Raymond W. Schmitt September, 2019
Physical Oceanographer
Emeritus Research Scholar
Department of Physical Oceanography
Woods Hole Oceanographic Institution
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Education:
B.Sc., Carnegie–Mellon University, (Physics)
Ph.D., University of Rhode Island, (Physical Oceanography)

Positions Held:

Research Associate, 1977–1978, University of Rhode Island; Postdoctoral Fellow, 1978–1979; Postdoctoral Investigator, 1979–1980; Assistant Scientist, 1980–1984; Associate Scientist, 1984–1994, tenure awarded, 1988; Senior Scientist, 1994–2018, Scientist Emeritus, 2018- Woods Hole Oceanographic Institution

Visiting Scientist, October 1987–March 1988, CSIRO Marine Laboratory, Division of Oceanography, Hobart, Tasmania, Australia

Visiting Fellow, September 1997–April 1998, Department of Applied Math and Theoretical Physics, University of Cambridge, UK

Honors: J. S. Guggenheim Fellow, 1997–1998.
Fellow, American Geophysical Union, 2012.
Van Allen Clark Sr. Chair for Excellence in Oceanography, 2012.
Invited Sverdrup Lecture, American Geophysical Union Fall Meeting, 2018.

Activities:
Convener, Meeting on Double Diffusion in Oceanography, WHOI, September 26–29, 1989.
Member, NSF review panels for Ocean Sciences (1992), Polar Programs (1991, 1993) and Ocean Technology and Interdisciplinary Coordination (2007).
Member, Atlantic Climate Change Program Science Working Group, 1991–1995
Member, Ocean Observing System Development Panel (OOSDP), 1992–1994.
Chair, Bigelow Medal Committee, Woods Hole Oceanographic Institution, 1996
Co–principal Lecturer, Summer Program in Geophysical Fluid Dynamics, Woods Hole Oceanographic Institution, 1996.
Member, CLIVAR International Science Steering Group, 1996–2000.
Member, SCOR Working Group 108 on Double-Diffusive Convection, 1996–2002.
Contributing Author, IPCC Third Assessment Report, 2000.
Expert Witness, US Senate Commerce Committee Hearing on Climate Change; July 18, 2000.
Invited Lecturer: Geophysical and Environmental Fluid Mechanics Summer School, Dept. of Applied Math and Theoretical Physics, Cambridge University, September 2002.
Guest Editor, *Journal of Marine Research*, 2004.
Guest Lecturer, Beckman Scholars Symposium, July 30, 2004.
Member, Editorial Board, *Dynamics of Atmospheres and Oceans*, 2004–2009.
Member, Ocean Studies Board, National Academy of Sciences, 2005-2007.
Co-Chair, CLIVAR Salinity Working Group, 2005-2007.
Co-Chair, NAS/NRC Scoping meeting on the role of the high- and mid-latitude oceans in climate, June 12, 2006.
Invited Plenary Speaker, *Ocean Obs '09*, Venice, September, 2009.

Member, NAS/NRC Panel on "America's Climate Choices: Advancing the Science of Climate Change", 2009-2010.
Member, *Marcus Langseth* Science Oversight Committee, 2006-2010.
NASA Salinity Science Team Leader, 2009-present.
Guest Lecturer, Institute of Physics (Ireland), April 26-30, 2010.
Member, NAS/NRC Panel on "Marine and Hydrokinetic Energy technology Assessment", 2010-2013.
Convener, SPURS Planning Workshop, APL/UW, Seattle, Jan 18-19, 2012.
Convener, Morss Colloquium on "Drought or Deluge". WHOI, May 16-18, 2012.
Keynote Speaker, Double-Diffusive Systems Workshop, UC Santa Cruz, Aug. 26-28, 2012.
Convener, SPURS Planning Workshop, Pasadena, CA, April 16-18, 2014.
Member, NASA Earth Science Subcommittee 2014-2017.
Leadoff Keynote Speaker, Salinity and Freshwater Changes in the Ocean Conference, Hamburg Germany, 12-15 October, 2015.
Plenary Speaker, CLIVAR Open Science Conference, Qingdao, China, Sept. 19-23, 2016.
Member, NASA Earth Science Advisory Committee, 2017-2020.
Convener, Global Ocean Salinity and Water Cycle Workshop, WHOI, May 22-26, 2017

Research Interests: Oceanic mixing and microstructure; double diffusive convection; relationships between small-scale mixing processes and large-scale temperature and salinity distributions; the thermohaline circulation of the ocean; the global water cycle and climate; development of oceanographic instrumentation; sustaining ocean observations for climate, terrestrial rainfall predictions.

Refereed Publications: 107 (Google Scholar Citations > 10,000, h-index = 48)

1. Schmitt, Raymond W., Jr., and David L. Evans, 1978. An estimate of the vertical mixing due to salt fingers based on observations in the North Atlantic Central Water. *Journal of Geophysical Research*, **83**(C6), 2913–2919.

2. Schmitt, Raymond W., Jr., 1979. Flux measurements on salt fingers at an interface. *Journal of Marine Research*, **37**(3), 419–436.

3. Schmitt, Raymond W., Jr., 1979. The growth rate of super–critical salt fingers. *Deep-Sea Research*, **26A**, 23–40.

4. Schmitt, Raymond W., and Richard B. Lambert, 1979. The effects of rotation on salt fingers. *Journal of Fluid Mechanics*, **90**, part 3, 449–463.

5. Schmitt, Raymond W., 1981. Form of the temperature–salinity relationship in the Central Water: Evidence for double-diffusive mixing. *Journal of Physical Oceanography*, **11**(7), 1015–1026.

6. Schmitt, Raymond W., and Daniel T. Georgi, 1982. Finestructure and microstructure in the North Atlantic Current. *Journal of Marine Research*, Supplement to **40**, 659–705.

7. Gargett, A. E., and R. W. Schmitt, 1982. Observations of salt fingers in the central waters of the eastern North Pacific. *Journal of Geophysical Research*, **87**(C10), 8017–8029.

8. Georgi, Daniel T., and Raymond W. Schmitt, 1983. Fine and microstructure observations on a hydrographic section from the Azores to the Flemish Cap. *Journal of Physical Oceanography*, **13**(4), 632–647.

9. Schmitt, Raymond W., 1983. The characteristics of salt fingers in a variety of fluid systems, including stellar interiors, liquid metals, oceans, and magmas. *Physics of Fluids*, **26**(9), 2373–2377.

10. Joyce, Terrence M., Raymond W. Schmitt and Marvel C. Stalcup, 1983. Influence of the Gulf Stream upon the short–term evolution of a warm-core ring. *Australian Journal of Marine and Freshwater Research*, **34**, 515–524.

11. Joyce, Terrence, Richard Backus, Karen Baker, Patricia Blackwelder, Otis Brown, Timothy Cowles, Robert Evans, Greta Fryxell, David Mountain, Donald Olson, Ronald Schlitz, Raymond Schmitt, Peter Smith, Raymond Smith and Peter Wiebe, 1984. Rapid evolution of a Gulf Stream warm-core ring. *Nature*, **308**, 837–840.

12. Olson, D. B., R. W. Schmitt, M. Kennelly and T. M. Joyce, 1985. A two–layer diagnostic model of the long–term physical evolution of Warm-Core Ring 82B. *Journal of Geophysical Research*, **90**(C5), 8813–8822.

13. Schmitt, Raymond W., and Donald B. Olson, 1985. Wintertime convection in warm-core rings: thermocline ventilation and the formation of mesoscale lenses. *Journal of Geophysical Research*, **90**(C5), 8823–8837.

14. Schmitt, Raymond W., Rolf G. Lueck and Terrence M. Joyce, 1986. Fine- and microstructure at the edge of a warm-core ring. *Deep-Sea Research*, **33**(11/12A), 1665–1689.

15. Kunze, Eric, Albert J. Williams, III., and Raymond W. Schmitt, 1987. Optical microstructure in the thermohaline staircase east of Barbados. *Deep-Sea Research*, **34**(10A), 1697–1704.

16. Schmitt, R. W., H. Perkins, J. D. Boyd and M. C. Stalcup, 1987. C-SALT: An investigation of the thermohaline staircase in the western tropical North Atlantic. *Deep-Sea Research*, **34**(10A), 1655–1665.

17. Toole, John M., and Raymond W. Schmitt, 1987. Small-scale structures in the northwest Atlantic subtropical front. *Nature*, **327**(6117), 47–49.

18. Schmitt, Raymond W., 1987. The Caribbean Sheets and Layers Transects (C-SALT) program. *Eos, Transactions of the American Geophysical Union*, **68**(5), 57–60.

19. Schmitt, R. W., 1988. Mixing in a thermohaline staircase. In: *Small-Scale Turbulence and Mixing in the Ocean*, J.C.J. Nihoul and B. M. Jamart (Editors), Elsevier Science Publishers, Amsterdam, pp. 435–452.

20. Schmitt, Raymond W., John M. Toole, Richard L. Koehler, Edward C. Mellinger and Kenneth W. Doherty, 1988. The development of a fine- and microstructure profiler. *Journal of Atmospheric and Oceanic Technology*, **5**(4), 484–500.

21. Schmitt, Raymond W., Phillip S. Bogden and Clive E. Dorman, 1989. Evaporation minus precipitation and density fluxes for the North Atlantic. *Journal of Physical Oceanography*, **9**(9), 1208–1221.

22. Schmitt, Raymond W., 1990. On the density ratio balance in the central water. *Journal of Physical Oceanography*, 20(6), 900–906.

23. Halliwell, G. R., Jr., P. Cornillon, K. H. Brink, R. T. Pollard, D. L. Evans, L. A. Reiger, J. M. Toole and R. W. Schmitt, 1991. Descriptive oceanography during the Frontal Air–Sea Interaction Experiment: Medium–to–large-scale variability. *Journal of Geophysical Research*, **96**(C5), 8553–8567.

24. Weller, R. A., D. L. Rudnick, C. C. Eriksen, K. L. Polzin, N. S. Oakey, J. M. Toole, R. W. Schmitt and R. T. Pollard, 1991. Forced ocean response during the Frontal Air–Sea Interaction Experiment. *Journal of Geophysical Research*, **96**(C5), 8611–8638.

25. Wijffels, Susan E., Raymond W. Schmitt, Harry L. Bryden and Anders Stigebrandt, 1992. On the transport of fresh water by the oceans. *Journal of Physical Oceanography*, **22**(2), 155–162.

26. Huang, R. X., and R. W. Schmitt, 1993. The Goldsbrough—Stommel circulation of the world ocean. *Journal of Physical Oceanography*, **23**(6), 1277–1284.

27. Schmitt, Raymond W., and Susan E. Wijffels, 1993. The role of the oceans in the global water cycle. *The Legacy of Hann, AGU Geophysical Monograph Series 75*, IUGG, **15**, 77–84.

28. Schmitz, William J., Jr., James R. Luyten and Raymond W. Schmitt, 1993. On the Florida Current T/S envelope. *Bulletin of Marine Science of the Gulf and Caribbean*, **53**(1), 1048–1065.

29. Schmitt, Raymond W., 1994. Double-diffusion in oceanography. *Annual Review of Fluid Mechanics*, **26**, 255–285.

30. Schmitt, Raymond W., 1994. Triangular and asymmetric salt fingers. *Journal of Physical Oceanography*, **24**(4), 855–860.

31. Toole, John M., Kurt L. Polzin and Raymond W. Schmitt, 1994. New estimates of diapycnal mixing in the abyssal ocean. *Science*, **264**, 1120–1123.

32. Kunze, Eric, Raymond W. Schmitt and John M. Toole, 1995. The energy balance in a warm-core ring's near-inertial critical layer. *Journal of Physical Oceanography*, **25**(5), 942–957.

33. Polzin, Kurt L., John M. Toole and Raymond W. Schmitt, 1995. Finescale parameterizations of turbulent dissipation. *Journal of Physical Oceanography*, **25**, 306–328.

34. Schmitt, Raymond W., 1995. The salt finger experiments of Jevons (1857) and Rayleigh (1880). *Journal of Physical Oceanography*, **25**(1), 8–17.

35. You, Yuzhu, Trevor J. McDougall and Raymond W. Schmitt, 1995. Dianeutral motion, water-mass conversion and non–linear effects on the density ratio in the Pacific thermocline. *Journal of Physical Oceanography*, **25**(5), 1891–1904.

36. Schmitt, R. W., 1995. The ocean component of the global water cycle. U.S. National Report to International Union of Geodesy and Geophysics, 1991–1994, Supplement to *Reviews of Geophysics*, pp. 1395–1409.

37. Schmitt, R. W., 1995. Why didn't Rayleigh discover salt fingers? In: *Double-Diffusive Convection.* A Brandt and H. Fernando, Editors, *AGU Geophysical Monograph*, **94**, 3–10.

38. Shen, C., and R. W. Schmitt, 1995. The wavenumber spectrum of salt fingers. In: *Double-Diffusive Convection*, A. Brandt and H. Fernando, Editors, *AGU Geophysical Monograph*, **94**, 305–312.

39. Nowlin, W., N. Smith, G. Needler, P. Taylor, R. Weller, R. Schmitt, L. Merlivat, A. Vezina, A. Alexiou, M. McPhaden and M. Wakatsuchi, 1996. An ocean observing system for climate. *Bulletin of the American Meteorological Society*, **77**(10), 2243–2273.

40. Polzin, K. L., N. S. Oakey, J. M. Toole and R. W. Schmitt, 1996. Fine structure and microstructure characteristics across the northwest Atlantic subtropical front. *Journal of Geophysical Research*, **101**(C6), 14,111–14,121.

41. Polzin, K. L., K. G. Speer, J. M. Toole and R. W. Schmitt, 1996. Intense mixing of Antarctic Bottom Water in the equatorial Atlantic. *Nature*, **380**(6569), 54–57.

42. Renardy, Yuriko Yamamuro and Raymond W. Schmitt, 1996. Linear stability analysis of salt fingers with surface evaporation or warming. *Physics of Fluids*, **8**(11), 2855–2867.

43. Montgomery, E. T., and R. W. Schmitt, 1997. Altimetric control of a free vehicle for near-bottom turbulence measurements. *Deep-Sea Research I*, **44**(6), 1077–1084.

44. Polzin, K. L., J. M. Toole, J. R. Ledwell and R. W. Schmitt, 1997. Spatial variability of turbulent mixing in the abyssal ocean. *Science*, **276**, (5309), 93–96.

45. Toole, John M., Raymond W. Schmitt, Kurt L. Polzin and Eric Kunze, 1997. Near-boundary mixing above the flanks of a mid-latitude seamount. *Journal of Geophysical Research*, **102**(C1), 947–959.

46. Schmitt, R. W., 1998. Double-diffusive convection: Its role in ocean mixing and parameterization schemes for large-scale modeling. In: *Ocean Modeling and Parameterizations*, E. Chassignet and J. Verron, Editors, Kluwer Academic Publishers, pp. 215–234.

47. Schmitt, R. W., 1998. The ocean's response to the freshwater cycle. In: *Global Energy and Water Cycles*, K. Browning and R. Gurney, Editors, Cambridge University Press, pp. 144–154.

48. Zhang, Jubao, Raymond W. Schmitt and Rui Xin Huang, 1998. Sensitivity of GFDL modular ocean model to the parameterization of double-diffusive processes. *Journal of Physical Oceanography*, **28**(4), 589–605.

49. Molinari, Robert L., Silvia Garzoli and Raymond W. Schmitt, 1999. Equatorial currents at 1000-m depth in the Atlantic Ocean. *Geophysical Research Letters*, **26**(3), 361–363.

50. Schmitt, R. W., 1999. Spice and the demon. *Science*, **283**(5804), 498–499.

51. Zhang, Jubao, Raymond W. Schmitt and Rui Xin Huang, 1999. The relative influence of diapycnal mixing and hydrologic forcing on the stability of the thermohaline circulation. *Journal of Physical Oceanography*, **29**(6), 1096–1108.

52. St. Laurent, Louis, and Raymond W. Schmitt, 1999. The contribution of salt fingers to vertical mixing in the North Atlantic Tracer Release Experiment. *Journal of Physical Oceanography*, **29**(7), 1404–1424.

53. Zhang, Jubao, and Raymond W. Schmitt, 2000. The impact of salt fingering on the thermohaline circulation under mixed boundary conditions. *Journal of Physical Oceanography*, **30**, (6), 1223–1231.

54. Ledwell, J. L., E. T. Montgomery, K. L. Polzin, L. C. St. Laurent, R. W. Schmitt and J. M. Toole, 2000. Evidence for enhanced mixing over rough topography in the abyssal ocean. *Nature*, **403**(6766), 179–182.

55. Schmitt, R. W., and E. T. Montgomery, 2000. Salinity, a missing piece in the climate puzzle. *Backscatter*, **11**(3), 10–16.

56. Schmitt, R. W., and J. R. Ledwell, 2001. Dispersion and diffusion in the deep ocean. In: *Encyclopedia of Ocean Sciences*, John H. Steele, Steve A. Thorpe, and Karl K. Turekian, Editors, Academic Press, San Diego; Vol. **2**, pp. 726–733.

57. Schmitt, R. W., 2001. Double-diffusive convection. In: *Encyclopedia of Ocean Sciences*, John H. Steele, Steve A. Thorpe, and Karl K. Turekian, Editors, Academic Press, San Diego; Vol. **2**, pp. 757–766.

58. St. Laurent, Louis C., John M. Toole, and Raymond W. Schmitt, 2001. Buoyancy forcing by turbulence above rough topography in the abyssal Brazil Basin. *Journal of Physical Oceanography*, **31**, 3476–3495.

59. Polzin, K. L., E. Kunze, J. M. Toole, and R. W. Schmitt, 2003. The partitioning of finescale energy into internal waves and vortices: Implications for horizontal mixing. *Journal of Physical Oceanography*, **33**, 234–248.

60. Schmitt, R. W., 2003. Observational and laboratory insights into salt finger convection. *Progress in Oceanography*, **56**(3-4), 419–433.

61. Holbrook, W. S. P. Parano, S. Pearse, and R. W. Schmitt, 2003. Thermohaline finestructure in an oceanographic front from seismic reflection profiling. *Science*, **301**(5634), 821–824.

62. Lavery, A. C., R. W. Schmitt and T. K. Stanton, 2004. High-frequency acoustic scattering from turbulent oceanic microstructure: The importance of density fluctuations. *Journal of the Acoustical Society of America*, **114**(5), 2685–2697.

63. Nash, J. D. E. Kunze, J. M. Toole, and R. W. Schmitt, 2004. Internal tide reflection and turbulent mixing on the continental slope. *Journal of Physical Oceanography*, 34(5), 1117–1134.

64. Hu, C., E. Montgomery, R. Schmitt, F. Muller-Karger, 2004. The Amazon and Orinoco River plumes in the tropical Atlantic and Caribbean Sea: Observation from space and S-PALACE floats. *Deep Sea Research*, **51** (10-11), 1151-1171.

65. Nandi, Papia, W. Steven Holbrook, Scott Pearse, Pedro Páramo, Raymond W. Schmitt, 2004. Seismic reflection imaging of water mass boundaries in the Norwegian Sea. *Geophysical Research Letters*, **31**, (23), L23311, 10.1029/2004GL021325 .

66. Schmitt, Raymond W., Robert C. Millard, John M. Toole and W. David Wellwood, 2005. A double-diffusive interface tank for dynamic–response studies. *Journal of Marine Research*, **63** (1) 263-289.

67. McDougall, T. J. , R. W. Schmitt, G. Veronis, F. Webster, 2005. The life and work of Nick Fofonoff. *Journal of Marine Research*, **63** (1), 1-7.

68. Schmitt, R. W., J. R. Ledwell, E. T. Montgomery K. L. Polzin, and J. M. Toole, 2005. Enhanced Diapycnal Mixing by Salt Fingers in the Thermocline of the Tropical Atlantic. *Science*, 308 (5722), 685-688.

69. Lagerloef, G. and R. Schmitt, Role of Ocean Salinity in Climate and Near-Future Satellite Measurements, Meeting Report, *EOS* Trans. AGU 87(43), 466-467, 2006.

70. Baker, D. J., R. W. Schmitt, C. Wunsch, 2007. Long-term Observations: Endowments and New Institutions. *Oceanography*, **20** (4), 10-14.

71. R. Schmitt , 2008. Salinity and the Global Water Cycle. *Oceanography*, **21** (1), 12-19.

72. R. Schmitt and the CLIVAR Salinity Working Group, 2008. What's Next for Salinity? *Oceanography*, **21** (1), 82-85.

73. Inoue, R., E. Kunze, L. St. Laurent, R.W. Schmitt, and J.M. Toole, 2008. Evaluating salt-fingering theories. *Journal of Marine Research*, **66**, 413-440.

74. Park, J.J., K. Kim, and R.W. Schmitt. 2009. Global distribution of the decay timescale of mixed layer inertial motions observed by Satellite-tracked drifters. *Journal of Geophysical Research*, **114**, C11010, doi:10.1029/2008JC005216.

75. Holbrook, W. S., I. Fer and R. W. Schmitt. 2009. Images of internal tides near the Norwegian continental slope. *Geophysical Research Letters*, **36**, L00D10, doi:10.1029/2009GL038909

76. Byun, S.-S., J. J. Park, K.-I. Chang, R. W. Schmitt, 2010. Observation of near-inertial wave reflections within the thermostad layer of an anticyclonic mesoscale eddy. *Geophysical Research Letters*, **37**, L01606, doi:10.1029/2009GL041601.

77. Lagerloef, G., J. Boutin, J. Carton, Y. Chao, T. Delcroix, J. Font, J. Lilly, N. Reul, R. Schmitt, S. Riser, and F. Wentz, 2010. Resolving the global surface salinity field and variations by blending satellite and in situ observations. *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison D.E. & Stammer, D., Eds., ESA Publication WPP-306.

78. Schmitt, R. W., T. Boyer, G. Lagerloef, J. Schanze , S. Wijffels, L. Yu, 2010. Salinity and the Global Water Cycle. In: *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 1)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison, D.E. & Stammer, D., Eds., ESA Publication WPP-306, doi:10.5270/OceanObs09.pp.34

79. Fer, I. P. Nandi, W. S. Holbrook, R. W. Schmitt, and P. Paramo, 2010. Seismic imaging of a thermohaline staircase in the western tropical North Atlantic. *Ocean Science*, **6**, 621-631, doi:10.5194/os-6-621-2010.

80. National Research Council, 2010: Advancing the Science of Climate Change. National Academies Press, Washington DC. 505 pp.

81. Lagerloef, G., R. Schmitt, J. Schanze, H.-Y. Kao, 2010. The oceans and the global water cycle. *Oceanography*, **23** (4), 82-93.

82. Schanze, J. J., R. W. Schmitt and L.L. Yu, 2010. The global oceanic freshwater cycle: a state-of-the-art quantification. *J. Marine Research*, **68** (3-4), 569–595. DOI: 10.1357/002224010794657164

83. Schmitt, R. W., 2011. Thermohaline convection at density ratios below one: a new regime for salt fingers. *J. Marine Research*, **69**, 779–795.

84. Schmitt, R. W., 2012. Finger Puzzles. *J. Fluid Mechanics*, **692**, 1-4.

85. Brearley, J. A., R. S. Pickart, H. Valdimarsson, S. Jonsonn, R. W. Schmitt, and T. W. N. Haine. 2012. The East Greenland Boundary Current System South of Denmark Strait. *Deep-Sea Research I* , **63**, 1-19.

86. Swift, S. A., A. Bower, R. W. Schmitt, 2012. Vertical, horizontal, and temporal changes in temperature in the Atlantis II and Discovery hot brine pools, Red Sea. *Deep Sea Research I,* **64**, 118–128.

87. Schanze, J. and R. W. Schmitt, 2013. Estimates of Cabbeling in the Global Ocean, *J. Physical Oceanography*, **43** (4), 698-705.

88. Wunsch, C., R. W. Schmitt and D. J. Baker, 2013. Climate change as an intergenerational problem. *Proceedings of the National Academy of Sciences*. 110 (12) 4435-4436.

89. Holbrook, W. Steven, Ilker Fer, Raymond W. Schmitt, Daniel Lizarralde, Jody M. Klymak, L. Cody Helfrich, Robert Kubichek, 2013. Estimating oceanic turbulence dissipation from seismic images. *J. Atmos. Oceanic Technol.*, **30**, 1767–1788. DOI:10.1175/JTECH-D-12-00140.1

90. Schmitt, R. W., 2015. An Old Salt Retires. *Oceanography*, 28 (1), 7.

91. Lindstrom, E, F. Bryan and R. Schmitt, 2015. SPURS: Salinity Processes in the Upper-ocean Regional Study, the North Atlantic Experiment. *Oceanography*, 28 (1), 14-19.

92. Schmitt, R. W. and A. Blair, 2015. A River of Salt. *Oceanography*, 28 (1), 40-45.

93. Farrar, J. T., L. Rainville, A. J. Plueddemann, W. S. Kessler, C. Lee, B. A. Hodges, R. W. Schmitt, J. B. Edson, S. C. Riser, C. C. Eriksen, D. M. Fratantoni, 2015. Salinity and temperature balances at the SPURS central mooring during fall and winter. *Oceanography* 28 (1), 56-65.

94. Schmitt, R. W. et al. 2015. From Salty to Fresh: SPURS-2: Diagnosing the Physics of a Rainfall-Dominated Salinity Minimum. *Oceanography* 28 (1), 150-159.

95. Levang, S and R. W. Schmitt, 2015. Centennial changes of the global water cycle in CMIP5 Models. *J. Climate*, **28**, 6489–6502. doi:10.1175/JCLI-D-15-0143.1

96. Fortin, W. F. J., Holbrook, W. S., and Schmitt, R. W., 2016. Mapping turbulent diffusivity associated with oceanic internal lee waves offshore Costa Rica, *Ocean Sci.*, 12, 601-612, doi:10.5194/os-12-601-2016

97. Li, L. R. W. Schmitt, C. Ummenhofer, K. Karnauskis, 2016. North Atlantic Salinity as a Predictor of Sahel Rainfall. *Science Advances*, **2**, e1501588. doi: 10.1126/sciadv.1501588

98. Li, L., R. W. Schmitt, C. Ummenhofer, K. Karnauskis, 2016. Implications of North Atlantic Sea Surface Salinity for Summer Precipitation over the US Midwest: Mechanisms and Predictive Value. *J. Climate*, 29, 3143-3159. doi: 10.1175/JCLI-D-15-0520.1

99. Fortin, W. F. J., W. S. Holbrook, and R. W. Schmitt, 2017. Seismic estimates of turbulent diffusivity and evidence of nonlinear internal wave forcing by geometric resonance in the SouthChina Sea, J. Geophys. Res. Oceans, 122, doi:10.1002/2017JC012690

100. Li, L., R. W. Schmitt and C. C. Ummenhofer 2018. The Role of the Subtropical North Atlantic Water Cycle in the 2015 Extreme Precipitation Events in the US. Climate Dynamics, 50: 1291- 1305. doi:10.1007/s00382-017-3685-y.

101. Zeng, L., Chassignet, E., Schmitt, R.W., Xu, X. and Wang, D., 2018. Salinification in the South China Sea since late 2012: a reversal of the freshening since 1990s. *Geophysical Research Letters*. 45 (6), 2744-2751. doi:10.1002/2017GL076574

102. Liu, T., Schmitt, R.W. and Li, L., 2018. Global search for autumn-lead sea surface salinity predictors of winter precipitation in southwestern United States. *Geophysical Research Letters*, 45(16), pp.8445-8454.

103. Schmitt, R.W. 2018. The ocean's role in climate. *Oceanography* 31(2):32–40, https://doi.org/10.5670/oceanog.2018.225

104. Martini, K. I., D. J. Murphy, R. W. Schmitt, N. G. Larson, 2019. Corrections for Pumped SBE 41CP CTDs Determined from Stratified Tank Experiments. *Journal of Atmospheric and Oceanic Technology*, **36** (4), 733-74

105. Zeng, L., Schmitt, R.W., Li, L., Wang, Q. and Wang, D., 2019. Forecast of summer precipitation in the Yangtze River Valley based on South China Sea springtime sea surface salinity. *Climate Dynamics*, p1-15. Doi: 10.1007/s00382-019-04878-y

106. Baker, D.J., Glackin, M., Roberts, S.J., Schmitt, R.W., Twigg, E.S., Vimont, D.J. and Weller, R.A., 2019. The Challenge of Sustaining Ocean Observations. *Frontiers in Marine Science*, *6*, p.10

107. Levang, S. and R. W. Schmitt, 2019. Inter-gyre salt transport in the climate warming response. *J. Physical Oceanography* (submitted).

108. Levang, S. and R. W. Schmitt, 2019. What causes the AMOC to weaken in CMIP5? *J. Climate* (submitted)

Patents:

1. Patent No. 9,441,947 "N-Wavelength Interrogation System and Method for Multiple Wavelength Interferometers" Issue Date: September 13, 2016 Inventors: Jason A. Kapit, Norman E. Farr, Raymond W. Schmitt.

2. Patent Pending, App. No. 15/227,253 "Submersible N-Wavelength Interrogation System and Method for Multiple Wavelength Interferometers". Filing Date: August 3, 2016. Inventors: Jason A. Kapit, Norman E. Farr, Raymond W. Schmitt. All claims have been allowed and we are waiting for issuance of the patent.