch, May 2012. Interviewed by Christine Parrish (Free Press) for our recent GNATS paper;
<http://freepressonline.com/main.asp?SectionID=52&SubSectionID=78&ArticleID=19678> Unknown circulation

W. Balch, 2013 (March) Interviewed by Savannah Judge for recent article for Colby magazine, “New research laboratory in East Boothbay”. Unknown circulation.

W. Balch, 21 March, 2013. *The Global Challenge of Ocean Acidification*. Seminar at Camden Public Library. 40 participants.

W. Balch, 28 May, 2013. Interviewed by Matt Burn, Portland Press Herald on warming in the Gulf of Maine, as measured by GNATS. Article titled, “In Maine, green crabs threaten clamming”.
http://www.pressherald.com/news/green-crabs-threaten-clamming-_2013-05-28.html?pagenum=full Circulation = 50,000

W. Balch, 8 September, 2013. Interviewed by North Cairn, Portland Press Herald on Sentinal Species for article titled, “What are these animals telling us?”
http://www.pressherald.com/news/what-are-these-animals-telling-us_2013-09-08.html?pagenum=full Circulation = 50,000

W. Balch. 14 January, 2014. Webinare for New England-Coastal Acidification Network (NE-CAN). This also involved writing a 6p. summary and participating in the NECAN meeting on 10 April, 2014. 35 participants.

W. Balch, 11 March, 2014. I gave a class (also open to the public) on ocean acidification at the Watershed School, Camden, ME. “Ocean Acidification, the other CO2 problem”. 50 participants.

W. Balch. 1 July, 2014. “What I did on my summer vacation” : A 14-year-old’s perspective of global ocean research at Bigelow Laboratory, 40 years later. Opera House at Boothbay Harbor, Boothbay Harbor, ME. 100 participants.

W. Balch. 2014. Job candidacy & interviewing — research focused positions. Bigelow Laboratory Post-doc seminar. October 2014.

W. Balch. 2015. Interviewed by David Abel, Boston Globe., Article published, “Cruise ship offers spa, casino, and perch for scientific method—Researchers ply gulf on Nova Star” as cover story on 26 Oct. 2015.

HYPERLINK

"<https://www.bostonglobe.com/metro/2015/10/25/cruising-gulf-maine-better-und-erstand-changing-climate/eAWXw5jNE05rVkSH7nM3OP/story.html>"

<https://www.bostonglobe.com/metro/2015/10/25/cruising-gulf-maine-better-understand-changing-climate/eAWXw5jNE05rVkSH7nM3OP/story.html> Circulation=246,000

W. Balch. 2015. How to write a proposal budget. Bigelow Laboratory Post-doc seminar.

W. Balch. 2015. Interviewed by Joe Gelarden, Boothbay Register for article that appeared on Dec. 30, 2015. "Uncle Joe's New Year's resolutions". Circulation=~7,000

W. Balch. 2016. Interviewed by Fred Bever, Maine public radio about new paper published in Global Biogeochemical Cycles. HYPERLINK
"http://news.mpbm.net/post/study-shows-gulf-maine-yellowing-after-scientists-find-data-hiding-plain-sight" \t "_blank"
<http://news.mpbm.net/post/study-shows-gulf-maine-yellowing-after-scientists-find-data-hiding-plain-sight> Listenership: all of Maine, parts of New Hampshire, Massachusetts and New Brunswick, Canada.

W. Balch. November 2016. Interview by Colin Woddard, Portland Press Herald for story "Idea to cut NASA's role in climate science could be major loss for Maine, scientists say". HYPERLINK
"http://www.pressherald.com/2016/11/28/idea-to-cut-nasas-role-in-climate-science-threatens-major-loss-for-maine-scientists-say/"
<HTTP://WWW.PRESSHERALD.COM/2016/11/28/IDEA-TO-CUT-NASAS-ROLE-IN-CLIMATE-SCIENCE-THREATENS-MAJOR-LOSS-FOR-MAINE-SCIENTISTS-SAY/> Circulation = 246,000

W. Balch. November 2016. Interview with Tory Ryden, WCSH TV News (Maine's leader in TV viewership as ranked by the Nielsen Ratings), Portland, ME regarding proposal to eliminate Earth science from NASA's mandate. Viewer impact: HYPERLINK
"http://www.wcsh6.com/news/local/maine-fallout-over-trump-adviser-comment-on-nasa-research/358574344"
<http://www.wcsh6.com/news/local/maine-fallout-over-trump-adviser-comment-on-nasa-research/358574344>

W. Balch. Wavelengths of change in the Gulf of Maine, 2017. Portsmouth Music Hall Annex, January, 2017. Portsmouth, NH. Attendees = 100

W. Balch. Wavelengths of change in the Gulf of Maine, 2017. Western Maine Audubon, April, 2017. Farmington, ME. Attendees = 75

W. Balch. "Sacred Cod". This is a documentary produced by David Liss and

David Abel about the fishing industry of the Gulf of Maine. We invited them to accompany us on a GNATS trip in 2016 aboard the *R/V Connecticut* and this film has an entire segment devoted to our work on the GNATS. The publication rights were sold to the Discovery Channel and the piece was shown nationwide on 13 April 2017 (and across Britain and Europe a week later). HYPERLINK
"<http://www.discovery.com/tv-shows/discovery-impact/about-sacred-cod/>"
<http://www.discovery.com/tv-shows/discovery-impact/about-sacred-cod/>
Unknown viewership.

W. Balch. "Wavelengths of Change: The Impacts of a Yellowing Gulf of Maine," Café Scientifique July 11, 2017. Bigelow Laboratory for Ocean Sciences (200 attendees).

W.M. Balch. Presentation of GNATS work to Broadreach Foundation principals regarding science opportunities at Bigelow, 16 January 2018.

W.M. Balch. Interviewed by David Abel, Boston Globe for article "After year of record deaths, right whales produce no new calves, which could be 'catastrophic'". Published 26 February, 2018. Circulation= 246,000
<https://www.bostonglobe.com/metro/2018/02/25/after-year-record-deaths-right-whales-produce-new-calves-which-could-catastrophic/wzPwtQSk9iRDIIvmaFp5nJ/story.html>

W. Balch. 2018. GNATS: Gulf of Maine North Atlantic Time Series-20 years of change in the Gulf of Maine. Lecture for Fishermens' Climate Forum, Island Institute, Rockland, ME 28 February, 28, 2018.

W. Balch. 2018. Interviewed for radio show, "Positively Maine", Produced by Torey Ryden (aired 20 May, 2018) on News Radio WGAN. Broadcast range Southern to Mid-Coast Maine. 5000 Watts. HYPERLINK
"<http://wgan.com/podcasts/5-20-18-positively-maine-barney-balch-bigelow-lab/>"
<http://wgan.com/podcasts/5-20-18-positively-maine-barney-balch-bigelow-lab/>

W. Balch. 2018. Interviewed by Fred Bever, (Maine Public) on how Mainers are lowering their carbon footprints. December 2, 2018. HYPERLINK
"<https://www.mainepublic.org/post/amid-dire-climate-change-news-mainers-are-looking-lower-their-carbon-footprints>"
<https://www.mainepublic.org/post/amid-dire-climate-change-news-mainers-are-looking-lower-their-carbon-footprints> This was also published by the Bangor Daily News. HYPERLINK
"<https://bangordailynews.com/2018/12/03/news/state/mainers-look-to-lower-their-carbon-footprint-amid-dire-climate-change-news/>"
<https://bangordailynews.com/2018/12/03/news/state/mainers-look-to-lower-their-carbon-footprint-amid-dire-climate-change-news/>

W. Balch Feb 2019. Talk: "GNATS: Gulf of Maine North Atlantic Time Series-

20 years of change in the Gulf of Maine.” Watershed School, Camden. Spoke to 50 students and local members of the community.

W. Balch, 2019. Interviewed by Fred Bever, Maine Public for his series “Power Struggle”. HYPERLINK

"<https://www.mainepublic.org/post/scientists-no-evidence-canadian-hydropower-cmp-project-would-disrupt-gulf-maine-food-chain>"

<https://www.mainepublic.org/post/scientists-no-evidence-canadian-hydropower-cmp-project-would-disrupt-gulf-maine-food-chain>. Article appeared on 27 March, 2019.

W. Balch, 2019. June 25, interviewed by Laura Poppick for Knowable Magazine (a magazine that explores the real-world significance of scholarly work through a journalistic lens. A digital magazine from Annual Reviews.) on a story about coccolithophores. HYPERLINK

"<https://www.knowablemagazine.org/article/living-world/2019/tiny-living-stones-sea>" \t "_blank"

<https://www.knowablemagazine.org/article/living-world/2019/tiny-living-stones-sea>

Train, M. and **W. Balch**. January-March 2019. Took Marcia Train (school teacher, Long Island, ME) to the Southern ocean to blog back to school students during our SubAntarctic Mode Water Cruise. She wrote about the science and interacted with hundreds of students during this 38d cruise aboard the R/V Thomas G. Thompson.

PROFESSIONAL

Funded Research (\$29 million total of funded research from 1987-2018 for 57 projects (\$39.8 million in 2018 dollars with average inflation rate at 2.58%):

- 1) NASA - "Evaluation of satellite primary production algorithms"
January 1, 1987 - December 31, 1990
NAGW-1291
\$301,727
- 2) NASA - "Marine phytoplankton productivity as a source of dimethylsulfide in surface ocean waters and the atmosphere" to P. Matrai, E. Saltzman and W. Balch
3 years \$324,459
- 3) NSF - "Photosynthesis and Calcification by Blooms of the Coccolithophore, *Emiliana huxleyi* in the Gulf of Maine"
2 years April 89 - April 90 OCE - 8900189 \$203,258
- 4) ONR - "An investigation of coccolithophore optical properties under bloom conditions" Sub-contract to proposal through Bigelow Laboratory for

- Ocean Sciences
 July 1, 1988 - December 31, 1988
 \$13,924
- 5) ONR - "An investigation of coccolithophore optical properties under bloom conditions: a continuation"
 July 1, 1989 - June 30, 1990
 \$16,768
- 6) ONR - "Bio-optical properties of coccolithophores"
 October 1, 1990 - September 30, 1991 \$29,978
- 7) ONR - "Bio-optical properties of coccolithophores - Part II"
 April 1, 1991 - September 30, 1992
 \$99,944
- 8) NASA - "Evaluation of physiologically-based algorithms for the remote sensing of ocean primary productivity"
 January 1, 1991. 3 yrs. \$379,740
- 9) NSF - "Calcification and photosynthesis measurements for the JGOFS Equatorial Pacific Study"
 November 1, 1991 - November 1993
 \$196,142
- 10) NOAA - "Climate and global change—productivity algorithm development"
 March 1, 1991. 1 year \$20,000
- 11) NASA - Ocean observations with EOS/MODIS: Algorithm Development and Post Launch Studies.
 December 15, 1993. - December 15, 2001
 \$2,019,533
- 12) ONR - "Assessing the importance of calcite to optical backscatter in the Ocean"
 October 1, 1992 - September 30, 1994 \$200,000
- 13) NASA - "Towards improved estimates of primary production and carbon turnover during the SeaWiFS mission"
 May 1, 1992 - April 30, 1996
 \$433,642
- 14) NSF- "Calcite production rates in the Arabian Sea"

- May 1, 1994- April 30, 1997
\$300,000
- 15) ONR- "Measuring the calcite-specific backscattering coefficient in the sea"
October 1, 1994- September 30, 1996
\$179,992
- 16) ONR- "Optical properties of marine viruses" with J. Vaughn (UNE)
July 1, 1996-June 31, 1999
\$496,978
- 17) RMRP-"Organic and inorganic carbon production in the Gulf of Maine.
October 1, 1995- September 30, 1997
\$200,001
- 18) NOAA- "Development and validation of regional time-varying coastal marine algorithms- "Gulf of Maine- A Case Study", with C.S. Yentsch, D. Phinney and M. Keller. July 15, 1996-July 14, 1999 \$447,000
- 19) ONR- "Impact of Turbulence and growth rate on the scattering signatures of marine phytoplankton"
1 October 1996- Sept 30, 1998
\$230,000
- 20) NASA- "Validation of Surface Bio-Optical Properties in the Gulf of Maine as a Means for Improving Satellite Primary Production Estimates", Sept. 1 1997-Aug. 31, 2000. \$588,690
Supplement Nov. 2000 \$
40,000
- 21) NOAA- "Ferry-based validation of satellite ocean color sensors in the Gulf of Maine" 9/9/00-9/30/01
\$10,000
- 22) NASA- "Development of a particle backscattering algorithm: Theoretical basis concurrent ship measurements, and global biogeochemical implications. with Dr. Janet Campbell (UNH) and Dr. John O'Reilly (NOAA, Narragansett, RI)
July 1 1997- June 31, 2000. BLOS Portion
\$51,048
One year supplement
\$17,984
- 23) ONR-DEPSCOR- "Impact of viral infections on absorption and scattering

- properties of marine bacteria and phytoplankton". With J. Vaughn (UNE). 1 May 99 to 30 April 02.
\$460,000
- 24) ONR- "Factors affecting the backscattering probability in the sea" 9/21/98 to 9/20/99. \$150,000
- 25) ONR- "Chalk-Ex: Transport of optically active particles from the surface mixed layer" With A. Plueddemann (WHOI) and C. Pilskaln (BLOS) 10/1/00 to 9/30/03. Balch component \$360,013; total project \$1,034,033
- 26) ONR- DURIP "Upgrading instrumentation to measure light scattering in the sea", with J. Vaughn (UNE). 4/1/01-3/31/02 \$119,040
- 27) NASA- The Gulf of Maine"- A test site for satellite studies of the "black" and "white" carbon cycle. 2/1/01 to 1/31/04 \$499,982
- 28) NASA- Viral control of meso-scale coccolithophore blooms in the Gulf of Maine (with J. Vaughn & J. Novotny, Univ. of New England; P. Matrai, Bigelow Laboratory). 01/01/02-12/31/04 \$520,220
- 29) NSF- "Production and dissolution of calcium carbonate in the global ocean: A synthesis and modeling project. (With W. Berelson, K. Lee, R. Najjar, R. Feely, and C. Sabine). 03/01/02-02/28/05 \$196,646
- 30) NSF- "Phytoplankton dynamics and carbon cycling in the equatorial Pacific Ocean: Control by Si and Fe. 12/1/03-11/30/07
Balch component \$337,000; Total Project \$2,000,000
- 31) NASA- "Using remote sensing to understand the consequences of climate, sea level changes and increased human activities in the coastal Gulf of Maine-- An interdisciplinary study of land-sea carbon coupling " 3/1/04-2/29/07
Balch Component \$507,575; Total Project-
\$1,475,000
- 32) NSF- "Collaboration Research: ITR: Interactive Software Systems for Expert-Assisted Image Analysis and Classification of Aquatic Particles" 11/1/03-10/31/08 Balch Component \$281,227; Total Project-
\$1,936,000
- 33) NASA- "The MODIS Ocean Product for Particulate Inorganic Carbon (MOD 25): Refinement of calcium carbonate estimates in the global ocean" 3/1/04-2/28/07.
\$586,269

- 34) ONR- “A Supplement to Chalk-Ex: Transport of Optically Active Particles from the Surface Mixed Layer” 10/1/03- 9/30/04 ; with C. Pilskaln; \$58,268
- 35) ONR- “Nanoparticles and Ocean Optics” 1/1/05-12/31/07 with J. Vaughn (UNE) and J. Goes (Bigelow Laboratory for Ocean Sciences) \$544,841
- 36) NASA- “GNATS”, the Gulf of Maine North Atlantic Time Series: Integrating terrestrial and ocean carbon cycles in a coastal shelf sea through coordinated ship and satellite observations. \$800,386
- NASA- Differentiating sources of backscattering in the Southern Ocean: Bubbles, whitecaps, and Coccolithophores (w/ Dr. H. Dierrson and A. Twardowski, Co-I's) 9/1/07-8/31/10 \$437,026
- 38) NASA- Using remote sensing to understand carbon flow and its transformations from upland ecosystems into the coastal ocean. 11/28/07-11/27/09 \$524,795
- 39) Maine Bond Fund- A proposal to add two Slocum Gliders to the Gulf of Maine/North Atlantic Time Series (GNATS) 12/1/2006-10/2010 \$282,400
- 40) NASA- A proposal for refinement of the MODIS calcite algorithm and Cal/Val Activities towards assembly of earth system data records 3/1/08 to 2/28/11 \$678,980
- 41) NSF- Patagonian Shelf coccolithophores: ecological factors regulating the southern hemisphere's largest recurring coccolithophore bloom 9/07-8/10 \$499,733.
- 42) ONR- “Expansion to Nanoparticles and Ocean Optics” 4/08-9/30/08 \$49,995
- 43) NSF- “The Great Southern Coccolithophore Belt” 6/1/10-5-31/14 \$2.56million
(\$1.49 million to Bigelow Laboratory (Balch and Twining)).
- NASA- “Coccolithophores of the Beaufort and Chukchi Seas: Harbingers of a Polar Biogeochemical Province in Transition?” \$685,001
- NASA- “Science data analysis of the MODIS ocean product for particulate inorganic carbon” \$649,999 2/20/2011 to 2/19/2014
- NASA- “Generating Environmental Data Records of Ocean Particulate Inorganic Carbon with NPP/NPOESS” 5/1/2011 to 4/30/2014, \$609,464
- NOAA- “Implications of ocean acidification on carbon export in a simplified planktonic food chain: Experiments using *Acartia* and *Pleurochrysis*.” 9-1-11 to 8-31-14, \$262,403

NASA- “Land-to-sea carbon export from the northeast watersheds of North America to the northwest Atlantic Ocean” Sept 1, 2011 to Aug 31, 2014, \$845,945

NSF- FSML “Enhanced Cooperative Radiochemistry Research and Education at the Bigelow Laboratory for Ocean Sciences” \$110,078 7/15/13 to 7/14/16; \$111649

- 50) NSF- “Ocean acidification – Effects of ocean acidification on *Emiliana huxleyi* and *Calanus finmarchicus*; insights into the oceanic alkalinity and biological carbon pumps”; 8/15/12 to 8/14/2015; \$999,956.
- 51) NASA- “Science Data Analysis: Integrating the MODIS PIC product into the climate data record”; 6/30/14-6/29/17; \$763,210.
- 52) NASA- “Maintenance and refinement of the MODIS algorithm for particulate inorganic carbon”; 8/22/14-8/21/18; \$558,994.
- 53) NASA- “Combining satellite, AUV and ship-based measurements from the multi-decadal time series “GNATS” to model the carbon cycle in the Gulf of Maine”; 9/1/14-8/31/17; \$1,299,051.
- 54) NSF- “Coccolithophore Mixotrophy”; 8/1/2016-7/31/19. \$669,754
- 55) NASA- “GNATS: An experimental observatory documenting the Gulf of Maine carbon cycle” 8/15/2017-8/14/2020. \$1,328,402
- 56) NASA-EPSCOR “Towards early detection and forecasting of harmful algal blooms in the Gulf of Maine” 8/1/2016-7/31/2019. \$120,995
- 57) NSF- “Collaborative Research: Biogeochemical and Physical Conditioning of Sub-Antarctic Mode Water in the Southern Ocean” 8/1/17 – 7/31/21 (Balch (lead) \$1,198,953; total proposal for 5 investigators= \$3,330,974
- 58) NASA- “Maintenance of the MODIS Algorithm for Particulate Inorganic Carbon: NASA Biennial Review” 10/12/2018-10/11/2021; \$299,982
- 59) NASA- “Remote sensing methods to characterize, quantify and monitor carbon in a continental shelf sea” with Catherine Mitchell; 09/01/2019 – 08/31/2022; \$431,016

SEA-GOING AND FIELD EXPERIENCE (total 853 sea days at sea plus 240 days running field stations):

Gulf of Maine 1978/79 (30h flight time in Cessna sea plane for aerial infra-red radiometry)

Gulf of Maine, Monhegan Island 1978 (Ran field sampling station) 4 months

Gulf of Maine, Southport Island 1979 (Ran field sampling station) 4 months

Gulf of Maine 1978 (R/V Tioga) 10 d
Sargasso Sea 1979 (R/V Eastward) 14 d
Mid Atlantic Bight 1979 (R/V Westward) 6 weeks
Sargasso Sea/Georges Bank 1979 (R/V Oceanus) 13 d
Southern California Bight 1980 (R/V New Horizon) 14 d
Celtic Sea/English Channel 1980 (R/V Sarsia) 14d
Gulf of Maine 1982 (R/V Gyre) 18 d
Southern California Bight 1983 (R/V New Horizon) 4 d
Sargasso Sea 1983 (R/V Cape Hatteras) 7 d
Southern California Bight 1984 (R/V New Horizon) 10 d
Southern California Bight 1985 (R/V Sproul) 8 d
Southern California Bight 1986 (R/V Sproul) 10 d
Southern California Bight 1987 (R/V Sproul; chief scientist) 9 d
Gulf of Maine 1988 (R/V Argo Maine) 7 d
Gulf of Maine 1989 (R/V Argo Maine) 14 d
Sargasso Sea/Mid Atlantic Bight (R/V Atlantis II) 14 d
Gulf of Maine 1990 (R/V Cape Hatteras) 14 d
North Atlantic 1991 (R/V Charles Darwin) 21 d
Gulf of Maine 1991 (R/V Cape Hatteras) 12 d
Equatorial Pacific 1992 (R/V Thompson) 45 d
Florida Current 1993 (R/V Corwith Cramer) 6d
Florida Current 1995 (R/V Westward) 6d
Arabian Sea July, 1995 (R/V Thompson) 30d
Arabian Sea October, 1995 (R/V Thompson; chief scientist) 30d
Gulf of Maine 1996 (R/V Pelican) 8d
Gulf of Maine 1997 (R/V Albatross) 11d
Gulf of Maine 1997 (R/V Delaware) 12d
Gulf of Maine 1998 (R/V Albatross) 11d
Gulf of Maine 1998 (M/S Scotia Prince) 10d
Gulf of Maine 1999 (M/S Scotia Prince) 20d
Gulf of Maine 2000 (M/S Scotia Prince) 12d
Gulf of Maine 2001 (M/S Scotia Prince) 12d
NW Atlantic 2001 (R/V Endeavor; chief scientist) 11d
Gulf of Maine 2002 (M/S Scotia Prince) 12d
NW Atlantic 2003 (R/V Endeavor; chief scientist) 11d
Equatorial Pacific 2004 (R/V Revelle) 30d
Atlantic 2004 (R/V Discovery; AMT transect U.K. to S. Africa) 44d
Gulf of Maine 2004 (M/S Scotia Prince) 12d
Gulf of Maine 2005 (misc ships of opportunity) 12d
NW Atlantic 2006 (R/V Cape Hatteras) 10d
Gulf of Maine 2006 (misc. ships of opportunity) 8d
Gulf of Maine 2007 (misc. ships of opportunity) 19d
Gulf of Maine 2008 (misc. ships of opportunity) 12d
Patagonian Shelf 2008 (R/V Roger Revelle, chief scientist) 30d
Gulf of Maine 2009 (misc. ships of opportunity) 12d

Gulf of Maine 2010 (misc. ships of opportunity) 12d
Southern Ocean 2011 (R/V Melville; Chief Scientist). 37d
Arctic 2011 (R/V Healy) 35d
Southern Ocean 2012 (R/V Revelle; Chief Scientist). 35d
Gulf of Maine 2013 (misc. ships of opportunity) 8d
Gulf of Maine 2014 (misc. ships of opportunity) 9d
Gulf of Maine 2015 (misc. ships of opportunity) 12d
Gulf of Maine 2016 (misc. ships of opportunity) 8d
Gulf of Maine 2017 (misc. ships of opportunity) 8d
Gulf of Maine 2018(misc. ships of opportunity) 8d
Gulf of Maine 2019 (misc. ships of opportunity) 9d
Southern Ocean 2020 (R/V Thomas G. Thompson; Chief Scientist. 39d

PROFESSIONAL AND HONORARY ORGANIZATIONS:

American Society of Limnology and Oceanography
Oceanography Society
American Geophysical Union
American Association for the Advancement of Science (past member)
Honorary Society of Sigma Xi (past member)
Phycological Society of America (past member)

OTHER PROFESSIONAL ACTIVITIES:

Academic advisor to the National Oceanographic Data Center for designing a global production data set. January 1988-1991.

Globec Planning Group - to develop long-range focus for the NSF-sponsored Global Ecosystem Dynamics program. 1988.

Member of West Coast Time Series Science Working Team- responsible for advising NASA with regard to the reception, processing, archival and distribution of CZCS and AVHRR data, 1989.

NSF review panel, Biological Oceanography 1990, 1994.

JGOFS Arabian Sea Planning Group 1991

NASA SeaWiFS Team 1992-present.

MODIS Team Collaborator, Miami, FL March 1996 to present

IOC/NODC Meeting on a Global Data Base for Biological and Chemical Data. Hamburg Germany May, 1996.

NASA SIMBIOS team: September 1997-2000

ONR-sponsored Coccolithophore Experiment Planning Meeting, August, 1999

NSF-sponsored OCTET Planning, March 2000

NSF-sponsored EDOCC Planning, March 2000

Invited speaker- Conference on “Coccolithophores- from molecular processes to global impact”, Ascona, Switzerland. February, 2002

NASA Biological Oceanography panel review- 2002

NASA Biological Oceanography panel review- 2005

NASA Review of future measurements- Oct 2006

Ocean Carbon Biogeochemistry steering sub-committee on Ocean Acidification and invited plenary speaker- October 2007, Scripps Inst. of Oceanography.

Subcommittee on Ocean Acidification (part of the U.S. Ocean Carbon and Biogeochemistry Program) September 2008 to 2011.

NASA Science Working Group for GEO-CAPE (geostationary ocean color mission)

National Academy: Reviewer of National Academies Ocean Studies Board document, “Assessing requirements for sustained ocean color research and operations”. March-April 2011.

Ocean Carbon Biogeochemistry Steering Committee (Jan, 2012 to 2015).

NASA review panel July 7-10, 2012

NASA committee for planning PACE Ocean Color Mission- 2011-2012

NSF review panel- 2014

Scientific Input Group; NASA Goddard visiting review committee. December 2014

Councilor in Biological Oceanography- The Oceanography Society (TOS), Jan. 1 2015 to December 31 2017.

NASA Panel for field programs; January 2015

Reviewed NASA EXPORTS program January 2015

Reviewed NASA Arctic Colors December 2015

SERVICE:

University of Miami Committee and Administrative Responsibilities:

- 1) MBF Academic Committee
- 2) Thesis committees: Aline Rodrigues, MBF (Chairman), RSMAS
Ian Gilbert, MBF (Chairman), RSMAS
Jennifer Fritz, MBF (Chairman), RSMAS
Catherine Campbell, MBF (Chairman), RSMAS
Joshua Feingold, MBF, RSMAS
Richard Edwards, MBF, RSMAS
Sarah Shaw, MBF, RSMAS
Richard Sikorski, MAC, RSMAS
Laura Valera, MBF, RSMAS
Maia McGuire, MBF, RSMAS
- 3) External Committee Members at other universities –
Rafael Cervantes Duarte, CICESE, Encinada, Mexico,
Ph.D.
committee
Steve Gadreau, Univ. New Hampshire (Masters committee),
Sara Rivero, Johns Hopkins University (Reviewer of Ph.D.
work)
Michael Brown, Dalhousie University (Masters committee)
Andre Bucci, University of Maine Orono (Ph.D.
committee)
Brian Collister, Old Dominion University (Ph.D.
committee)
- 4) Other Committee Work:
U. Miami MBF Computer Committee
U. Miami School Council-MBF representative
U. Miami Sexual Harassment Committee
- 5) U. Miami Undergraduate interns
Ms Shannon Cass Calay (Attended Scripps Inst. of Oceanography where she
received her Ph.D.)
Jaime Kinney

Bigelow Laboratory Committee and Administrative Responsibilities:

- 21) Post-doc seminar coordinator, Bigelow Laboratory, July, 2015- July, 2017
- 20) Personnel Committee, Bigelow Laboratory 2015-present
- 19) Safety Committee, Bigelow Laboratory 2013-2017
- 18) IRC Committee, Bigelow Laboratory for Ocean Sciences, 2014-2016
- 17) CCMP Search Committee (Bigelow Laboratory 2009-2010)
- 16) Education Committee, Bigelow Laboratory 1995 to 2012

- 15) Chair- Search committee new Senior Scientist Positions at Bigelow Laboratory; August 2005 to present
- 14) Search committee for UNE Director of Marine Sciences Center (2003)
- 13) Long-range committee for academic activities (2002-2003)
- 12) Program committee (2000-present)
- 11) Planning committee for BLOS university activities (2002)
- 10) Search committee, Chair- Systems administrator position (2001)
- 9) Chair Remote Sensing Committee (1996-2001)
 - 8) Compensation Committee (1996-97)
 - 7) P.I. Search Committee; 3 searches convened (1997-2001)
 - 6) UNE/BLOS Physics Position Search Committee (1997-1998)
 - 5) UNE/BLOS Masters planning committee (1997-2005)
 - 4) BLOS academic coordinator with UNE (1995-2005)- responsible for coordinating teaching activities (including Gulf of Maine Seminar series), summer course organization,
 - 3) BLOS Undergraduate/REU/High School Interns:
 - Jessica Nelson (UNE undergrad; went on to receive Ph.D. from Scripps Inst. of Oceanography)
 - Kerry Tetrault (Univ. New England)
 - Krystal Wescovitch (Univ. New England)
 - Kerry Weber (Univ. New England)
 - Jessica Zima (Univ. New England)
 - Laura Windecker (Bowdoin Undergrad; Received Ph.D. from UC Santa Barbara)
 - Sara Komoroski (Lincoln Academy High School Student; Now at Boston College)
 - Amanda Grauman (BLOS REU; Univ. Wisconsin Superior)
 - Elise Olson (MIT undergrad; Completed Ph.D. program at WHOI under Dennis McGillicuddy)
 - Emily Lyczkowski (Colby College; Received MS at UMaine Orono School of Marine Science; temporarily employed at Bigelow Laboratory)
 - James Johnson (Boothbay Regional High School graduate; Graduated from New School, NYC; currently a photojournalist in New York city)
 - Angela Warner (Colby College; Graduated from Colby, now working at environmental law firm in Boston; 2011)
 - Michael Stephens (Colby College; 2011) I took Michael to the Arctic in July-Aug 2011 aboard USCGC Healy; He now works in the environmental tourism industry
 - Rosalene Campbell(Boothbay Regional High School graduate; supervised for 2012, 2013; Graduated from Boston University 2016)
 - Marina Van der Eb (Univ. Maine Orono; 2012)
 - Ashley Poels (BLOS REU; Summer 2012)
 - Victoria Abel (BLOS REU from Colby College, Summer 2013)
 - Erica Eames ((Boothbay Regional High School)
 - Julia Maine (Bowdoin College)

Abigale Onos (Smith College)
Clara Bird (Duke University)
Halley Steinmetz (U. Mass Amherst)
Gabi Martinez (Rollins College, FL)

- 2) Moderator CORE Ocean Sciences Bowl (1998 (UNE), 1999 (UNH), 2000 (UMO)),
2001 (UNE), 2004 (UNE), 2005 (UNH).
1) BLOS program committee (with BLOS board members) 1999-2005.

Community Activities: Design Review Board 1997-2005 (Newcastle, ME), Gifted and Talented Committee (1997-2002; Great Salt Bay School, Damariscotta, ME), trombonist various bands (last 53 years).

Discography:

- 10) **Balch, B.**, D. Clarke, M. Felder, D. Harris, H. Maine, B. Manning, M. Mitchell, S. Potter. 2019. "The Novel Jazz Septet- Ellington & Strayhorn Novellas". Produced by B. Balch. Sheepscoot Jazz and Swing Co., Newcastle, ME. SJSC 06212019 04
- 9) **Balch, B.**, B. Jones, Dave Clarke, M. Felder, M. Macksoud, H. Maine, M. Mitchell (Novel Jazz Septet). 2015. "Novel and Novelle- More Unearthed Treasures By Billy Strayhorn and Duke Ellington". Produced by B. Balch, M. Mitchell. Sheepscoot Jazz and Swing Co., Newcastle, ME. SJSC 606548685428; <http://www.cdbaby.com/cd/noveljazzseptet2>
- 8) **Balch, B.** and M. Felder. "Spirituals". Collected spirituals for trombone and piano. Sheepscoot Jazz and Swing Company, Newcastle, ME. Released 15 June 2013.
- 7) Page, R., **B. Balch**, P. Collins, D. Creeden, D. Page, and J. Tukey. "Barrel House Bob Page and his Smokin' 88's" Copyright-Hottrax Records (751256001623); <http://www.cdbaby.com/cd/bbobpage>
- 6) **Balch, B.**, B. Boege, Dave Clarke, M. Felder, B. Friederich, H. Maine, M. Mitchell (Novel Jazz Septet). 2011. "Novel Jazz-Live; Ellington and Strayhorn Rediscovered." Produced by B. Balch, M. Mitchell and B. Boege. Sheepscoot Jazz and Swing Co., Newcastle, ME. SJSC 04102011; <http://www.cdbaby.com/cd/noveljazzseptet>
- 5) Page, R., D. Page, M. Havenstein, **B. Balch**, T.J. Wheeler, B. Terrie, and J. Tukey 2009. "Live at Lincoln Academy", Lincoln Academy, Newcastle, ME.
- 4) **Balch, B.**, B. Boege, Dave Clarke, M. Felder, M. Macksoud, H. Maine, M. Mitchell (Novel Jazz Septet). 2008. "Novel Ellington and Strayhorn." Produced by B. Balch and B. Boege. Sheepscoot Jazz and Swing Co., Newcastle, ME. SJSC 11082008; HYPERLINK "<http://cdbaby.com/cd/noveljazz>"
<http://cdbaby.com/cd/noveljazz>

- 3) Havenstein, M. with J. Howe, L. Harris Jr., C. Jennison, R. Norris, N. Kaletsky, S. Philbrick, A. Doane, G. Wright, B. Page, D. Page, J. Tukey, **B. Balch**, P. Collins, L. McAuslin, M. Hamilton, P. Runnels, L. Percy, B. Costa, A. Delgado, J. LaValle, S. Neale, B. Mulkern, J. Hunter, B. Bragan, D. Pierce and C. Stone. 2003. "Muriel in concert". Beach Road Recording, Lincolnville, ME.
- 2) Page, R., **B. Balch**, P. Collins, L. McAuslin, D. Page, and J. Tukey. 1998. "Cash is a problem". Recorded and mixed at Rosewood Studio, Bremen, ME. Jump & Shout Records JASR 1001, Atlanta, GA.
<http://www.cdbaby.com/cd/bobpage>
- 1) Page, R., **B. Balch**, P. Collins, D. Creedon, D. Page, and J. Tukey. 1996. Bob Page "Project II- Blues in Dixieland". Produced by Aleck Janoulis. Recorded at R. W. Studio. Hottrax Records 5125-60004-2, Atlanta, GA.
<http://www.hottrax.com/bobpage/default.htm>

List of four references:

Ocean Optics/Remote Sensing :

Dr. Ken Voss

Physics Dept.

University of Miami

Coral Gables, FL 33124. tel. (305) 284-2323

Ocean Optics/Remote Sensing:

Dr. Chuamin Hu

University of South Florida

140 7th Avenue South, St.Petersburg, FL 33701, USA

Biological Oceanography :

Dr. Marlon Lewis

Oceanography Dept.

Dalhousie University

Halifax, Nova Scotia, B3H 4H9, Canada. tel. (902)492-4780.

Biological Oceanography:

Dr. Alex Poulton

Lyell Centre

Heriot-Watt University

Edinburgh, Scotland.

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