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B. S. E., Duke University, 1979
S. M., Massachusetts Institute of Technology, 1982
Ph.D., Massachusetts Institute of Technology, 1985

Postdoctoral Investigator, 1985,
Department of Civil Engineering,
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Postdoctoral Fellow, 1985–1986;
Postdoctoral Investigator, 1986–1987;
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Associate Scientist, 1991–2000, tenure awarded, 1995;
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Department of Physical Oceanography,
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Member, American Geophysical Union, American Meteorological Society, American Physical Society.

Fellow, American Physical Society, 2001.

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Research Interests: Theoretical, numerical and laboratory studies in geophysical fluid dynamics: stratified flows, nonlinear internal waves and tides, hydraulic phenomena, abyssal circulation in the presence of topography, geological fluid dynamics, bio-fluid dynamics.

Refereed Publications:

Helfrich, K. R., W. K. Melville, and J. W. Miles, 1984. On interfacial solitary waves over variable topography. *Journal of Fluid Mechanics*, **149**, 305–317.

Helfrich, K. R., and W. K. Melville, 1986. On long nonlinear internal waves over slope–shelf topography. *Journal of Fluid Mechanics*, **167**, 285–308.

Whitehead, J. A., and K. R. Helfrich, 1986. The Korteweg–de Vries equation from laboratory conduit and magma migration equations. *Geophysical Research Letters*, **13**, 545–546.

Melville, W. K., and K. R. Helfrich, 1987. Transcritical two-layer flow over topography. *Journal of Fluid Mechanics*, **178**, 31–52.

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Helfrich, K. R., and J. A. Whitehead, 1989. Solitary waves on conduits of buoyant fluid in a more viscous fluid. *Geophysical and Astrophysical Fluid Dynamics*, **51**, 35–52.

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Helfrich, K. R., and W. K. Melville, 1990. Review of dispersive and resonant effects in internal wave propagation. *The Physical Oceanography of Sea Straits*, L. J. Pratt, editor, NATO/ASI Series, Kluwer Academic Publishers, Dordrecht; pp. 391–420.

Whitehead, J. W., and K. R. Helfrich, 1990. Magma waves and diapiric dynamics. *Magma Transport and Storage*, Michael L. Ryan, editor, John Wiley & Sons, Chichester, pp. 53–76.

Helfrich, K. R., and T. M. Battisti, 1991. Experiments on baroclinic vortex shedding from hydrothermal plumes. *Journal of Geophysical Research*, **96**(C7), 12,511–12,518.

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Helfrich, Karl R., and Joseph Pedlosky, 1993. Time-dependent isolated anomalies in zonal flows. *Journal of Fluid Mechanics*, **251**, 377–409.

Helfrich, K. R., 1994. Thermals with background rotation and stratification. *Journal of Fluid Mechanics*, **259**, 265–280.

Kim, S. L., L. S. Mullineaux, and K. R. Helfrich, 1994. Larval dispersal via entrainment into hydrothermal vent plumes. *Journal of Geophysical Research*, **99**(C6), 12655–12665.

Grimshaw, R. H. J., and K. R. Helfrich, 1995. Solitary waves on two-dimensional slab conduits of buoyant fluid in a more viscous fluid. *Geophysical and Astrophysical Fluid Dynamics*, **79**, 223–238.

Helfrich, K. R., 1995. Thermo-viscous fingering of flow in a thin gap: A model of magma flow in dikes and fissures. *Journal of Fluid Mechanics*, **305**, 219–238.

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Speer, K. G., and K. R. Helfrich, 1996. Hydrothermal plumes: A review of flow and fluxes. In: *Hydrothermal Vents and Processes*, L. M. Parson, C. L. Walker, and D. R. Dixon, Editors, Geological Society Special Publication No. 87, pp. 373–386.

Pedlosky, J., L. J. Pratt, M. A. Spall, and K. R. Helfrich, 1997. Circulation around islands and ridges. *Journal of Marine Research*, **55**, 1199–1251.

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Pratt, L. J., K. R. Helfrich, and E. Chassignet, 2000. Hydraulic adjustment to an obstacle in a rotating channel. *Journal of Fluid Mechanics*, **404**, 117–149.

Wells, J. R., and K. R. Helfrich, 2001. Circulation around a thin zonal island. *Journal of Fluid Mechanics*, **37**, 301–323.

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Helfrich, K. R., and J. Pineda, 2003. Accumulation of particles in propagating fronts. *Limnology and Oceanography*, **48**(4), 1509–1520.

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Da Silva, J. C. B., and K. R. Helfrich, 2008. Synthetic aperture radar observations of resonantly generated internal solitary waves at Race Point Channel (Cape Cod), *Journal of Geophysical Research*, **113**, C11016, doi: 10.1029/2008JC005004.

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Helfrich, K. R., and B. L. White, 2010. A model of internal solitary waves with trapped cores. *Nonlinear Processes in Geophysics,* **17,** 303-318.

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DiBacco, C., H. L. Fuchs, J. Pineda, and K. R. Helfrich, 2011. Swimming behavior and velocities of barnacle cyprides in a downwelling flume. *Marine Ecology Prog. Series*, **433**, 131-148.

Grimshaw, R. H. J., and K. R. Helfrich, 2012. The effect of rotation on internal solitary waves. *IMA J. Appl. Maths.*, doi: 10.1093/imamat/hxs024.

Grimshaw, R., K. Helfrich and E. R. Johnson, 2012. The reduced Ostrovsky equation: integrability and breaking. *Std. Appl. Math.* **129**, 414-436.

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Pineda, J., V. Starczak, J. da Silva, K. Helfrich, M. Thompson, D. Wiley. Whales and waves: zooplankton accumulation, fish and humpback whale foraging response, and the shoaling of internal waves at Stellwagen Bank. *Limnology and Oceanography*, submitted.

Luzzatto-Fegiz, P. and K. R. Helfrich. Laboratory experiments and simulations for solitary internal waves with trapped cores. *J. Fluid Mech.* submitted.

Alford, M. H., T. Peacock, *et al.* The formation and fate of internal waves in the South China Sea. *Nature*, submitted

Non-refereed Publications

Pratt, L. J., and K. R. Helfrich, 1990. Current research problems. *The Physical Oceanography of Sea Straits*, L. J. Pratt, editor, Kluwer, Dordrecht; pp. 577−580.

Helfrich, K. R., 1987. Experiments on baroclinic eddy evolution and stability in continuously stratified systems. Proceedings of the *Third International Conference on Stratified Flows*, California Institute of Technology, Pasadena, California, February 1987.

Helfrich, K. R., 2001. Dispersion from hydrothermal vents. In: *Encyclopedia of Ocean Sciences*, John H. Steele, Steve A. Thorpe, and Karl K. Turekian, Editors, Academic Press, San Diego, **2**, 733−741.

Helfrich, K. R., and L. J. Pratt, 2002. Rotating hydraulics and upstream basin circulation. In electronic *Proceedings of the 2nd Meeting on the Physical Oceanography of Sea Straits*, Villefranche, France, April 15−19, 2002.

Helfrich, K.R., R. Grimshaw and T. Johnson, 2010. Effect of rotation on internal solitary waves. Proceedings of HYDRALAB-III, Hannover, Germany, February 2-3, 2010.

Mullineaux, L. S., K. R. Helfrich, E. Anderson, P. Statts, A. Wargula, and K. Wilt. Swimming and diving of the oyster larvae (Crassostera virginica). *MEPS*, in preparation.

Grimshaw, R., K. R. Helfrich, and A. Scotti. Large-amplitude internal waves in the ocean. *Nonlin. Proc. Geophys.*, in preparation. (Overview note for a special issue by the co-editors).

Thesis

Helfrich, K. R., 1985. On long nonlinear internal waves over bottom topography. Ph.D. Thesis, Massachusetts Institute of Technology, 272 pp.