

CURRICULUM VITAE

Kelvin J Richards

1 PERSONAL INFORMATION

Name: RICHARDS Kelvin John

Address:

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School of Ocean and Earth Science and Technology
University of Hawai'i at Mānoa
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USA

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2 PRESENT APPOINTMENT

Position: Professor and Director (since July 2014)

Institution:

International Pacific Research Center
and Department of Oceanography
School of Ocean and Earth Science and Technology
University of Hawai'i at Mānoa

Date of appointment: 1 September 2002

3 PREVIOUS APPOINTMENTS

Dates from to		Appointment
1.1.78	5.31.80	Royal Society Ernest Cook Trust Fellowship, Department of Applied Mathematics and Theoretical Physics, University of Cambridge.
6.1.80	8.31.85	Senior Scientific Officer, Institute of Oceanographic Sciences, Wormley.
9.1.85	8.30.95	Lecturer, University of Southampton, UK
9.1.95	6.30.99	Senior Lecturer, University of Southampton, UK
7.1.99	8.30.02	Reader, University of Southampton, UK

4 QUALIFICATIONS

Date	Title of Award	Subject	Awarding Body
1974	B.Sc.	Mathematics	Univeristy of Exeter
1975	M.Sc.	Applied Mathematics	Univeristy of Exeter
1978	Ph.D.	Oceanography	University of Southampton

5 GRADUATE AND POSTDOCTORAL SUPERVISION

5.1 Completed PhD students (completion date)

Bablu SINHA (1992), Tom HAINE(1992), Claire SMITH (nee Burren) (1993), Kyung-Il CHANG (1995), Mark INALL (1995), Peter LANCASTER(1995), Duncan BALDWIN (1995), Ian UDALL (1995), Sheldon BACON (1995), John ALLEN (1996), Helene BANKS (1996), Rui QUENTAL–MENDES(1996), Ian THOMAS(1997), Steven SPALL(1997), Stuart BRENTNALL(1999), John HEMMINGS (2000), Andreas THURNHERR (2000), Rodney JOHNSON (2002), Luciano PEZZI (2003), Alessio BELLUCCI (2004), Anna PIRANI (2004), Paula McLEOD (2004), Paulo CALIL (2009), Ana Carolina VAZ (2012), Saulo SOARES (2015)

5.2 Current graduate students (advisor)

None

5.3 Postdoctoral fellows

Yanli JIA (1989–1990)
Vladimir IVCHENKO (1991–1997)
Mai Mai LAM (1994–1998)
Adrian MARTIN (1995–1999)
Neil EDWARDS (1996–2000)
Stuart BRENTNALL (2000–2002)
Andrei NATAROV (2004–2007)
Elodie MARTINEZ (2006–2007)
Shin KIDA (2007–2008)
Francois ASCANI (2009–2014)
Miho ISHIZU (2010–2013)
Saulo SOARES (2015–present)

6 TEACHING

Current courses taught:

- OCN620 Physical Oceanography (lead instructor)
- OCN760 Tracers: their dispersion, transport and reaction (sole instructor)
- OCN665 Small-scale air-sea interactions (lead instructor)

7 RESEARCH

7.1 Publications

Published in refereed journals:

(* PhD student supervised by me; †postdoc supervised by me)

- [97] Youngs M. K., A. F. Thompson, A. Lazar and K. J. Richards (2107) ACC meanders, energy transfer and mixed barotropic-baroclinic instability. *J. Phys. Oceanogr.*, 47(6), 1291-1305, doi:10.1175/JPO-D-16-0160.1
- [96] Richards K. J. (2017) Viral infections of oceanic plankton blooms. *J. Theoretical Biology*, 412, 27-35 doi:10.1016/j.jtbi.2016.09.022
- [95] Soares S. M.[†], A. Natarov and K. J. Richards (2016) Internal swells in the tropics: Near-inertial wave energy fluxes and dissipation during CINDY. *J. Geophys. Res.*, 121, 3297-3324, doi: 10.1002/2015JC01160.
- [94] Thurnherr A. M., E. Kunze, J. M. Toole, L. St Laurent, K. J. Richards, A. Ruiz-Angulo (2105) Vertical kinetic energy and turbulent dissipation in the ocean. *Geophys. Res. Lett.*, 42, 7639–7647.
- [93] Natarov, A., and K. J. Richards (2015). Persistent presence of small vertical scale velocity features during three-dimensional equilibration of equatorial inertial instability. *Physics of Fluids*, 27 (8), 84109, doi:10.1063/1.4928319.
- [92] Wilson Samuel T., Benedetto Barone, Francois Ascani, Robert R Bidigare, Matthew J Church, Daniela A Valle, Sonya T Dyhrman, Sara Ferrn, Jessica N Fitzsimmons, Laurie W Juranek, Zbigniew S Kolber, Ricardo M Letelier, Sandra MartnezGarca, David P Nicholson, Kelvin J Richards, Yoshimi M Rii, Mnica Rouco, Donn A Viviani, Angelicque E White, Jonathan P Zehr, David M Karl (2015) Short-term variability in euphotic zone biogeochemistry and primary productivity at Station ALOHA: A case study of summer 2012. *Global Biogeochemical Cycles*, 29, 1145-1164.
- [91] Richards K. J., A. Natarov, E. Firing, Y. Kashino, S. M. Soares, M. Ishizu, G. S. Carter, J. H. Lee and K. I. Chang (2015) Shear-generated turbulence in the equatorial Pacific produced by small vertical scale flow features. *J. Geophys. Res.* 120, doi: 10.1002/2014JC010673.
- [90] Ishizu M., C. Sukigara, T. Suga and K. J. Richards (2015) Estimating the nitrate concentration from the dissolved oxygen concentration and seawater temperature

- in the Kuroshio extension, Oyashio, and mixed water regions. *J. Oceanography*, 71, 19–26
- [89] Sasaki W., T. Doi, K. J. Richards and Y. Masumoto (2015) The influence of ENSO on the equatorial Atlantic precipitation through the Walker circulation in a CGCM. *Climate Dynamics*, 44, 191–202
- [88] Furue R., Y. Jia, J. P. McCreary, N. Schneider, K. J. Richards, P. Muller, B. D. Cornuelle, N. Martnez Avellaneda, D. Stammer, C. Liu, A. Kohl (2015) Impacts of regional mixing on the temperature structure of the equatorial Pacific Ocean. Part 1: vertically uniform vertical diffusion. *Ocean Modelling*, 91, 91-111.
- [87] Lee C., K–I Chang, J. H. Lee and K. J. Richards (2014) Vertical mixing due to double diffusion in the tropical western Pacific. *Geophys. Res. Lett.*, 41, 7964-7970, doi:10.1002/2014GL061698.
- [86] Ganachaud A., S. Cravatte, A. Melet, A. Schiller, N. J. Holbrook, B. M. Sloyan, M. J. Widlansky, M. Bowen, J. Verron, P. Wiles, K. Ridgway, P. Sutton, J. Sprintall, C. Steinberg, G. Brassington, W. Cai, R. Davis, F. Gasparin, L. Gourdeau, T. Hasegawa, W. Kessler, C. Maes, K. Takahashi, K. J. Richards and U. Send (2014) The Southwest Pacific Ocean circulation and climate experiment (SPICE). *J. Geophys. Res.* 119 doi: 10.1002/2013JC009678
- [85] Robidart J. C., M. J. Church, J. P. Ryan, F. Ascani, S. T. Wilson, D. Bombar, R. Martin III, K. J. Richards, D. M. Karl, C. A. Scholin and J. P. Zehr (2014) Ecogenomic sensor reveals controls on N₂-fixing microorganisms in the North Pacific Ocean. *ISME Journal*, 8 (6), 1175–1185, doi: 10.1038/ismej.2013.244
- [84] Sasaki W., T. Doi, K. J. Richards and Y. Masumoto (2014) Impact of the equatorial Atlantic sea surface temperature on the tropical Pacific in a CGCM. *Climate Dynamics*, 43, 2539–2552.
- [83] Seiki A., M. Katsumata, T. Horii, T. Hasegawa, K. J. Richards, K. Yoneyama, and R. Shirooka (2013) Abrupt cooling associated with the oceanic Rossby wave and lateral advection during CINDY2011. *J. Geophys. Res.* 118, 5523-5535, doi: 10.1002/jgrc.20381
- [82] McCreary, J.P., Z. Yu, R.R. Hood, P.N. Vinayachandran, R. Furue, A. Ishida, and K.J. Richards (2013) Dynamics of the Indian-Ocean oxygen minimum zones. *Prog. Oceanogr.*, 112-113, 15-37, doi:10.1016/j.pocean.2013.03.002.

- [81] Ishizu M.[†] and K. J. Richards (2013) Relationship between oxygen, nitrate, and phosphate in the world ocean based on potential temperature. *J. Geophys. Res.* 118, 19, doi:10.1002/jgrc.20249
- [80] Soares, S* and K. J. Richards (2013) Radiation of inertial kinetic energy as near-inertial waves forced by tropical Pacific Easterly Waves. *Geophys. Res. Lett.* 40, 17601765, doi:10.1002/grl.50387
- [79] Vaz, A*, K. J. Richards and C. Paris (2013) Mesoscale flow variability and its impact on connectivity for the island of Hawai'i. *Geophys. Res. Lett.*, 40, 332337, doi:10.1029/2012GL054519
- [78] Ascani, F[†], K. J. Richards, E. Firing, S. Grant, K. S. Johnson, Y. Jia, R. Lukas and D. M. Karl (2013), Physical and biological controls of nitrate concentration in the upper North Pacific subtropical ocean, *Deep Sea Research II*, 93, 119134
- [77] Sasaki, W, K. J. Richards and J.-J. Luo (2013) Impact of vertical mixing induced by small vertical scale structures above and within the equatorial thermocline on the tropical Pacific in a CGCM, *Climate Dynamics* DOI 10.1007/s00382-012-1593-8.
- [76] Sasaki, W, K. J. Richards and J.-J. Luo (2012) Role of vertical mixing originating from small vertical scale structures above and within the equatorial thermocline in an OGCM, *Ocean Modelling*, 57-58, 29-42.
- [75] Jia, Y., G.C. Nihous and K.J. Richards (2012) Effects of ocean thermal energy conversion systems on near and far field seawater properties: a case study for Hawaii, *J. Renewable and Sustainable Energy*, 4, 063104, doi: 10.1063/1.4766820.
- [74] Guidi, L., P.H.R. Calil, S. Duhamel, K.M. Bjorkman, S.C. Doney, G.A. Jackson, B. Li, M.J. Church, S. Tozzi, Z.S. Kolber, K.J. Richards, A.A. Fong, R.M. Letelier, G. Gorsky, L. Stemann, and D.M. Karl (2012) Does eddy-eddy interaction control surface phytoplankton distribution and carbon export in the North Pacific Subtropical Gyre?, *J. Geophys. Res. Biogeosci.*, 117, G02024, doi:10.1029/2012JG001984.
- [73] Sasai Y, K. J. Richards, A. Ishida, H. Sasaki (2012) Spatial and temporal variabilities of the chlorophyll distribution in the northeastern tropical Pacific: The impact of physical processes on seasonal and interannual time scales. *J. Marine Systems*, 96-97, 24-31.
- [72] Richards K. J., Y. Kashino, A. Natarov, and E. Firing (2012) Mixing in the western equatorial Pacific and its modulation by ENSO, *Geophys. Res. Lett.*, 39, L02604, doi:10.1029/2011GL050439.

- [71] Jia Y, P. H. R. Calil, E. P. Chassignet, E. J. Metzger, J. T. Potemra, K. J. Richards, A. J. Wallcraft (2011) Generation of mesoscale eddies in the lee of the Hawaiian Islands, *J. Geophys. Res.*, 116, C11009, doi: 10.1029/2011JC007305.
- [70] Thompson, A. F., and K. J. Richards (2011), Low frequency variability of Southern Ocean jets, *J. Geophys. Res.*, 116, C09022, doi:10.1029/2010JC006749.
- [69] Aiki H., K. J. Richards and H. Sakuma (2011), Maintenance of the mean kinetic energy in the global ocean by the barotropic and baroclinic energy routes. *Ocean Dynamics*, 61, 675-700.
- [68] Thompson, A. F., P. H. Haynes, C. Wilson, and K. J. Richards (2010), Rapid Southern Ocean front transitions in an eddy-resolving ocean GCM, *Geophys. Res. Lett.*, 37, L23602, doi:10.1029/2010GL045386.
- [67] Sasai Y., K. J. Richards, A. Ishida, and H. Sasaki (2010), Effects of cyclonic mesoscale eddies on the marine ecosystem in the Kuroshio Extension region using an eddy-resolving coupled physical-biological model. *Ocean Dynamics*, 60, 693-704.
- [66] Martinez E.[†], and K. J. Richards (2010), Impact of spatio-temporal heterogeneities and lateral stirring and mixing on mid-water biotic interactions. *J. Marine Systems*, 82, 122-134.
- [65] Calil P. H. R.*. and K. J. Richards (2010), Transient upwelling hot spots in the oligotrophic North Pacific. *J. Geophys. Res.*, 115, C02003, doi:10.1029/2009JC005360.
- [64] Kida S.[†] and K. J. Richards (2009), Seasonal sea surface temperature variability in the Indonesian Seas. *J. Geophys. Res.*, 114, C06016, doi:10.1029/2008JC005150.
- [63] Richards K. J., S.-P. Xie and T. Miyama (2009), Vertical mixing in the ocean and its impact on the coupled ocean/atmosphere system in the Eastern tropical Pacific. *J. Climate.*, 22, 3703-3719
- [62] Small R. J., K. J. Richards, S.-P. Xie, P. Dutrieux, T. Miyama (2009), Damping of Tropical Instability Waves caused by the action of surface currents on stress. *J. Geophys. Res.*, 114, C04009, doi:10.1029/2008JC005147.
- [61] Kashino Y., N. Espana, F. Syamsudin, K. J. Richards, T. Jensen, P. Dutrieux and A. Ishida (2009), Observations of the North Equatorial Current, Mindinao Current, and Kuroshio Current system during the 2006/2007 El Nino and 2007/2008 La Nina. *J. Oceanography*, 65, 325-333.
- [60] Natarov A. and K. J. Richards (2009), Three-dimensional instabilities of oscillatory zonal shear flows on the equatorial beta-plane. *J. Fluid Mechanics*, 623, 59-74.

- [59] Aiki H. and K. J. Richards (2008), Energetics of the global ocean: the role of layer-thickness form drag. *J. Phys. Oceanogr.*, **38**, 1845–1869.
- [58] Calil P. H. R.* , K. J. Richards, Y. Jia and R. R. Bidigare (2008), Eddy activity in the lee of the Hawaiian Islands. *Deep Sea Res. II*, 55, 1179–1194.
- [57] Natarov A.[†], K. J. Richards and J. P. McCreary (2008), Two-dimensional instabilities of time-dependent zonal flows: Linear shear. *J. Fluid Mechanics*, 599, 29–50.
- [56] de Szoeki S. P., S-P. Xie , T. Miyama, K. J. Richards and R. J. Small (2007), What maintains the SST front north of the eastern Pacific equatorial cold tongue? *J. Climate*, 20, 2500–2514.
- [55] Xie S-P., T. Miyama, Y. Wang, H. Xu, S. P. de Szoeki, R. J. Small, K. J. Richards, T. Mochizuki, T. Awaji (2007), A regional ocean-atmosphere model for eastern Pacific climate: towards reducing tropical biases. *J. Climate*, 20, 1504–1522.
- [54] Endoh T., Y. Jia and K. J. Richards (2006), Sensitivity of the ventilation process in the North Pacific to the eddy induced tracer transport. *J. Phys. Oceanogr.*, 36, 1895–1911.
- [53] Richards, K. J., N. A. Maximenko, F. O. Bryan, and H. Sasaki (2006), Zonal jets in the Pacific Ocean, *Geophys. Res. Lett.*, 33, L03605, doi:10.1029/2005GL024645.
- [52] Bellucci, A.* , and K. J. Richards (2006), Effects of NAO variability on the North Atlantic Ocean circulation. *Geophys. Res. Lett.*, 33, L02612, doi:10.1029/2005GL024890.
- [51] Richards K. J. and S. J. Brentnall[†](2006), The impact of diffusion and stirring on the dynamics of interacting populations. *J. Theoretical Biology*, 238, 340–347
- [50] Edwards N.[†]and K. J. Richards (2004), Nonlinear double-diffusive intrusions at the equator. *J. Mar. Res.*, 62, 233–259.
- [49] Pezzi L. P.* , J. Vialard, K. J. Richards, C. E. Menkes and D. Anderson (2004), Influence of ocean-atmosphere coupling on the properties of Tropical Instability Waves. *Geophys. Res. Lett.*, L16306, doi:10.1029/2004GL019995.
- [48] Lee J.H., and K. J. Richards (2004), The three-dimensional structure of the interleaving layers in the western equatorial Pacific Ocean. *Geophys. Res. Lett.*, 31, L07301, doi:10.1029/2004GL019441.
- [47] Heath M.R., P.R. Boyle, A. Gislason, W. Gurney, S.J. Hay, E. Head, S. Holmes, A. Ingvarsdottir, S.H. Jonasdottir, P. Lindeque, R.T. Pollard, J. Rasmussen, K. Richards, K. Richardson, G. Smerdon and D. Speirs (2004), Comparative ecology

- of over-wintering *Calanus finmarchicus* in the northern North Atlantic, and implications for life-cycle patterns. *ICES Journal of Marine Science Volume*, 61(4), 698–708.
- [46] Ruddick B and K J Richards (2003). Oceanic thermocline intrusions: Observations. *Progress in Oceanography*, 56, 499-527.
- [45] Brentnall S J[†], K J Richards, J Brindley and E Murphy (2003). Plankton patchiness and its effect on larger-scale productivity. *J Plankton Res*, 25, 121-140.
- [44] Haine T W N, K J Richards and Y Jia (2003). Chlorofluorocarbon constraints on North Atlantic ventilation. *J Phys Ocean*, 33, 1798–1814.
- [43] Richards K. J. and N. R. Edwards (2003). Lateral Mixing in the Equatorial Pacific: the importance of inertial instability. *Geophys. Res. Lett.*, 30(17), 1888, doi:10.1029/2003GL017768.
- [42] Pezzi, L.* and K. J. Richards (2003), The effects of lateral mixing on the mean state and eddy activity of an equatorial ocean. *J. Geophys. Res.*, 108, 3371, doi:10.1019/2003JC0011834.
- [41] Thurnherr A M*, K J Richards, C R German, G F Lane-Serff and K G Speer (2002). Flow and mixing in the rift valley of the mid-Atlantic ridge. *J Phys Ocean*, 32, 1763–1778.
- [40] McLeod P*, Martin A P[†] and K J Richards (2002). Minimum length scale for growth limited oceanic plankton distributions. *Ecological Modelling*, 158, 111-120.
- [39] Martin A P[†], K J Richards, A Bracco and A Provenzale (2002). Patchy productivity in the open ocean. *Global Biogeochemical Cycles*, 16 (2), doi:10.1029/2001GB001449.
- [38] Richards K J and H. Banks(2002). Characteristics of interleaving in the western equatorial Pacific. *J. Geophys. Res.*, 107(C12), 3231, doi:10.1029/2001JC000971.
- [37] Martin A P[†], K J Richards, C S Law and M Liddicoat (2001). Horizontal dispersion within an anticyclonic mesoscale eddy. *Deep Sea Research Part II: Topical Studies in Oceanography*, 48, 739–755.
- [36] Martin A P[†] and K J Richards (2001). Mechanisms for vertical transport within a North Atlantic mesoscale eddy. *Deep Sea Research Part II: Topical Studies in Oceanography*, 48, 757–773.

- [35] Law C S, A P Martin[†], M I Liddicoat, A J Watson, K J Richards and E M S Woodward (2001). A Lagrangian SF₆ tracer study of an anticyclonic eddy in the North Atlantic: patch evolution, vertical mixing and nutrient supply to the mixed layer. *Deep Sea Research Part II: Topical Studies in Oceanography*, 48,705–724.
- [34] Martin A P[†], K J Richards and M J R Fasham (2001). Phytoplankton production and community structure in an unstable frontal region. *J Marine Systems*, 28, 65–89.
- [33] Thurnherr A M* and K J Richards (2001). Hydrographic setting of the *Rainbow* hydrothermal plume (36°14'N, Mid-Atlantic Ridge). *J Geophys Res*, 106, 9411–9426.
- [32] Spall S A* and K J Richards (2000). A numerical model of mesoscale frontal instabilities and plankton dynamics – I. Model formulation and initial experiments. *Deep-Sea Research I*, 47, 1261–1301.
- [31] Richards K J and M E Inall* (2000). The upper ocean heat content of the western equatorial Pacific: processes controlling its change during TOGA-COARE. *J Geophys Res*, 105, 19,575 – 19590.
- [30] Best S, V O Ivchenko[†], K J Richards, R D Malone and R C Smith (1999). Eddies in numerical models of the Antarctic Circumpolar Current and their influence on the mean flow. *J Phys Ocean*, 29, 328–350.
- [29] Sinha B* and K J Richards (1999). The jet structure of the Antarctic Circumpolar Current. *J Phys Ocean*, 29, 1143–1155.
- [28] Edwards N R[†] and K J Richards (1999). Linear double-diffusive-inertial instability at the equator. *J Fluid Mechanics*, 395, 295–319.
- [27] German C R, K J Richards, M D Rudnicki, M M Lam[†] and J L Charlou (1998). Topographic control of a dispersing hydrothermal plume. *Earth and Planetary Science Letters*, 156, 267–273.
- [26] Martin A P[†], I P Wade, K J Richards and K J Heywood (1998). The PRIME eddy. *J Marine Research*, 56, 439–462.
- [25] Inall M E*, K J Richards and G Eldin (1998). The changing structure of the upper ocean in the western equatorial Pacific during TOGA COARE. *J Geophys Res*, 103, 21385–21400.
- [24] Ivchenko V O[†], K J Richards, B Sinha and J-O Wolff (1997). Parameterization of mesoscale eddy fluxes in zonal ocean flows. *J Marine Research*, 55, 1127–1162.

- [23] Ivchenko V[†], K J Richards and D Stevens (1996). The dynamics of the Antarctic Circumpolar Current. *J Phys Ocean*, 26, 753–774.
- [22] Jia Y and K J Richards (1996). Ventilation of tritium in an isopycnic model of the North Atlantic. *J Geophys Res.* 101, 11883–11901.
- [21] Smith C*, K J Richards and M J Fasham (1996). The impact of mesoscale eddies on plankton dynamics in the upper ocean. *Deep Sea Research*, 43, 1807–1832.
- [20] Richards K J, Y Jia[†] and C F Rogers (1995). Dispersion of tracers by ocean gyres. *J Phys Ocean*, 25, 873–887.
- [19] Richards K J, M E Inall* and N C Wells (1995). The diurnal mixed layer and upper ocean heat budget in the western equatorial Pacific. *J Geophys Res*, 100, 6865–6879.
- [18] Haine T* and K J Richards (1995). The influence of the seasonal mixed layer on oceanic uptake of CFCs. *J Geophys Res*, 100, 10727–10744.
- [17] Eldin G, T Delcroix, C Henin, K J Richards, Y du Penhoat, J Picaut and P Rual (1994). The large scale structure of currents and hydrology along 156E during the COARE intensive observation period. *Geophys Res Letters*, 24, 2681–2684.
- [16] Richards K J, D A Smeed, E J Hopfinger and G Chabert d’Heres (1992) Boundary layer separation of rotating flows past surface mounted obstacles. *J Fluid Mechanics*, 237, 343–371.
- [15] Savage G, D R Turner, P H Burkill, A J Watson, M V Angel, R D Pingree, H Leach and K J Richards (1992). The BOFS 1990 spring bloom experiment: temporal evolution and spatial variability of the hydrographic field. *Progress in Oceanography*, 29, 235–281.
- [14] Richards K J, and R Pollard (1991) The structure of the upper ocean in the western equatorial Pacific. *Nature*, 350, 48–50.
- [13] The FRAM group (1991) An eddy-resolving model of the Southern Ocean. *EOS, Transactions of the American Geophysical Union*, 72, 169 and 174–175.
- [12] Richards K J (1991) Double diffusive interleaving at the equator. *J Phys Oceanogr.*, 21, 433–438.
- [11] Richards K J (1990) Physical processes in the benthic boundary. *Phil Trans Roy Soc Lond A* 331, 3–13.

- [10] Hunt J C R, K J Richards and P W M Brighton (1988) Stably stratified shear flow over low hills. *Q J Roy Met Soc.* 114, 859–886.
- [9] Hunt J C R, S Leibovich and K J Richards (1988) Turbulent shear flows over low hills. *Q J Roy Met.* 114, 1435–1470.
- [8] Rogers C F and K J Richards (1988) On the vertical structure description of quasi-geostrophic ocean models. *Dynamics of Atmos. and Oceans.* 12, 207–233.
- [7] Richards K J (1984) The interaction between the bottom mixed layer and mesoscale motions of the ocean: a numerical study. *J Phys. Ocean.* 14, 754–768.
- [6] Hunt J C R and K J Richards (1984) Stratified shear flow over one and two hills. *Boundary Layer Met.* 30, 223–259.
- [5] Richards K J (1982) Modelling the benthic boundary layer. *J Physical Ocean.* 12, 428–439.
- [4] Richards K J (1982) The effect of a bottom boundary layer on the stability of a baroclinic zonal current. *J Physical Ocean.* 12, 1493–1505.
- [3] Richards K J and P A Taylor (1981) A numerical model of flow over sand waves in water of finite depth. *Geophys J R Astr Soc* 65, 103–128.
- [2] Britter R E, J C R Hunt and K J Richards (1981) Air flow over a two-dimensional hill: studies of velocity speed-up, roughness effects and turbulence. *Q J Roy Met Soc* 107, 91–110.
- [1] Richards K J (1980) The formation of ripples and dunes on an erodible bed. *J Fluid Mechanics*, 99, 597–618.

Edited:

Editorial board (2015): Special Issue on the Coordinated International Field Campaign in 2011–2012 on the Madden–Julian Oscillation. *J. Meteorological Society of Japan*, 93A, 1–178.

Published in edited works:

Richards K. J., H. Sasaki and F. Bryan (2008), Jets and waves in the Pacific Ocean. In *High resolution numerical modelling of the atmosphere and ocean*, edited by K. P. Hamilton and W. Ohfuchi, Springer, 187–194.

- Richards K J, S J Brentnall[†], P McLeod* and A P Martin[†](2001). Stirring and mixing of biologically reactive tracers. Proceedings 'Aha Huliko'a Hawaiian Winter Workshop, Univ Hawaii, Jan 2001.
- Richards K J (1998) Interleaving at the equator. In *Ocean modelling and parameterization* Ed E. Chassignet and J. Verron. NATO Science Series, Series C: Mathematical and Physical Sciences – vol 516, Kluwer Academic Publishers, Dordrecht, 235–252.
- Godfrey J S, S P Anderson, E F Bradley, J A Butt, P A Coppin, M Cronin, I Helmond, T J McDougall, L Pender, K J Richards, W Smyth and R Weller (1995) Surface fluxes and mixed layer heat and freshwater budgets in TOGA-COARE. Proceedings of the International Scientific Conference on TOGA, Melbourne, 1995. WMO report WCRP-91 - WMO/TD No. 717, 464-468.
- Richards K J, M E Inall, G Eldin and C Henin (1995) The large scale response of the upper ocean to atmospheric forcing during TOGA-COARE. Proceedings of the International Scientific Conference on TOGA, Melbourne, 1995. WMO report WCRP-91 - WMO/TD No. 717, 499-503.
- Richards K J (1998) Interleaving at the equator. In *Ocean modelling and parameterization* Ed E. Chassignet and J. Verron. NATO Science Series, Series C: Mathematical and Physical Sciences – vol 516, Kluwer Academic Publishers, Dordrecht, 235–252.
- Sinha B and K J Richards (1993) The wavelet transform applied to flow around Antarctica. Proceedings of IMA conference on wavelets, fractals and fourier transforms. Eds M Farge, J C R Hunt and J C Vassilicos. Oxford University Press, 221-228.
- Richards K J (1986) Turbulent flow over topography with applications to sand wave development. In 'Physics of desertification'. Ed El-Baz and Hassen, Martinus Nijhoff.
- Richards K J (1985) The benthic boundary layer. In 'Turbulence and diffusion in stable environments'. Ed J C R Hunt, Claredon Press, 237-252.
- Richards K J (1985) Processes affecting dispersion in and above the benthic boundary layer. Proc 7th symposium on turbulence and diffusion. American Meteorology Soc. 105-108.
- Richards K J (1983) Turbulent flow over ripples and their effective roughness. In 'Mechanics of sediment transport'. eds Sumer and Muller, Balkema, Rotterdam, 127-132.

Taylor P A, K J Richards and R A Nunes (1978) Models of turbulent airflow above idealised water waves. In 'Turbulent fluxes through the sea surface, wave dynamics and prediction'. Ed. Favre and Hasselman.

Unpublished reports:

Richards K J, M E Inall and S Keene (1993) COARE-POI Cruise Report: SeaSoar data collection, processing and calibration. Southampton University, Department of Oceanography. 22pp.

Delcroix T, *et al* (1993) Rapport de la campagne COARE-POI à bord du N.O. Le Noroit 1^{er} décembre 1992 - 2 mai 1993 de 5°N à 5°S le long du méridien 156°E. Rapports de Missions, Sciences de la Mer Océanographie Physique, N° 10. ORSTOM, Nouméa, Nouvelle-Calédonie.

Richards et al (1988) RRS Charles Darwin Cruise 32, 3 April - 2 May 1988. A study of the upper density and current structure of the western equatorial Pacific. Southampton: Southampton University, Department of Oceanography. 19pp.

Richards K J and S O'Farrell (1987) Dispersion of tracers by the oceanic eddy field. Final Report. IOS Report 251, 24pp.

Richards K J (1986) Dispersion of tracers by the oceanic eddy field. IOS Report 229.

Saunders P M and K J Richards (1985) Benthic boundary layer IOS observational and modelling programme. Final Report. IOS Report 199.

Richards K J (1984) Benthic boundary layer studies. IOS Report 181.

Richards K J (1984) Experiments on rotating flow over a model three-dimensional hill and flow separation. Report to CRNS, France.

Richards K J (1983) The effect of friction on the dynamics of the ocean. Ocean modelling, 42.

Richards K J (1983) Benthic boundary layer - IOS modelling programme. IOS Report 162.

Hunt J C R and K J Richards (1980) Practical formulae for predicting the dispersion of air pollution in hilly terrain. Report to the Health and Safety Executive.

Taylor P A and K J Richards (1979) On wakes and drag in the neutrally stratified atmospheric boundary layer. AES Internal Report ARQL 7/79. Atmospheric Environment Service, Downsview, Ontario.

8 PROFESSIONAL ACTIVITIES

8.1 Research cruises since 1988:

Principal scientist of RRS Charles Darwin cruise 32, 3 April - 2 May 1988, Lae, Papua New Guinea to Suva, Fiji. A study of the upper density structure of the western equatorial Pacific.

Scientist in charge physical oceanography, RRS Discovery cruise 192, 10–27 June 1990, NE Atlantic. Cruise A3 of the BOFS Lagrangian study.

R/V Le Noroit, 29 December 1992 – 18 February 1993. SeaSoar measurements during the Intensive Observing Period of TOGA COARE in the western equatorial Pacific.

RRS Discovery cruise 228, 21 May – 28 June 1997, Vigo to Vigo. FLAME, to study the dispersion of the plume from the RAINBOW hydrothermal vent.

FS Poseidon cruise 240, 19 June – 10 July 1998. FLAME 2, mooring recovery.

R/V Onnuri, 15 Nov – 5 Dec 1999, Eastern equatorial Pacific, to study upper ocean structure and interleaving.

Principal Scientist RRS Discovery 262, 18 April – 27 May 2002, Marine Productivity Cruise: Biophysical studies of zooplankton dynamics in the northern North Atlantic.

R/V Mirai, MR0707: January 2008, Western equatorial Pacific, to study upper ocean structure.

R/V Mirai, MR0803: August 2008, Western equatorial Pacific, to study upper ocean structure.

R/V Mirai, MR0904: November/December 2009, Western equatorial Pacific, to study upper ocean structure and mixing.

R/V Onnuri, GAIA 11: May 2011, Western equatorial Pacific, to study upper ocean structure and mixing.

R/V Mirai, MR1107: October 2011, CINDY cruise to tropical Indian Ocean.

Chief Scientist R/V Kilo Moana, KM1203: May 2012, MIXET cruise.

Chief Scientist R/V Kilo Moana, KM1225: Oct-Nov 2012, MIXET cruise

R/V Mirai, MR1402: Feb-Mar 2014, Western equatorial Pacific, to study upper ocean structure and mixing.

Chief Scientist R/V Falkor, FK150728: August 2015, Central equatorial Pacific

8.2 Visiting Scientist

JIMAR, Univ of Hawaii, April 1989

IMI travelling fellowship. Univ of Washington, Summer 1989 Seattle

JIMAR, Univ of Hawaii, March 1991

JRCOC, Chilworth, Summer 1993

ORSTOM, New Caledonia, September 1993

Ocean Univ., Qingdao, P R China, October 1993

Woods Hole Oceanographic Institution, USA, Summer 1995

JIMAR, Univ of Hawaii, January 1999

PMEL, Seattle, USA, August 1999

IPRC, Univ of Hawaii, January 2001

INGV, Bologna, Italy, December 2003

NCAR, Boulder, Colorado, Summer 2004

NCAR, Boulder, Colorado, Summer 2012

Visiting Professor, Niels Bohr Institute, Copenhagen, Jan-June 2015

Visiting Professor, Tohoku University, Sendai, Japan, June 2017

8.3 Lecture courses at international schools

NATO ASI winter school, Les Houches, France: Ocean modelling and parameterization, January 1998

Grand Combin summer school, Aosta, Italy: Fundamental problems in geophysical and astrophysical fluid dynamics, June 1999

8.4 Invited Talks, Invited Meetings, Meeting Convenor, since 2003

Pacific Decadal Variability workshop, Alexandria, February 2003.

CLIVAR SSG-12, Victoria, May 2003

PUMP Planning meeting, NCAR, May 2003.

Tropical biases workshop, Princeton, May 2003.

CLIVAR Pacific Panel meeting, Yokohama, July 2003.

PICES planning meeting, Seoul, Korea, October 2003.

CLIVAR Working Group on Seasonal to Interannual Predictability, Honolulu, November 2004.

INGV, Bologna, Italy, (invited talk) 'Mixing in the ocean', November 2003.

Frontier Symposium, Yokohama (invited talk), 'Mixing processes in the tropical ocean', March 2004.

Univ Tokyo (invited talk), 'Inertial instability and mixing in the ocean', March 2004.

EGU Symposium, Nice, France (invited talk), 'Stirring and mixing of the marine ecosystem', April 2004.

LODYC, Paris (invited talk) 'Impact of physical processes on the Marine Ecosystem', April 2004.

Assessment of ocean models for climate research, Princeton, June 2004.

CLIVAR SSG-13, Baltimore, June 2004.

Los Alamos National Laboratory (invited talk), 'Stirring and mixing', August 2004.

Convenor of PICES/CLIVAR workshop on Scale interactions in Climate and the Marine Ecosystem, Hawaii, October 2004.

CLIVAR Working Group on Seasonal to Interannual Predictability, Exeter, UK, October 2004.

CLIVAR GSOP meeting, Boulder, November 2004.

Regional modeling workshop, Boulder, March 2005.

Univ Tokyo (invited talk) ‘Stirring and mixing of biological populations’, April 2005.

Frontier, Yokohama (invited talk) ‘The small scale nature of the mean flow of the ocean’, April 2005.

SW Pacific workshop, Cairns, Australia, August 2005.

IAG/IAPSO/IABO Joint Assembly, Cairns, Australia (invited talk) ‘Stirring and mixing: its effect on the marine ecosystem’, August 2005.

Tropical biases meeting, COLA, September 2005.

Workshop on high resolution models, Yokohama, Japan (invited talk) ‘Zonal jets in high resolution ocean models’, September 2005.

Chair organizing committee CLIVAR/OOPC/GOOS/ARGO workshop on the South Pacific, Concepcion, Chile, October 2005

Seoul National University, Korea (public lecture), Patterns in the Marine Ecosystem, December 2006.

Hokkaido University (invited lecture series), ‘Tracers, their diffusion, transport and reaction’, September 2008

MIT (invited talk), ‘Small Scale Structures in the Equatorial Thermocline’, November 2008

Seoul National University, Korea, Workshop on Global Climate Monitoring and Modeling, Jun 2009

International Workshop on Living Organisms in Flows, Palma de Mallorca (invited talk) ‘The marine ecosystem response to eddying motions: from the sunlit upper waters to the twilight zone at depth’, June 2010

Western Pacific Geophysics Meeting, Taipei (invited talk) ‘Mixing in the Equatorial Thermocline’, June 2010

University of Tokyo (invited talk) ‘Mixing in the Equatorial Thermocline (MIXET)’, July 2010

IUGG, Melbourne, Australia (invited talk) ‘Equatorial mixing’, July 2011

AOGS, Singapore (invited talk) ‘Equatorial mixing and ENSO’, August 2012

EGU, Vienna, Austria (invited talk) ‘Controls on SST in the southern tropical Indian Ocean’, April 2013

International workshop – regional climate models, Busan, South Korea (invited talk) ‘Physical controls on biological production in the North Pacific sub-tropical gyre’, September 2013

Niels Bohr International Academy Colloquium, Copenhagen, Denmark (invited talk) ‘Turbulence in the natural environment’, February 2015

OSS 2015, Busan, South Korea (invited talk) ‘Mixing in equatorial Pacific and its modulation by ENSO’, October 2015

International Workshop: Dynamics and Interactions of the Ocean and Atmosphere, Tohoku University, Japan (invited talk) ‘The importance of ocean mixing in ocean/atmosphere interactions in the tropics’, July 2017

Global Ocean Summit 2016, Qingdao, China (invited talk) ‘Scale interactions: the challenge of capturing the small scales’, September 2016

OMIX meeting, University Tokyo (invited talk) ‘Shear driven turbulence in the natural environment’, March 2017

8.5 Service: University of Hawaii

Team Leader Theme 2, IPRC: 2003–2014

Chair, search committee for 2 faculty positions IPRC/Dept Ocean: 2003.

Chair, Departmental Personnel Committee, Oceanography: July 2006 - July 2007.

Member, UHM Tenure Promotion Renewal Committee : 2007

Division Head, Physical Oceanography, Department of Oceanography: July 2007 - July 2009

Leader Theme 4 (ecosystem dynamics), JAMSTEC/IPRC Initiative: 2007 - 2014

Associate chair of oceanography: July 2008 - July 2009

Chair, Department of Oceanography: July 2010 - 2013

Member, Center for Ocean Science Education excellence (COSEE) at UH, Science Advisory Committee, 2012–present

Director, Pacific Island Climate Science Center (DOI funded) (2014–2016)

Director, International Pacific Research Center (2014–present)

8.6 Committees:

Scientific Steering Group of FRAM, a NERC Community Research Programme, 1988 – 1991.

Scientific User Requirements Working Group for the RRS John Biscoe replacement and RRS Discovery refurbishment, NERC, 1988 – 1991.

Expert Group Review of Marine Science in the UK. NERC 1989.

Dynamical Specialist Group committee of the Royal Meteorological Society, 1990 – 2001.

Planning Group of PRIME, a NERC Community Research Programme, 1991 – 1994.

Scientific Steering Group of PRIME, a NERC Community Research Programme, 1994 – 1999.

Scientific Steering Group of UGAMP, a NERC Community Research Programme, 1992 – 2002.

Marine and Atmospheric Sciences Research Grant and Training Awards Committee, NERC, 1995 – 1998.

European Geophysical Society, oceans/atmosphere committee, 1998 – 2002

SCOR working group 108: double diffusive convection, 1999 – 2001

European Geophysical Society, Vice-President for Oceans, 2000 – 2002

European Geophysical Society, Chair of Nansen Medal Committee, 2000 – 2002

Scientific steering committee of Environmental Mathematics and Statistics, jointly funded thematic programme of NERC and EPSRC 2001 – 2002

Chair of international CLIVAR Pacific Panel, 2001 - 2005

Review Committee of the Los Alamos National Laboratory's (LANL) Climate, Ocean, and Sea Ice Modeling (COSIM) Project, January 3–4, 2002

Review Committee of environmental research institutes for the General Secretariat for Research and Technology, Greece, July 10–16, 2005

NSF Review Panel, Physical Oceanography, November 2006

NSF Review Panel, Petascale computing , April 2007

Consortium for Ocean Leadership, Ocean Expert, 2010 –

Chair, review panel, WHOI-KAUST partnership, October 2012

External reviewer, Department of Earth and Planetary Science, University of Tokyo,
January 2013

NOAA Review Panel, November 2015

9 Outreach since 2012

College of Micronesia, Pohnpei. Talk to students about ocean observations. May and
November 2012

TV interview. Ocean turbulence linked to climate change KITV News August 18, 2015

Newspaper article. Up close with El Nino Honolulu Star Advertiser August 19, 2015

Radio broadcast. New research suggest small changes in oceans could have major impact
Australian Broadcast Corporation (ABC) August 20, 2015

Radio broadcast. HPR Bytemarks Cafe. El Nino Data Collection. September 2 2015

Mid Pacific Institute. Talk to 170 8th grade students. September 24 2015

Nature News Feature. Hunting the Godzilla El Nio, Nature International Weekly Jour-
nal of Science, Oct 20, 2015