VITA (revised OCT 2023)

Eric Kunze 13 JUN 1956

Education

BSc in Honors Physics/Mathematics, UBC, 1979.
non-thesis Masters in Physical Oceanography (Tom Sanford, advisor), 1982,
"Observations of Near-Inertial Waves in a Front".
PhD in Physical Oceanography (Tom Sanford, advisor), 1985,
"Near-Inertial Wave Propagation in Geostrophic Shear".

Work Experience

1983 Summer: WHOI GFD summer fellow, Woods Hole Oceanographic Institution (advisor: Francis Bretherton).
1985 - 86: WHOI postdoctoral fellow, Woods Hole Oceanographic Institution (advisor: Raymond W. Schmitt).
1986 - 87: postdoctoral research scientist, Woods Hole Oceanographic Institution (collaborating with Raymond Schmitt, Sandy Williams and Melbourne Briscoe).
1987 - 2014: U of Washington.
2004 - 2011: Canada Research Chair.
2010 - 2016: affiliate professor, College of the Environment, U of Washington.
2014 - present: senior scientist, NorthWest Research Associates

Awards

WHOI Summer GFD fellow, 1983, Woods Hole Oceanographic Institution
WHOI Postdoctoral Fellowship, 1985, Woods Hole Oceanographic Institution.
Killam Postdoctoral Fellowship, 1985, Dalhousie U, Halifax, NS (declined).
Father James B. Macelwane Medal for Young Investigators, 1992, American Geophysical Union.
First Sverdrup Lecturer: American Geophysical Union Fall Meeting, 1992.
Canada Research Chair in Physical Oceanography, 2004 - 2011.

Research Interests

Oceanic phenomena that contribute to mixing and stirring with particular attention to the interactions of meso- to microscale processes such as fronts, eddies, internal waves, potential-vorticity-carrying finestructure, turbulence, double diffusion and surface forcing.

Parameterization of the impact of these subgridscale processes on larger scales through dynamical understanding.

Publications (9519)

1. Kunze, E., and T.B. Sanford, 1984: Observations of near-inertial waves in a front. *J. Phys. Oceanogr.*, **14**, 566-581. (169)
2. Kunze, E., 1985: Near-inertial wave propagation in geostrophic shear. *J. Phys. Oceanogr*., **15**, 544-565. (809)
3. Kunze, E., and T.B. Sanford, 1986: Near-inertial wave interactions with mean flow and bottom topography near Caryn Seamount. *J. Phys. Oceanogr.*, **16**, 109-120. (42)
4. Kunze, E., and R. Lueck, 1986: Velocity profiles in a warm-core ring. *J. Phys. Oceanogr.,* **16**, 991-995. (21)
5. Kunze, E., 1986: The mean and near-inertial velocity fields in a warm-core ring. *J. Phys. Oceanogr.*, **16**, 1444-1461. (82)
6. Kunze, E., 1987: Limits on growing, finite-length salt fingers: A Richardson number constraint. *J. Mar. Res.*, **45**, 533-556. (164)
7. Kunze, E., A.J. Williams III, and R.W. Schmitt, 1987: Optical microstructure in the thermohaline staircase east of Barbados. *Deep-Sea Res.*, **34**, 1697-1704. (60)
8. Kunze, E., 1990: The evolution of salt fingers in inertial-wave shear. *J. Mar. Res*., **48**, 471-504. (62)
9. Kunze, E., A.J. Williams III and M.G. Briscoe, 1990: Observations of shear and vertical stability from a neutrally-buoyant float (Part 1). *J. Geophys. Res.*, **95**, 18,127-18,142. (159)
10. Kunze, E., M.G. Briscoe and A.J. Williams III, 1990: Interpreting shear and strain finestructure from a neutrally-buoyant float (Part 2). *J. Geophys. Res*., **95**, 18,111-18,125. (58)
11. Gregg, M.C., and E. Kunze, 1991: Internal-wave shear and strain in Santa Monica Basin. *J. Geophys. Res*., **96**, 16,709-16,719. (172)
12. Kunze, E., M.A. Kennelly and T.B. Sanford, 1992: The depth dependence of shear finestructure off Point Arena and near Pioneer Seamount. *J. Phys*. *Oceanogr.*, **22**, 29-41. (20)
13. Kunze, E., and T.B. Sanford, 1993: Submesoscale dynamics near a seamount: I. Measurements of Ertel vorticity. *J. Phys. Oceanogr.*, **23**, 2567-2588. (40)
14. Kunze, E., 1993: Submesoscale dynamics near a seamount: II. The partition of energy between internal waves and geostrophy. *J. Phys. Oceanogr.*, **23**, 2589-2601. (18)
15. Muench, J., E. Kunze and E. Firing, 1994: The potential vorticity structure of equatorial deep jets. *J. Phys. Oceanogr.*, **24**, 418-428. (29)
16. Kunze, E., 1994: A proposed flux constraint for salt fingers in shear. *J. Mar. Res.*, **52**, 999-1016. (40)
17. Kunze, E., 1995: Quantifying salt-fingering fluxes in the ocean. *Double-Diffusive Convection, AGU Chapman Conference Proc. Geophysical Monograph 94*, A. Brandt and J. Fernando, Eds., 313-320. (7)
18. Kunze, E., R.W. Schmitt and J.M. Toole, 1995: The energy balance in a warm-core ring's near-inertial critical layer. *J. Phys. Oceanogr.*, **25**, 942-957. (169)
19. Sun, H., E. Kunze and A.J. Williams III, 1996: Vertical heat-flux measurements from a neutrally-buoyant float. *J. Phys. Oceanogr.*, **26**, 984-1001. (15)
20. Kunze, E., and T.B. Sanford, 1996: Abyssal mixing: Where it isn't. *J. Phys. Oceanogr.*, **26**, 2286-2296. (169)
21. Toole, J.M., R.W. Schmitt, K.L. Polzin and E. Kunze, 1997: Near-boundary mixing above the flanks of a midlatitude seamount. *J. Geophys. Res.*, **102**, 947-959. (182)

22**.** Kunze, E., and J.M. Toole, 1997: Tidally-driven vorticity, diurnal shear and turbulence atop Fieberling Seamount. *J. Phys. Oceanogr.*, **27**, 2663-2693. (234)
23. Kunze, E., and E. Boss, 1998: A model for vortex-trapped internal waves. *J. Phys. Oceanogr.*, **28**, 2104-2115. (38)
24. Muench, J.E., and E. Kunze, 1999: Internal-wave interactions with equatorial deep jets. Part I: Momentum-flux divergences. *J. Phys. Oceanogr.*, **29**, 1453-1467. (26)
25. Muench, J.E., and E. Kunze, 2000: Internal-wave interactions with equatorial deep jets. Part II: Acceleration of the jets. *J. Phys. Oceanogr.*, **30**, 2099-2110. (26)
26. Sun, H., and E. Kunze, 1999: Internal wave/wave interactions: Part I. The role of Internal-wave vertical divergence. *J. Phys. Oceanogr.*, **29**, 2886-2904. (34)
27. Sun, H., and E. Kunze, 1999: Internal wave/wave interactions: Part II. Spectral energy transfer and turbulence production rates. *J. Phys. Oceanogr.*, **29**, 2905-2919. (51)
28. Polzin, K., E. Kunze, J. Hummon and E. Firing, 2002: The finescale response of lowered ADCP velocity profiles. *J. Atmos. Oceanic Techno.*, **19**, 205-224. (126)
29**.** Kunze, E., L.K. Rosenfeld, G.S. Carter and M.C. Gregg, 2002: Internal waves in Monterey Submarine Canyon. *J. Phys. Oceanogr*, **32**, 1890-1913. (385) [2023]
29b. Gregg, M.C., G.S. Carter and E. Kunze, 2005: Corrections to mixing rates in two papers about Monterey Submarine Canyon, Carter and Gregg (2002) and Kunze *et al.* (2002). *J. Phys. Oceanogr*., **35**, 1712-1715. (3)
30. McPhee-Shaw, E.E., and E. Kunze, 2002: Boundary-layer intrusions from a sloping bottom: A mechanism for generating intermediate nepheloid layers. *J. Geophys. Res*., **107**, doi: 10.1029/2001JC000801. (110)
31. Johnson, G.C., E. Kunze, K.E. McTaggart and D.W. Moore, 2002: Temporal and spatial structure of the equatorial deep jets in the Pacific Ocean. *J. Phys. Oceanogr*., **32**, 3397-3407. (32)
32. Polzin, K.L., E. Kunze, J.M. Toole and R.W. Schmitt, 2003: The partition of finescale energy into internal waves and geostrophic motions. *J. Phys. Oceanogr.*, **33**, 234-248. (67)
33. Kunze, E., 2003: A review of salt-fingering theory. *Prog. Oceanogr*., **56**, 399-417. (124)
34. Althaus, A.M., E. Kunze and T.B. Sanford, 2003: Internal tide radiation from Mendocino Escarpment. *J. Phys. Oceanogr*., **33**, 1510-1527. (149)
35. Rudnick, D.L., T. Boyd, R.E. Brainard, G.S. Carter, G.D. Egbert, M.C. Gregg, P.E. Holloway, J. Klymak, E. Kunze, C.M. Lee, M.D. Levine, D.S. Luther, J. Martin, M.A. Merrifield, J.N. Moum, J.D. Nash, R. Pinkel, L. Rainville and T.B. Sanford, 2003: From tides to mixing along the Hawaiian Ridge. *Science*, **301**, 355-357. (369)
36. Kunze, E., and S.G. Llewellyn Smith, 2004: The role of smallscale topography in turbulent mixing of the global ocean. *Oceanography*, **17**(1), 51-60. (125)
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38. Nash, J.D., M.H. Alford and E. Kunze, 2005: Estimating internal-wave energy-fluxes in the ocean. *J. Atmos. Oceanic Techno*., **22**, 1551-1570. (264)
39. Klymak, J.M., J.N. Moum, J.D. Nash, E. Kunze, J.B. Girton, G.S. Carter, C.M. Lee, T.B. Sanford and M.C. Gregg, 2006: An estimate of tidal energy lost to turbulence at the Hawaiian Ridge. *J. Phys. Oceanogr*., **36**, 1148-1164. (231)
40. Nash, J.D., E. Kunze, T.B. Sanford and C.M. Lee, 2006: Structure of the baroclinic tide generated at Kaena Ridge, Hawaii. *J. Phys. Oceanogr*., **36**, 1123-1135. (145)

41. Lee, C.M., E. Kunze, T.B. Sanford, J.D. Nash, M.A. Merrifield and P.E. Holloway, 2006: Internal tides and turbulence along the 3000-m isobath of the Hawaiian Ridge. *J. Phys. Oceanogr*., **36**, 1165-1183. (106)
42. Kunze, E., E. Firing, J.M. Hummon, T.K. Chereskin and A.M. Thurnherr, 2006: Global abyssal mixing inferred from lowered ADCP shear and CTD strain profiles. *J. Phys. Oceanogr*., **36**, 1553-1576. (487)
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43b. Kunze, E, J.F. Dower, R. Dewey and E.A. D'Asaro, 2007: Mixing it up with krill. Response to A. Visser *Science Perspective "Biomixing of the Oceans?"*. *Science*, **318**, 1239. (13)
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48. MacKinnon, J., M. Alford, P. Bouruet-Aubertot, N. Bindoff, S. Elipot, S. Gille, J. Girton, M. Gregg, R. Hallberg, E. Kunze, A. Naviera Garabato, H. Phillips, R. Pinkel, K. Polzin, T. Sanford, H. Simmons and K. Speer, 2009: Using global arrays to investigate internal waves and mixing. *Proc. OceanObs'09: Sustained Ocean Observations and Information for Society Conference* (Vol. 1), Venice, Italy, 21-25 SEP 2009, J. Hall, D.E. Harrison and D. Stammer Eds., ESA Publication WPP-306, 2010F, 17 pp. (http://www.oceanobs09.net/blog/?p=691). (15)
49. Kelly, S.M., J.D. Nash and E. Kunze, 2010: Internal-tide energy over topography. *J. Geophys. Res*., **115**, doi: 10.1029/2009JC005618. (89)
50. Rousseau, S., E. Kunze, R. Dewey, K. Bartlett and J. Dower, 2010: On turbulence production by swimming marine organisms in the open-ocean and coastal waters. *J. Phys. Oceanogr*., **40**, 2107-2121. (42)
51. Kimura, S., W. Smyth and E. Kunze, 2011: Turbulence in a sheared salt-fingering-favorable environment: Anisotropy and effective diffusivities. *J. Phys. Oceanogr*., **41**, 1144-1159. (25)
52. Kunze, E., 2011: Fluid mixing by swimming organisms in the low-Reynolds-number limit. *J. Mar. Res*., **69**, 591-601. (35)
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54. Kelly, S.M., J.D. Nash, K.I. Martini, M.H. Alford and E. Kunze, 2012: The cascade of tidal energy from low to high modes on a continental slope. *J. Phys. Oceanogr*., **42**, 1217-1232. (73)
55. Kunze, E., C. MacKay, E.E. McPhee-Shaw, K. Morrice, J.B. Girton and S.R. Terker, 2012: Turbulent mixing and exchange with interior waters on sloping boundaries. *J. Phys. Oceanogr*., **42**, 910-927. (84)

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57. Martini, K.I., M.H. Alford, E. Kunze, S.M. Kelly and J.D. Nash, 2013: Internal bores and breaking internal tides on the Oregon continental slope. *J. Phys. Oceanogr*., **43**, 120-139. (47)
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61. Waterhouse, A.F., J.A. MacKinnon, J.D. Nash, M.H. Alford, E. Kunze, H.L. Simmons, K.L. Polzin, L.C. St. Laurent, O.M. Sun, R. Pinkel, L.D. Talley, C.B. Whalen, T.N. Huussen, G.S. Carter, I. Fer, S. Waterman, A. Naveira Garabato, T. Sanford and C.M. Lee, 2014: Global patterns of mixing from measurements of the turbulent dissipation rate. *J. Phys. Oceanogr*., **44**, 1854-1872. (459)
62. Terker, S.R., J.B. Girton, E. Kunze, J.M. Klymak and R. Pinkel, 2014: Observations of the internal tide on the California continental margin north of Point Sur. *Cont. Shelf Res*., **82**, 60-71. (9)
63. Sato, M., J.M. Klymak, E. Kunze, R. Dewey and J.F. Dower, 2014: Turbulence and internal waves in Patricia Bay, Saanich Inlet, British Columbia. *Cont. Shelf Res*., **85**, 153-167. (15)
64. Frajka Williams, E., E. Kunze and J.A. MacKinnon, 2014: Bispectra of internal tides and parametric subharmonic instability. *arXiv,* 1410.0926v1. 23 pp. (4)
65. Kunze, E., J.M. Klymak, R.-C. Lien, R. Ferrari, C.M. Lee, M.A. Sundermeyer and L. Goodman, 2015: Submesoscale water-mass spectra in the Sargasso Sea. *J. Phys. Oceanogr*., **45**, 1325-1338. (31)
66. Müller, M., B.K. Arbic, J.G. Richman, J.F. Shriver, E. Kunze, R.B. Scott, A.J. Wallcraft and L. Zamudio, 2015: Toward an internal gravity-wave spectrum in global ocean models. *Geophys. Res. Lett*., **42**, doi: 10.1002/2015GL063365, 8p. (44)
67. Cole, S.T., C. Wortham, E. Kunze and W.B. Owens, 2015: Eddy stirring and horizontal diffusivity from Argo float observations: Geographic and depth variability. *Geophys. Res. Lett*., **42**, 3989-3997. doi: 10.1002/2015GL063827. (107)
68. Shcherbina, A.Y., M.A. Sundermeyer, E. Kunze, E.A. D'Asaro, G. Badin, D. Birch, A.-M.E.G. Brunner-Suzuki, J. Callies, B.T. Kuebel Cervantes, M. Claret, B. Concannon, J. Early, R. Ferrari, L. Goodman, R.R. Harcourt, J.M. Klymak, C.M. Lee, M.-P. Lelong, M.D. Levine, R.-C. Lien, A. Mahadevan, J.C. McWilliams, M.J. Molemaker, S. Mukherjee, J.D. Nash, T. Özgökmen, S.D. Pierce, S. Ramachandran, R.M. Samelson, T.B. Sanford, R.K. Shearman, E.D. Skyllingstad, K. Schafer Smith, A. Tandon, J.R. Taylor, E.A. Terray, L.N. Thomas and J.R. Ledwell, 2015: The LatMix summer campaign: Submesoscale stirring in the upper ocean. *Bull. Amer. Meteor. Soc.*, **96**, 1257-1279. (116)
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72. Kunze, E., 2017: Internal-wave-driven mixing: Global geography and budgets. *J. Phys. Oceanogr*., **47**, 1325-1345, doi: 10.1175/JPO-D-16-0141.1. (135)
73. Kunze, E., 2017: The internal-wave-driven meridional overturning circulation. *J. Phys. Oceanogr*., **47**, 2673-2689. (43)
74. MacKinnon, J.A., M.H. Alford, J.K. Ansong, B.K. Arbic, A. Barna, B.P. Briegleb, F.O. Bryan, M.C. Buijsman, E.P. Chassignet, G. Danabasoglu, S. Diggs, S.M Griffies, R.W. Hallberg, S.P. Jayne, M. Jochum, J.M. Klymak, E. Kunze, W.G. Large, S. Legg, B. Mater, A.V. Melet, L.M. Merchant, R. Musgrave, J.D. Nash, N.J. Norton, A. Pickering, R. Pinkel, K. Polzin, H.L. Simmons, L.C. St. Laurent, O.M. Sun, D.S. Trossman, A.F. Waterhouse, C.B. Whalen and Z.-X. Zhao, 2017: Climate Process Team on internal-wave-driven ocean mixing. *Bull. Amer. Meteor. Soc.*, **98**, 2429-2454. doi: BAMS-D-16-0030. (255)
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76. Kunze, E., 2019: Biologically-generated mixing in the ocean. *Ann. Rev. Mar. Sci*., **11**, 215-226. (30)
77. Kunze, E., 2019: A unified model spectrum for anisotropic stratified and isotropic turbulence in the ocean and atmosphere. *J. Phys. Oceanogr*. **49**, 385-407, doi: 10.1175/JPO-D-18-0092.1. (25)
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81. Kunze, E., J.B. Mickett and J.B. Girton, 2021: Destratification and restratification of the spring surface boundary-layer in a subtropical front. *J. Phys. Oceanogr*., **51**, 2861-2882, doi: 10.1175/JPO-D-21-0003.1. (3)
82. Vladoiu, A., R.-C. Lien and E. Kunze, 2022: Two-dimensional wavenumber spectra on the horizontal submesoscale and vertical finescale. *J. Phys. Oceanogr.*, **52**, 2008-2027, doi: 10.1175/JPO-D-21-0111.1. (1)
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86. Kunze, E., R.-C. Lien, C.B. Whalen, J.B. Girton, B. Ma and M.C. Buijsman, 2023: Seasonal variability of near-inertial/semidiurnal motions and turbulence in the sub-Arctic North Atlantic. *J. Phys. Oceanogr*., **53**, accepted, doi: 10.1175/JPO-D-22-0231.1.

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Voet, G., A.F. Waterhouse, A. Savage. E. Kunze, J.A. MacKinnon, M.H. Alford, J.A. Colosi, H.L. Simmons, T. Klenz, S.M. Kelly, J.N. Moum, C.B. Whalen, R.-C. Lien and J.B. Girton, 2023: Near-inertial energy variability in a strong mesoscale eddy field in Iceland Basin, *TOS*, submitted.

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Unrefereed Reports

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Kunze, E., 1985: Near-Inertial Wave Propagation in Geostrophic Shear. *Ph.D. thesis*, Informal Document 9-85, Applied Physics Lab, U of Washington, Seattle, WA, 90 pp.

Kunze, E., and P. Müller, 1989: The Effect of Internal Waves on Vertical Geostrophic Shear. *Parameterization of Smallscale Processes, Proceedings, 'Aha Huliko'a Hawaiian Winter Workshop*, edited by P. Müller, Hawaii Inst. Geophys., 273-287. (9)

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Lien, R.-C., E. Kunze, R. Inoue and S.-I. Ito, 2017: Intraseasonal Variations of Upper-Ocean Mixing in the Western North Pacific. JpGU Meeting, MAY 2017.

Kunze, E., 2018: A unified turbulence spectrum for the ocean and atmosphere. *Ocean Sciences*, FEB 2018, Portland, OR.

Lien, R.-C., E. Kunze, R. Inoue and S.-I. Ito, 2018: Where do wind-forced inertial waves dissipate? *Ocean Sciences*, FEB 2018, Portland, OR.

Girton, J., E. Kunze, J. Mickett and J.T. Farrar: 2018: SMILE: The Submesoscale Mixed-Layer Eddies Experiment. *Ocean Sciences*, FEB 2018, Portland, OR.

Wortham, C., M.-P. Lelong, J. Early, E. Kunze and M.A. Sundermeyer, 2018: The role of intermittency in internal-wave-driven lateral mixing. *Ocean Sciences*, FEB 2018, Portland, OR.

Sundermeyer, M.A., M.-P. Lelong, C. Wortham, J. Early and E. Kunze, 2018: Internal wave, vortical mode and their effects on submesoscale dispersion. *Ocean Sciences*, FEB 2018, Portland, OR.

Gregg, M.C., E.A. D'Asaro, J.J. Riley and E. Kunze, 2018: Mixing efficiency in the ocean. *Ocean Sciences*, FEB 2018, Portland, OR.

Kunze, E., T. Nagai, A. Tandon and A. Mahadevan, 2018: Spontaneous generation and re-absorption of internal waves in a Kuroshio Front simulation. *Modeling Imbalance in the Atmosphere and Ocean*. Banff Intl. Res. Stn., 18-23 FEB 2018.

Smirnov, A., B.N. Holden, S. Kinne, G. Stenchikov, E. Boss. T. Zielinski, V.F. Radionov, G. Zibordi, M. Ondrusek, E. Lobecker, D. Sowers, N. Nelson, S. Fiedler, M. Krinitsky, E. Kunze, S. Freeman, V. Slavakova, R. Frouin, R. Brewin, T. Smyth, J.Y. Schmale, M. Tzortziou, R. Humphries, A. van der Plas, C. Hu, J. Halla, P. Disterhoft, I. Slutsker, D.M. Giles, N.T. O'Neill and T.F. Eck, 2018: Maritime aerosol network as a component of AERONOT-current status and relevance to remote sensing. *Remote Sensing for Studying the Ocean-Atmosphere Interface SOLAS Workshop*, Potomac, MD, 13-15 MAR 2018.

McPhee-Shaw, E.E., J.-P. Xu, E. Kunze, A. Waterhouse and J. Girton, 2018: Low-mode internal tide energy loss at a canyon topographic pinch-point leads to intense stratified mixing layers and a focused region of lateral flow between near-boundary and offshore waters. 4th INCISE Symposium, 5-7 NOV, Shenzhen, China.

Lien, R.-C., and E. Kunze, 2019: Dissipation at storm-driven near-inertial waves. PAMS, Taiwan.

Kunze, E., 2019: Internal-wave-driven mixing and the meridional overturning circulation in the Pacific. OMIX, Tokyo, Japan, 23-24 MAY 2019 (invited).

Lien, R.-C., and E. Kunze, 2019: Storm-driven near-inertial waves and turbulent mixing. OMIX, Tokyo, Japan, 23-24 MAY 2019 (invited).

Kunze, E., R.-C. Lien and A. Vladoiu, 2019: Model spectra for turbulence below and above the Ozmidov wavenumber. JpGU, 26 MAY 2019 (invited).

Kunze, E., 2019: Where does turbulence begin? 22 AUG 2019, Ray Schmitt Symposium, WHOI, Woods Hole, MA.

Mickett, J., E. Kunze, J.B. Girton and J.T. Farrar, 2020: Constraining the surface boundary-layer stratification budget in the eastern North Pacific Subtropical Front. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

Essink, S., R.-C. Lien and E. Kunze, 2020: The fate of storm-generated near-inertial waves in the Kuroshio-Oyashio Confluence. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

Vladoiu, A., R.-C. Lien and E. Kunze, 2020: Submesoscale horizontal wavenumber spectra from the upper eastern North Pacific. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

Early, J.J., C. Wortham, M.-P. Lelong, M.A. Sundermeyer and E. Kunze, 2020: Lateral diffusivity from linear and nonlinear internal waves. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

McPhee-Shaw, E.E., A.F. Waterhouse, E. Kunze, J.B. Girton and J.-P. Wu, 2020: Near-boundary turbulent dissipation, suspended particle dispersal and stratified turbulent layers: A comparison of two eastern Pacific submarine canyons. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

Sundermeyer, M.A., M.-P. Lelong, E. Kunze, J.J. Early and C. Wortham, 2020: Pathways from internal-wave-driven processes to vortical mode and submesoscale dispersion. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

Avila, B., M.A. Sundermeyer, M.-P. Lelong, E. Kunze, J.J. Early and C.J. Wortham, 2020: Stratification anomalies in the ocean interior. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

Khani, S., J.B. Girton, E. Kunze, J. Mickett and J.T. Farrar, 2020: Submesoscale horizontal structure of upper-ocean velocity and density. *Ocean Sciences Meeting*, AGU, San Diego, CA, 16-21 FEB 2020.

Wu, Y.C., A. Mahadevan, E. Kunze and A. Tandon, 2020: Lee waves in shear flow. APS DFD Conference, 23 NOV 2020, 8 pp.

Essink, S., R.-C. Lien and E. Kunze, 2021: Near-inertial wave-modulated turbulence in a Kuroshio anticyclonic eddy. EGU, Vienna, 26 APR 2021.

Takahashi, A., R-C. Lien, E. Kunze, H. Nakamura and R. Inoue, 2021: Energetic turbulence and internal waves in Tokara Strait. JpGU, Yokohama, Japan, 3-6 JUN 2021.

Vladoiu, A., R.-C. Lien and E. Kunze, 2021: 2D horizontal-vertical wavenumber spectra of density finestructure from a towed CTD chain. JpGU, Yokohama, Japan, 3-6 JUN 2021.

Essink, S., R.-C. Lien and E. Kunze, 2021: Near-inertial wave modulated turbulence in a Kuroshio anticyclonic eddy. JpGU, Yokohama, Japan, 3-6 JUN 2021.

Kunze, E., R.-C. Lien, C. Wu, A. Mahadevan and A. Tandon. 2022: Energy exchange between internal gravity waves and balanced flow: Wave action conservation and a path to dissipation. *Ocean Sciences*, 27 FEB-4 MAR.

Vladoiu, A., R.-C. Lien and E. Kunze 2022: Two-dimensional wavenumber spectra on the horizontal submesoscale and vertical finescale. *Ocean Sciences,* 27 FEB-4 MAR.

Takahashi, A., R.-C. Lien, E. Kunze, H. Nakamura, R. Inoue and E. Tsutsumi, 2022: Energetic turbulence and nonlinear internal waves in Tokara Strait. *Ocean Sciences*, 27 FEB-4 MAR.

Wu, C., E. Kunze, A. Tandon and A. Mahadevan, 2022: Reabsorption of lee-wave energy in bottom-intensified currents. *Ocean Sciences*, 27 FEB-4 MAR.

Moulin, A., J. Girton, J. Mickett and E. Kunze, 2022: Splitting of a low-salinity intrusion reveals cross-front exchange. *Ocean Sciences*, 27 FEB-4 MAR.

Wu, Y., E. Kunze, A. Mahadevan and A. Tandon, 2022: Gravity-wave emission from a lee-wave critical layer. *SPARC Gravity Wave Symposium*, 28 MAR-1 APR, Frankfurt.

Takahashi, A., R.-C. Lien, E. Kunze, H. Nakamura, R. Inoue and E. Tsutsumi, 2022: Energetic turbulence and nonlinear internal waves in Tokara Strait. *JpGU*, 22 MAY-2 JUN, Japan.

Essink, S., A. Vladoiu, B. Ma, R.-C. Lien, E. Kunze and Y.J. Yang, 2022: Towed-chain observations of KH billows over a Kuroshio seamount. *Turbulent Mixing in the Kuroshio Current over Topography* online meeting, 6 JUN 2022, Kyushu, Japan.

Takahashi, A., R.-C. Lien, E. Kunze, H. Nakamura, R. Inoue and E. Tsutsumi, 2022: Energetic turbulence and internal waves generated by the Kuroshio flowing over a small seamount. *Gordon Ocean Mixing Conference*, 5-10 JUN, Mt. Holyoke College, MA.

Kunze, E., R.-C. Lien, B. Ma, C.B. Whalen and J.B. Girton, 2022: NISKINE EM float half-inertial period pairs. ONR NISKINE Workshop, DC, AUG 2022.

Kunze, E., A. Takahashi and R.-C. Lien, 2022: Hirase parameter space and lee waves. *Kuroshio Interaction with Tokara Strait Topography* (KITTY). 9 NOV, Kagoshima, Japan.

Takahashi, A., R.-C. Lien, E. Kunze, B. Ma, H. Nakamura, A. Nishina, E. Tsutsumi, R. Inoue, T. Nagai and T. Endoh, 2022: Energetic stratified turbulence generated by Kuroshio-seamount interaction in Tokara Strait. *Kuroshio Interaction with Tokara Strait Topography* (KITTY). 9 NOV, Kagoshima, Japan.

Lien, R.-C., A. Vladoiu, S. Essink, E. Kunze MORE, 2022: Nonlinear lee waves and KH billows generated by Kuroshio-seamount interaction. *Kuroshio Interaction with Tokara Strait Topography* (KITTY). 9 NOV, Kagoshima, Japan.

Wu, Y., E. Kunze, A. Mahadevan and A. Tandon, 2023: Gravity-wave emission from lee-wave critical layers and energy budgets. *EGU*, 23-28 APR, Vienna.

Kunze, E., R.-C. Lien, C. Wu, A. Takahashi, A. Tandon and A. Mahadevan, 2023: Wave action conservation E/ω_L and lee waves. *Workshop on Turbulent Mixing in and around the Kuroshio*. 4 JUN, Kagoshima, Japan.

Lien, R.-C., A. Vladoiu, S. Essink, E. Kunze, B. Ma, Y.J. Yang, M.-H. Chang, S. Jan, J.-L. Chen and A. Hsu, 2023: Nonlinear lee wave and KH billow generated by Kuroshio-seamount interaction. *Workshop on Turbulent Mixing in and around the Kuroshio*. 4 JUN, Kagoshima, Japan.

Thomas, L.N., J.N. Moum, L.-X. Qu, J. Hilditch, E. Kunze and L. Rainville, 2024: Blocked drainpipes and smoking chimneys–Discovery of new near-inertial wave phenomena in anticyclones. *Ocean Sciences*, FEB 2024, New Orleans.

Takahashi, A., R.-C. Lien, E. Kunze, B. Ma, H. Nakamura, A. Nishina, E. Tsutsumi, R. Inoue, T. Nagai and T. Endoh, 2024: Energetic stratified turbulence generated by Kuroshio-seamount interactions in Tokara Strait. *Ocean Sciences*, FEB 2024, New Orleans.

Vladoiu, A., R.-C. Lien, E. Kunze, B.B. Ma, S. Essink, Y.J. Yang, M.-H. Chang and J.-L. Chen, 2024: Towed CTD chain surveys of Kelvin-Helmholtz instabilities at a Kuroshio seamount. *Ocean Sciences*, FEB 2024, New Orleans.

Professional Activities

editor, *Journal of Marine Research* 1990 - 2003
member SCOR WG 108 on Double Diffusion -- 1996 - 2003
Student Ombudsman, School of Oceanography, U of Washington, 1992 - 2004
Chair, Ocean Physics Dept, Applied Physics Lab, U of Washington, 2002-2003
Participant, Bathymetry from Space Workshop, Scripps, 24-26 OCT 2002
(www.igpp.ucsd.edu/bathymetry_workshop)
Garrett Symposium organizing committee member, 2008.
CNC/SCOR eastern Canada 9-institute lecture tour, OCT 2008
"Ocean Abyssal Mixing and the Meridional Overturning Cell"
editor *Journal of Physical Oceanography*, 2009 – 2013.
Science Communication Fellow, Pacific Science Center., 2012 – 2020.
"The Influence of Polar Seas on the Global Ocean".

postdoctoral research co-advisor – Anne Takahashi (2020 - 23)
postdoctoral research co-advisor – Aurelie Moulin (2020 - 22)
postdoctoral research co-advisor – Sebastian Essink (2019 - 23)
postdoctoral research co-advisor – Anda Vladiou (2019 - 23)
postdoctoral research co-advisor – Cynthia Yue Wu (2020 - 23)
postdoctoral research co-advisor – Sina Khani (2020 - 21)
postdoctoral research advisor – Cimmaron Wortham (2013 - 16)
graduate student committee member -- Halley Dosser (PhD 2015)
graduate student committee member -- Byron Kilbourne (PhD 2015)
honors thesis supervisor -- Patrick Conley (2011)
graduate student advisor -- Susan Barton (pre-doc 2010)
NSERC USRA supervisor -- Sara Fissel (summer 2010)
undergrad supervisor -- Emery Hartley (summer 2010)
graduate student co-advisor -- Mei Sato (PhD 2013)
"Variability in Diel Vertical Migration of Zooplankton and Characteristics of the Physical Environments in Saanich Inlet, British Columbia"
undergrad co-supervisor -- Evan Maynard (summer 2008)
graduate student co-advisor -- Jeannette Bedard (Masters 2011)
"Tidal Interactions with Local Topography Above a Sponge Reef"
NSERC USRA supervisor -- Cassandra Rosa (summer 2007)
graduate student co-advisor -- Shani Rousseau (Masters 2009)
"Influence of Swimming Marine Organisms on Turbulence in the Ocean from In Situ Measurements"
graduate student committee member -- Philip Benoit (PhD candidate 2004-2012)
graduate student committee member -- Wendy Callendar (Masters 2009)
graduate student advisor -- Reyna Jenkyns (Masters 2009)
"Momentum Transfer Between Semidiurnal Internal Waves and Subinertial Flow at a Dissipating Surface Reflection"
graduate student committee member -- Dilumie Abeysirigunawardena (PhD candidate)
graduate student collaboration -- Sam Kelly (OSU PhD 2010)
graduate student committee member – Katie Morrice (Moss Landing, Masters 2011)
graduate student committee member -- Samantha Terker (PhD 2012)
graduate student committee member -- Eleanor Frajka Williams (PhD 2009)

graduate student committee member -- Kim Martini (PhD 2010)
graduate student committee member -- Wayne Martin (PhD 2008)
external examiner -- Steve Jachec, Stanford University, CA (PhD 2007)
graduate faculty representative -- Else Shoop (Masters 2006 Psychology)
graduate advisory committee member -- Maya Whitmont (Masters 2006)
graduate faculty representative -- Andrey Skvortsov (Masters 2005)
graduate student committee member -- Irene Garcia Berdeal (PhD 2005)
visiting graduate student co-advisor -- Bruno Gomez visiting (PhD candidate 2005)
graduate student advisor -- Eleanor Frajka Williams (Masters 2005)
graduate student committee member -- Glenn Stuart Carter (PhD 2005)
graduate student acting advisor -- Marlene Jeffries (Masters 2004)
graduate student committee member -- Abdullah Bamasoud (Masters 2004)
graduate faculty rep -- Melanie Francis Fitzpatrick (- 2004, PhD candidate, Geophys.)
graduate faculty rep -- Mark Kenyon Renner (- 2004, PhD candidate, Music)
graduate student committee member -- Tina M. Drexler Lomnicky (Masters 2004)
graduate student committee member -- John Mickett (- 2004 PhD candidate)
graduate student committee member -- Jen MacKinnon (PhD 2002)
graduate student committee chairman -- Alana Althaus (Masters 2001)
"Internal Tide Radiation from Mendocino Escarpment"
--winner of 1st annual Dean A. McManus Excellence in Teaching Award, 2002
graduate student committee co-chair -- Erika McPhee-Shaw (PhD 2000)
graduate faculty representative -- Brooke Skelton (PhD1999)
external examiner -- Brian May, Dalhousie University, PhD thesis 1999
graduate faculty representative -- Blake Charles Chenevert (PhD 1998)
graduate faculty representative -- Neill Phillip Symons (PhD 1998)
graduate student committee chairman -- Sun Haili (PhD 1997)
"Ray-Tracing Internal Wave/Wave Interactions and Spectral Energy Transfer"
graduate student committee member -- Emmanuel Boss (PhD 1996)
graduate student committee member -- Daniel Codiga (PhD 1996)
graduate faculty representative -- Donald Slinn (PhD 1995)
graduate student committee member -- Craig Lee (PhD 1995)
graduate student committee chairman -- Joanna Muench (PhD 1995)
"Internal Wave Interactions with Equatorial Deep Jets"
graduate faculty representative -- Jen-E Wu (PhD 1995)
graduate student committee member -- Holly Fair (Masters 1994)
graduate student committee member -- Tracy Petroske (Masters 1993)
graduate student committee member -- Mark Prater (PhD 1991)
graduate student committee member -- Joel Wesson (PhD 1991)
graduate faculty representative -- Pascale Lelong (PhD 1988)
graduate student committee member -- Norge Larson (PhD 1987)
postdoctoral research advisor – Kurt Polzin (1993)
postdoctoral research advisor – Jonathan Nash (2001 - 2003)
postdoctoral research co-advisor – Ryuichiro Inoue (2004 - 2006)
lecturer WHOI summer GFD program, Summer 1987, 1995, 2010.
taught 3-credit advanced graduate course "Internal Waves in an Inhomogeneous Ocean" Autumn 1990, Winter 1998, Spring 2003, Winter 2011.
taught 3-credit core graduate course "Waves in the Ocean" Spring 1993.

taught 3-credit advanced graduate course "Upper-Ocean Dynamics" Spring 1995, Spring 1999, Winter 2001
taught 5-credit graduate core course Ocean 510 "The Physics of Ocean Circulation" Autumn 1995
taught UVic Physics 426 "Fluid Mechanics", Autumn 2005, 2006, 2007, 2008, 2009, 2010.
co-taught UVic EOS 350 "Understanding the World's Oceans", Autumn 2005, 2006
co-taught UVic EOS 534 "Ocean Mixing", Winter 2007
supervisor, CR/NC Ocean 519A "Student Seminar Series", Autumn, 1996
guest lecturer in EOS 525 “Research Frontiers in Earth and Ocean Science”, Autumn 2004
cited in *Science* Research News article (Kerr, R.A., 1997: Geophysicists Peer into Fiery Core and Icy Ocean Depths. *Science*, **275**, 160-161.)

Organizations
fellow American Geophysical Union
member American Meteorological Society

Current and Pending Funding

92. NSF

1. Collaborative Research: Lee Waves and Turbulence Forced by the Kuroshio (KITTY) (in collaboration with Ren-Chieh Lien and Anne Takehashi, APL-UW) (PIN 7860848/1306)
2. OCE-1829190 (NWRA G540P - Tokara)
3. 1 JAN 2019 - 31 DEC 2023.
4. $486,869 (NWRA component)
5. 1-, 3-, 3- , 3- and 3-mm effort for E. Kunze in years 1, 2, 3, 4 and 5.
6. Deployment of line arrays of 10 chi-augmented EM-APEX profiling floats in the Kuroshio upstream of Hirase Seamount in Tokara Strait to be advected bo be advected downstream to study nonlinear flow/topography interactions with a focus on modification of the internal-wave field and dissipative losses in the wake of the seamount.

93. NSF

1. Collaborative Research: Kelvin-Helmholtz Instabilities at a Kuroshio Seamount (KHIKS)
   (in collaboration with Anda Vladoiu, Sebastian Essink, Ren-Chieh Lien, APL-UW) (PIN 7778)
2. OCE-2048554 (NWRA P676)
3. 1 AUG 2021 - 31 JUL 2025.
4. $219,932 (NWRA component)
5. 2-, 2-, 1- and 1-mm effort for E. Kunze in years 1, 2, 3 and 4.
6. Kelvin-Helmholtz instabilities will be measured with shipboard along- and across-flow surveys using a towed CTD chain, ADCPs and echosounder to determine their vertical, along- and across-stream structure as the instabilities evolve downstream of a seamount in the path of the Kuroshio east of Taiwan. 60-m tall billows have been observed in this region. These data will be used to determine the downstream evolution of density overturn scales, as well as along- and across-stream lengthscales to infer turbulence production for comparison with realistic numerical simulations and microstructure profiling being conducted by Taiwanese colleagues. The downstream evolution of water-mass variability will be used to infer diapycnal diffusivities.

94. NSF

1. Collaborative Research: Modeling Near-Inertial Waves from Cradle to Grave [in collaboration with Pascale Lelong (NWRA), Kraig Winters (UCSD)] (PIN)
2. OCE-2068285 (NWRA P675)
3. 1 MAR 2021 - 28 FEB 2025.
4. $700,510 (NWRA component)
5. 2-, 1-, 1- and 2-mm effort for E. Kunze in years 1, 2, 3 and 4.
6. Nested numerical modelling to track the lifetime of wind-forced near-inertial waves from cradle to grave, i.e., from wind generation in the surface mixed-layer through refraction and trapping by a baroclinic anticyclone, downward radiation into the pycnocline, critical-layer amplification at the vortex base, instability producing turbulence, and the cascade to dissipation. The nested models will allow an

oceanographically realistic forward energy cascade from the meso- to turbulent scales to be studied in detail.

95. NSF
1. Collaborative Research: Lee Waves and Sheared Mean Flow: Interactions and Impacts of Topography (Son of Lee)
   [in collaboration with Cynthia Yue Wu (U Michigan), Amala Mahadevan (WHOI) and Amit Tandon (U Mass Dartmouth)] (PIN 42058)
2. OCE-2148405 (NWRA 21-P729; 2148403 all, 2148404 WHOI)
3. 1 MAR 2022 - 28 FEB 2025.
4. $287,769 (NWRA component)
5. 2-, 2- and 3-mm effort for E. Kunze in years 1, 2 and 3.
6. Numerical modeling of lee-wave generation in a more realistic setting that OCE-1756093 with broadband bathymetry including subinertial wavenumber ($|kU| < |f|$) features that can block, split and steer the subinertial flow and impact lee-wave generation in the lee-wave band ($|f| < |kU| < N$), and their subsequent propagation, interaction, exchange and dissipation in a bottom-intensified jet.

96. NSF
1. Collaborative Research: Nonlinear Wake Observations at a Kuroshio Seamount (NOKS) [in collaboration with Ren-Chieh Lien and Anda Vladoiu (APL-UW), Anne Takahashi (U Tokyo)]
2. OCE-2318952 (NWRA G799P)
3. 1 JAN 2024 - 31 DEC 2025.
4. $181,378 (NWRA component)
5. 2- and 2-mm effort for E. Kunze in years 1 and 2.
6. Data analysis and interpretation of full-depth EM profiling float box arrays, and 3-D shipboard ADCP, underway CTD and underway VMP surveys in the wake of Hirase Seamount in Tokara Strait where $\delta_f = |\mathbf{V}_h|/f > 1$, $\delta_N = |\mathbf{V}_z|/N \sim 1$ and diapycnal diffusivities $K \sim 10^{-2}$ m^2 s^{-1}. The focus will be on the nonlinear dynamics and instability mechanisms responsible for turbulence production.

Research Cruises

1. Student assistant on mooring deployment cruise on Oregon shelf, *Wecoma*, Barbara Hickey, chief scientist, OCT 1980.
2. Deployed XCPs in a Gulf Stream warm-core ring, *Bartlett*, Mike Gregg, chief scientist, JAN 1983.
3. Deployed XCPs in a Gulf Stream cold-core ring, *Lynch*, Tom Sanford, chief scientist, DEC 1983.
4. Deployed XCPs above Pioneer Seamount and in OPTIMA domain, *McArthur*, SEP 1984.
5. Assisted in test deployment of Richardson-number measuring float, *Knorr*, JUL 1987.
6. Deployed XCPs in the wake of Ampere Seamount and in the Mediterranean Outflow plume south and west of Portugal, *Oceanus*, Tom Sanford, chief scientist, SEP 1988.
7. Deployed XCPs in a Gulf Stream warm-core ring, *Oceanus*, Ray Schmitt, chief scientist, JAN 1990.

8. Deployed XCPs over Fieberling Guyot, *New Horizon*, John Toole, chief scientist, APR 1991.
9. Deployed XCPs, XCTDs and XDPs in Monterey Submarine Canyon, *Point Sur*, Mike Gregg, chief scientist, AUG 1997.
10. Deployed XCPs, made CTD casts and analysed AVP data across Mendocino Escarpment, *Wecoma*, Tom Sanford and Eric Kunze, co-chief scientists, OCT 1997.
11. Deployed XCPs and XCTDs on Virginia continental slope, *Oceanus*, Kurt Polzin, chief scientist, MAY 1998.
12. Deployed XCPs, made CTD casts and analysed AVP data along the Hawaiian Ridge, *Wecoma*, Tom Sanford, Craig Lee and Eric Kunze, co-chief scientists, OCT 2000.
13. Deployed XCPs and analysed AVP data along the Hawaiian Ridge, *Wecoma*, Tom Sanford, Craig Lee and Eric Kunze, co-chief scientists, OCT 2002.
14. Participation in one-day instrument test cruise in Saanich Inlet, *Strickland*, Lou St. Laurent, chief scientist, FEB 2005.
15. Participation in four-day instrument test cruise between Oahu and Molokai, *Wecoma*, Jonathan Nash, chief scientist, FEB 2005.
16. 3-day VMP test cruise in Saanich Inlet, Strickland, Eric Kunze, chief scientist, APR 2005.
17. Deployed XCPs and analysed data on Oregon continental slope, *Wecoma*, Jonathan Nash, chief scientist, SEP 2005.
18. 3-day VMP test cruise in Saanich Inlet, *Strickland*, Eric Kunze, chief scientist, JUN 2006.
19. 1-week VMP cruise off Point Sur, CA (AESOP), *Point Sur*, James Girton, chief scientist, AUG 2006.
20. 2-day VMP cruise in Saanich Inlet (ZOOM07), *Strickland*, Eric Kunze, chief scientist, MAY 2007.
21. 3-week VMP cruise to Ocean Station Papa (ZOOM07), *CCGS Tully*, Marie Robert, chief scientist, JUN 2007.
22. 1-day new Hammerhead towed body test cruise in Saanich Inlet, *Strickland*, Rolf Lueck, chief scientist, OCT 2007.
23. 2-week VMP, Hammerhead and ADCP cruise to survey Fraser Ridge in the Strait of Georgia , *CCGS Vector*, Eric Kunze and Richard Dewey, co-chief scientists, NOV 2007.
24. 2-day VMP cruise in Saanich Inlet (ZOOM08), *Strickland*, Shani Rousseau, chief scientist, MAY 2008.
25. 2-week VMP cruise to Monterey Submarine Canyon, *Point Sur*, Eric Kunze, Erika McPhee-Shaw and James Girton, co-chief scientists, AUG 2008.
26. 9-day Hammerhead/dye-release and -tracking cruise in Saanich Inlet, *Strickland*, Eric Kunze and Richard Dewey, co-chief scientists, MAY 2009.
27. 1-day VMP cruise in Saanich Inlet, *Strickland*, Eric Kunze, chief scientist, JUL 2009.
28. 2-day EM APEX float test cruise in Saanich Inlet, *Strickland*, Eric Kunze, chief scientist, AUG 2009.
29. 4-day mooring deployment on Fraser Ridge and VMP test cruise in Saanich Inlet, *Strickland*, Eric Kunze, Jeannette Bedard and Richard Dewey, chief scientists, JUN 2010.
30. 7-day VMP sampling in Barkley Canyon as part of Coastal Carbon 2010 cruise, *Tully*, Debby Ianson, chief scientist, AUG 2010.

31. 5 1-day mooring deployment and recovery cruises in Strait of Georgia and Saanich Inlet (ZOOM10+), *Strickland*, Eric Kunze, Mei Sato, Jeannette Bedard and Richard Dewey chief scientists, AUG-SEP 2010.
32. 5 1-day Hammerhead test cruise and sampling water-mass finestructure in Saanich Inlet, *Strickland*, Eric Kunze, chief scientist, APR 2011.
33. 3-week Hammerhead cruise as part of ONR's Lateral Stirring DRI, *R/V Oceanus*, Craig Lee, chief scientist, JUN 2011.
34. 8-day cruise to deploy 6 chi-augmented EM-APEX profiling floats with R.-C. Lien, *R/V Shinsei-maru*, Shin-ichi Ito, chief scientist, AUG 2016.
35. 5-week cruise to examine surface mixed-layer restratification using SWIMS and EM-APEX floats with James Girton, John Mickett and Tom Farrar, *R/V Sikuliaq*, James Girton, chief scientist, MAR 2017.
36. 10-day cruise to deploy 7 chi-augmented EM-APEX profiling floats with R.C. Lien, *R/V Shinsei-maru*, Shin-ichi Ito, chief scientist, AUG 2017.
37. 21-day cruise deploying towed CTD chain, EM floats, 2 drifters and using shipboard 75- and 300-kHz ADCP, *R/V Oceanus*, Ren-Chieh Lien, chief scientist, JUL 2018.
38. 10-day cruise deploying 10 EM-APEX profiling floats and 2 ADCP/CTD moorings with R.-C Lien, *R/V Kagoshima-maru*, Hirohiko Nakamura, chief scientist, NOV 2019.
39. 7-day cruise deploying 8 EM-APEX profiling floats with R.-C. Lien and A. Takahashi, *R/V Kagoshima-maru*, Hirohiko Nakamura, chief scientist, JUN 2023.