

Richard Banks Coffin

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EDUCATION

NSF funded Postdoctoral Fellow (Mar. 1986 - Dec. 1987) Gordon College, Wenham, MA. (Advisor: Richard T. Wright)

Ph.D., Oceanography (Sep. 1982 - June 1986), University of Delaware. (Advisor: Jonathan H. Sharp)

M.S., Microbiology (Sep. 1978 - May 1980), University of New Hampshire (Advisor: Galen Jones)

B.A., Microbiology (Sep. 1973 - June 1977), University of New Hampshire.

POSITIONS

Full Professor, Chair Department of Physical and Biological Sciences, Texas A&M University Corpus Christi, July 2014 – Present.

Founder-President Strategic-Carbon LLC 2011- Present.

Section Head Code 6114, Marine Biogeochemistry. Lead for international development of methane hydrate exploration and deep ocean sediment carbon sequestration. Naval Research Laboratory, DC, September 2003 to June 2014.

Adjunct Faculty Professor, Texas A&M University – Corpus Christi, October 2013 to Present.

Senior Research Microbiologist, Naval Research Laboratory, Washington DC, June 1996 to September 2003.

Research Microbial Ecologist, US Environmental Protection Agency, Gulf Breeze, FL. July 1990- June 1996.

Adjunct Faculty Member, Hawaii Natural Energy Institute, Univ. of Hawaii, Honolulu, Hawaii, August 2000- present.

Adjunct Faculty Member, College of Marine Studies, University of Delaware, Lewes DE September 1996 - 2005.

Adjunct Faculty Member at FSU and TAMU, September 1990 – 2000.

BACKGROUND

Isotope geochemistry is applied to determine key ecosystem cycles. Work has focused on soil groundwater systems, estuaries, coastal and deep ocean water column and sediment. Field work has been global with recent priorities on Navy harbors through the US, the Arctic Ocean and coastal regions off Chile, New Zealand, Canada, Norway, Japan and the US. During these field efforts contribution has been through working as leader or co-leader of planning, execution and interpretation. Work has addressed environmental assessment, energy exploration and field technology development. Examples of success include providing a 25 million dollar cost savings plan for harbor remediation in Liepaja Latvia and focusing methane hydrate energy exploration sites off the coasts New Zealand, Alaska,

Texas and Chile providing 10 – 30 million dollar savings at each potential drill site.

KEY CAREER PROGRAMS

1996 – present, Adjunct Faculty Member – Universities of Delaware, Hawaii, Florida State, Texas A&M, Texas A&M Corpus Christi. Serving on 15 students Ph.D. and Masters committees and providing invited lectures to classes. Additional academic interactions have been with students from William and Mary University, the Catholic University of Valparaiso and University of Auckland.

2000 – present, Ocean Methane Hydrate Exploration - NRL and TAMU-CC lead for national and international methane hydrate research and development. Chief and Co-chief scientist off the coasts of US (Gulf of Mexico and Arctic), Canada, Chile, New Zealand and Norway on 16 expeditions. Approximate budget \$25 mil.

2000 – present, International Methane Hydrate Research and Development Workshops. Co-organizer and developer of workshops to plan international methane hydrate research globally. Planners from the US, Norway and Japan have lead international workshops in Washington DC, Hawaii, Canada, New Zealand, Chile, Scotland, Norway and Japan. 25 countries participated. Approximate budget \$2 mil.

1998 – 2008, Military Harbor Environmental Assessment. Lead and co-lead harbor remediation programs in 8 military harbors to assess contaminant sources and natural attenuation schedules. Approximate budget \$12 mil.

2002 – 2004, Boron nanoparticle fuel enhancement. Approximate budget \$1 mil.

2000 – 2004, Deep Ocean Carbon Sequestration - Chief scientist for field operations on an international deep ocean carbon sequestration involving participants from the US, Norway, Canada, Japan and Australia. Approximate budget \$5 mil.

1992 – 1995, Florida Key Coral Reef Health. Chief Scientist on 6 expeditions through the Florida Keys to assess environmental impact on coral reefs. Approximate budget \$ 2 mil.

1989 – 1996, Gulf of Mexico Hypoxia Assessment. Chief Scientist on 12 research expeditions to study Mississippi River impact on the Gulf of Mexico coastal hypoxia. Approximate budget \$6 mil.

1990 -1995, National Biotechnology Risk Assessment Manager, US EPA Gulf Breeze. Planning and review of biotechnology risk assessment research conducted at EPA National Research Laboratories. Approximate budget \$75 mil.

1990 – 1993, Ecuador Mangrove Deforestation/Shrimp Pond Development Environmental Impact. Assessment of environmental impact for mangrove deforestation and the resulting development of shrimp ponds resulted in a thorough ecosystem assessment. The data gathered resulted in Ecuadorian president requesting a legal testimony in an environmental impact law suit between shrimp and banana farmers. Approximate budget \$1.5 mil.

RESEARCH EXPERIENCE

2017-2018, Chief scientist leading assessment of Texas Coastal oxygen demand. Research is supported through Texas OneGulf

2017-2018, CoPI for development of UAV and sensors to conduct airborne assessment of methane and carbon dioxide gas fluxes in the coastal ocean. Research is supported through NSF MRI.

2015 Co-chief scientist on an expedition off the Hikurangi Margin, New Zealand to provide geochemical assessment of a double BSR. Research is supported through NIWA, DOE, and ONRG.

2013-2014, Co-chief scientist of overflight assessment and ground truthing of Arctic methane flux from tundra, thermokrast lakes and coastal waters to the atmosphere. Researchers from NOAA, Harvard, USACE and NRL are supported with funding from NSF and Navy RRTO.

2011-2013, Co-chief scientist, New Zealand, paleo-geochemistry and methane hydrate exploration. 3 expeditions on the RV Polaris and RV Sonne. ONR, DOE, GEOMAR, and New Zealand government funding.

2009, Chief Scientist, Beaufort Sea, methane hydrate research, energy and climate. 4 nations, 34 scientists. ONR, DOE, NRL funding.

2007, Chief Scientist, Alaminos Canyon, Texas-Louisiana Shelf. Methane hydrate exploration. DOE, ONR funding.

2006, Co-chief scientist, Hikurangi Margin, New Zealand plate convergence contribution to vertical methane flux. ONR, NRL, ONRG, and DOE funding.

2000-2006, Military harbor remediation research, District of Columbia, Philadelphia, Charleston, Honolulu, Norfolk, San Diego, San Francisco. ONR funding.

2003-2004, Co-chief scientist, two expeditions off the mid Chilean Margin. Methane hydrate exploration.

2000-2003, Co-chief scientist, three expeditions on the Cascadia Margin, Canada. Methane hydrate exploration.

2002-2005, Chief scientist, three expeditions of the Texas-Louisiana Shelf. Methane hydrate exploration. DOE, ONR funding.

1999-2004, Chief scientist - initiate preliminary survey for international experiment in carbon sequestration off Hawaii and Norway. Four cruises were for 7-10 days with scientists from Japan, Norway, Canada and the US. 6 sub dives on Loihi. DOE funding.

1999-2001, Co-Chief scientist -Five cruises in Russian Military Harbor Liepaja Latvia, working on ONR funded harbor remediation. Collaborative with University of Latvia. ONR, ONR Global

funding.

1998, 2000, Co-Chief scientist, 14 submarine dives in the Gulf of Mexico, from the Edmund Link. Sample for $\Delta^{14}\text{C}$ and $\delta^{13}\text{C}$ analysis to initiate understanding of methane hydrate formation. NRL funding.

1992-1996, Co-Lead Scientist, Groundwater organic contaminant natural attenuation and source identification. Gainesville, FL and Port Hueneme CA. SERPD funding.

1995, Antarctica, Co-Chief Scientist, Ozone depletion. NSF funding.

1992-1995, Gulf of Mexico Hypoxia. Chief Scientist, 10 expeditions. EPA funding.

1990-1993, Florida Keys, coral health assessment. Chief Scientist 6 expeditions. EPA funding.

1990-1995, US EPA National Manager Biotechnology Risk Assessment, Gulf Breeze FL.

1990-1993, Ecuador Mangrove Research. World Bank and EPA funding.

1992, Ecuador shrimp pond toxicity. Ecuadorian government funding.

1989-1990, Valdez oil spill natural attenuation research. EPA and Exxon funding.

PUBLICATIONS (160 TOTAL, h-index 41, citations 4467)

Journals

Coffin R., Hamdan, L., Plummer, R., Smith, J. Yoza, B. Larsen, R. Montgomery, M. Submitted. Coastal Beaufort Sea Alaskan Shelf Organic Carbon Source(s): Strong Spatial Variations. *Energies*.

Coffin, R. Yoza, B., Masutani, S. Kvamme, B, Uchida, T. Norio, T. Submitted. Review on Coastal Gas Hydrate Distributions Discussed at and Developed Through the International Gas Hydrate Research and Development Workshops. *Energies*.

Uchida, T., Kvamme, B., Coffin, R. Norio, T. Oyama, A., Masutani, S. In Press. Review of Fundamental Properties of Gas Hydrates Breakout Sessions of the International Workshop on Methane Hydrate Research and Development. *Energies*.

Waghorn, K. Pecher, I., Strachan, L., Crutchley, G.; Bialas, J., Coffin, R., Davy, B., Koch, S., Kroeger, K. F., Papenberg, C., Rose, P., Sarkar, S. In Press.. Paleo-Fluid Expulsion Influencing Contouritic Drift Formation on the Chatham Rise, New Zealand. *Basin Research*.

Lorenson, T., Greinert, J., Coffin, R. 2016. Dissolved methane in the Beaufort Sea and the Arctic Ocean, 1992-2009; Sources and atmospheric flux. *Limnol. Ocean.* LO-15-0412.R3

- Osburn, C.L. Boyd, T.J. Montgomery, M.T., Bianchi, T.S. Coffin, R.B., Paerl, H.W. 2016. Spatial Variations in Sediment Organic Matter Sources on the Alaskan Beaufort Sea Shelf. *Frontiers in Marine Science*, doi: 10.3389/fmars.2015.00127
- Coffin, R. B., Osburn, C.L., Plummer, R.E., Rose, P.S., Grabowski, K.S. 2015. Deep sediment methane incorporation into shallow sediment carbon pools in Atwater Valley, Texas-Louisiana Shelf, Gulf of Mexico. *Energies* 8, 1561-1583; doi:10.3390/en8031561.
- Leifer, I., Solomon, E. Schneider von Deimling, J., Coffin, R., Linke, P. 2015. Investigations of the Geologic, Water-Colum, and Atmospheric Phenomina of a Persisten North Sea Gas Blowout. *Mar. Petrol. Geol.* 68:806-823.
- Coffin, R.B., Hamdan, L.J., Smith, J.P., Rose, P.S., Plummer, R.E., Yoza, B., Pecher., I. Montgomery, M.T. 2014. Contribution of Vertical Methane Flux to Shallow Sediment Carbon Pools across Porangahau Ridge, New Zealand. *Energies* 7, 5332-5356; doi:10.3390/en7085332.
- Rose, P.S., J.P. Smith, R.C. Aller, J.K. Chchran, R.L. Swanson, Coffin, R.B. 2015. Medically-Driven 131I as a Tool for Investigating the Fate of Wastewater Nitrogen in Aquatic Environments. *Environ. Sci. & Technol.* DOI:10.1021/aceutgb00189.
- Smith, J. P., Coffin, R. B. 2014. Methane Flux and Authigenic Carbonate in Shallow Sediments Overlying Methane Hydrate Bearing Strata in Alaminos Canyon, Gulf of Mexico. *Energies* 7, 5332-5356; doi:10.3390/en7085332.
- Treude, T., Krause, S., Schweers, J., Dale, A.W., Coffin, R.B., Hamdan, L.J. 2014. Sulfate reduction and methane oxidation activity below the sulphate-methane transition zone in Alaska Beaufort continental margin sediments: Implications on deep sulphur cycling. *GCA* 144:217-237.
- Coffin, R.B., Hamdan, L. Smith, J.P., Plummer, R., Millholland, L. Larson, R. 2013. Spatial Variation in Shallow Sediment Methane Source and Cycling along the Alaskan Beaufort Sea. *Marine Petroleum and Geology* 10.1016/j.marpetgeo.2013.05.002.
- Boyd, T.J., Pound, M.J., Lohr, D., Coffin, R.B. 2013. Radiocarbon-depleted CO₂ evidence for fuel biodegradation at the Naval Air Station North Island (USA) fuel farm site. *Environmental Science. Processes & Impacts*; DOI:10.1039/c3em00008g.
- Hamdan, L. J., Coffin, R. B., Sikaroodi, M., Greinert, J., Treude, T., and Gillevet, P. M. (2013). Ocean currents shape the microbiome of Arctic marine sediments. *ISME J.* 7, 685–696. doi: 10.1038/ismej.2012.143
- Montgomery, M.T., Coffin, R.B., Boyd, T.J., Smith, J.P., Plummer, R.E., Walker, S.E., and C.L. Osburn. 2011. Mineralization rates of 2,4,6-Trinitrotolene and bacterial production amongst natural microbial assemblages in coastal sediments. *Environmental Pollution* (published online 12 AUG 2011). DOI:10.1016/j.envpol.2011.07.018
- .Hamdan, LJ, Gillevet, PM, Pohlman, JW, Sikaroodi, M, Greinert, J, Coffin, RB. 2011. Diversity

and biogeochemical structuring of bacterial communities across the Porangahau ridge accretionary prism, New Zealand. *FEMS Microbiol. Ecol.*, 77: 518-532.

Joye, S. B., Leifer, I., MacDonald, I. R., Chanton, J. P., Meile, C. D., Teske, A. P., Kostka, J. E., Chistoserdova, L., Coffin, R., Hollander, D., Kastner, M., Montoya, J. P., Rehder, G., Solomon, E., Treude, T., and Villareal, T. A., 2011. Comment on "a Persistent Oxygen Anomaly Reveals the Fate of Spilled Methane in the Deep Gulf of Mexico, *Science* **332**:6033.

I.A. Pecher, S.A. Henrys, W.T. Wood, G. Crutchley, A.R. Gorman, R. Coffin, N. Kukowski, J. Greinert, and K. Faure 2010). Focused Fluid Expulsion on the Hikurangi Margin, New Zealand – Evidence from Possible Local Upwarping of the Base of Gas Hydrate Stability. *Marine Geology*. 272:99-113.

Schwalenberg, K., W. Wood, I. Pecher, L. Hamdan, S. Henrys, M. Jegen, and R. Coffin. 2010. Preliminary interpretation of CSEM, heatflow, seismic, and geochemical data for gas hydrate distribution across the Porangahau Ridge, New Zealand . *Marine Geology* 272:79-88.

Montgomery, M.T., Boyd, T.J., Osburn, C.L., Plummer, R.E., Masutani, S.M., and R.B. Coffin. 2010. Desalination technology waste streams: effect of pH and salinity on metabolism of marine microbial assemblages. *Desalination* 249:861-864.

Coffin, R., Rose, K., Greinert, J., and Wood, W. First Trans-Shelf-Slope Climate Study in the U.S. Beaufort Sea Completed. *FITI Newsletter*, March 2010

Pohlman, J. W., M. Kaneko, V. Heuer, R. Coffin and M. Whiticar. 2009. Methane sources and production patterns in the northern Cascadia margin gas hydrate system. *Earth and Planetary Science Letters*. 287:504-512.

Coffin, R. and J. Greinert. 2009. Review: Developing Long Term International Collaboration on Methane Hydrate Research and Monitoring in the Arctic Region - International workshop at Royal NIOZ, The Netherlands *EOS* 90:240.

Coffin, R. B. and W. Wood. 2009. Naval Research Laboratory Contribution to Global Methane Hydrate Research. <http://www.netl.doe.gov/technologies/oil-as/FutureSupply/MethaneHydrates/>

Pohlman, J. W., J. E. Bauer, E. A. Canuel, K. S. Grabowski, D. L. Knies, C. S. Mitchell, M. J. Whiticar, and R. B. Coffin. 2009. Sources and fluxes of methane in gas hydrate cold-seep systems: Evidence from radiocarbon and stable isotope signatures. . *Marine Chemistry* 115:102–109

Coffin, R. B., L. Hamdan, R. Plummer, J. Smith, J. Gardner, W. T. Wood. 2008. Analysis of Methane and Sulfate Flux in Methane Charged Sediments from the Mississippi Canyon, Gulf of Mexico. *Marine and Petroleum Geology* doi:10.1016/j.marpetgeo.2008.01.014.

Hamdan, L.J., Gillevet, PM, Sikaroodi, M, Pohlman, JW, Plummer, RE, Coffin, RB. 2008. Microbial diversity of sediments associated with methane gas and hydrate along the mid-Chilean

Margin. *FEMS Microbiol Ecol* 65:15-30

Wood, W. T., P. Hart, D. Hutchinson, N. Dutta, F. Snyder, R. B. Coffin, and J. F. Gettrust. 2008. Gas and Gas Hydrate Distribution Around Seafloor Seeps in Mississippi Canyon, Northern Gulf of Mexico, using Multi-Resolution Seismic Imagery. *Marine and Petroleum Geology* doi:10.1016/j.marpetgeo.2008.01.014

Pohlman, J. C. Ruppel, D. Hutchinson, R. Downer, R. Coffin. 2008. Assessing sulfate reduction and methane cycling in a high salinity pore water system (Keathley Canyon, Northern Gulf of Mexico) *Marine and Petroleum Geology*. doi:10.1016/j.marpetgeo.2008.01.014.

Coffin, R.B., Pohlman, J.W., Grabowski, K.S., Knies, D.L., Plummer, R.E., Magee, R.W., Boyd, T.J. 2008. Radiocarbon and stable carbon isotope analysis to confirm petroleum natural attenuation in the vadose zone. *Environmental Forensics* 9:75-84

Hamdan, L.J., Gillevet, PM, Sikaroodi, M, Pohlman, JW, Plummer, RE, Coffin, RB. 2008. Microbial diversity of sediments associated with methane gas and hydrate along the mid-Chilean Margin. *FEMS Microbiol Ecol* 65:15-30

Hoch, M. P., K. S. Dillon, R. B. Coffin and L. A. Cifuentes. 2008. Sensitivity of bacterioplankton nitrogen metabolism to eutrophication in sub-tropical coastal waters of Key West, Florida. *Marine Pollution Bulletin* 56 (5), pp. 913-926.

Pohlman, J.W., Bauer, J.E., Osburn, C.L., Coffin, R.B., 2007. "Carbon Isotope Evidence (C-13 and C-14) for Fossil Methane-Derived Dissolved Organic Carbon from Gas Hydrate Bearing Cold Seeps", *Geochimica Et Cosmochimica Acta* 71:798-798.

Tomaru, H., Matsumoto, R., Coffin, R.B., Pohlman, J.W., Spence, G.D. 2007. Geochemical relation between gas hydrates and water venting in the seismic blanking zone on the northern Cascadia continental margin offshore Vancouver Island, Canada. *Journal of Geochemical Exploration* 95:40-47

Coffin, R B., J. W. Pohlman, J. Gardner, R. Downer, W. Wood, L. Hamdan, S. Walker, R. Plummer J. Gettrust and, J. Diaz 2007. Methane Hydrate Exploration on the Mid Chilean Coast: A Geochemical and Geophysical Survey. *Am. Chem. Soc., Div. Pet. Chem.* Doi:10.1016/j.petrol.2006.01.013

Lu, H., Y.-T. Seo, J.-W. Lee, I. Moudrakovski, J. A. Ripmeester, N. R. Chapman, R. B. Coffin and J. P. Pohlman. 2007. Complex gas hydrate from the Cascadia margin. *Nature*. 445:303-306.

Boyd, T. J., C. L. Osburn. K. J. Johnson, K. B. Birgl and R. B. Coffin. 2006 Compound-Specific Isotope Analysis Coupled with Multivariate Statistics to Source-Apportion Hydrocarbon Mixtures. *Environ. Sci. Technol.* 40:1916-1924.

- Hoch, M. P., R. A., Snyder, W. H. Jeffrey, K. S. Dillon, and R. B. Coffin. 2006. Expression of glutamine synthetase and glutamate dehydrogenase by marine bacterioplankton: Assay optimizations and efficacy for assessing nitrogen to carbon metabolic balance in situ. *Limnol. Oceanogr. Methods* 4:308-328.
- Pohlman, J. W., E. Canuel, N. Chapman, G. Spence, M. Whiticar, and R. Coffin. 2005. The origin of thermogenic gas hydrates on the northern Cascadia Margin as inferred from isotopic ($^{13}\text{C}/^{12}\text{C}$ and D/H) and molecular composition of hydrate and vent gas. *Org. Geochemistry*. 36:703-716.
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- Chapman, R., J. Pohlman, R. Coffin, J. Chanton and L. Lapham. 2004. Thermogenic gas hydrates in the Northern Cascadia Margin. *EOS*. 85:361.
- Coffin, R.B., M.T. Montgomery, T.J. Boyd and S.M. Masutani. 2004. Influence of Ocean CO_2 Sequestration on Bacterial Production. *Energy* 29:1511-1520.
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