

## Ira Leifer

Bubbleology Research International, Inc.

Solvang, CA 93463

++1 805 683 3333, [ira.leifer@bubbleology.com](mailto:ira.leifer@bubbleology.com) [www.bubbleology.com](http://www.bubbleology.com)

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### Education

Ph.D.	Atmospheric Sciences	Georgia Institute of Technology, 1995.
M. S.	Aeronomy	University of Michigan, 1989
B. Sc.	Physics, Astronomy	SUNY at Stony Brook, 1984

### Foreign Languages

Conversational Italian. Conversational French. Japanese third year level.

### Honors and Synergistic Activities

2012 -present	FOSTERRS Interagency Oil Spill Response Task Force Member
2010	JSOST Deepwater Horizon Oil Spill Conference Panel Member
2010 -2011	US Govt., Deepsea Plume Modeling Team Member
2010	Panel Member Blue Ocean Film Festival
2010	US Govt., Mass Balance Calculator Team Member
2010	Deep Spill 2 Study Team Leader
2010	US Govt., Technical Flow Rate Team Member
2010	BBC "How the Earth Changed History, Episode. Human Planet." Interview.
2008	History Channel Show "Catastrophe. Episode: Planet of Fire." Interview.
2007	History Channel Show "Methane Explosion." Interview.
2006, 2007	Yuan Lin Science Program, bubbleology presentation and lab experiment.
2006-2008	Marine Science Advisory Committee
2006	CNN Interview on hydrate destabilization and catastrophic seepage
2005	SB Museum of Natural History Geophysics Festival - bubbleology and seeps table.
2004	Participant in Discovery Channel Episode "Diving to Bermuda " on Bermuda Triangle and Marine Seeps
2003	Summer Session Lecture/Mentor
2003	Gulf of Mexico, Hydrates Research Consortium Member.
2002	Participation in Santa Barbara Museum of Natural History Bubble Festival.
2001-2004	Strathmore's Who's Who.
2001	Consulting Science Editor to Odyssey Science Magazine, Bubbleology issue - July.
1997 - 2000	Mentoring a doctoral student in researching bubble microphysics at the National University of Ireland, Galway.
2000 - present	Development and maintenance of the <a href="http://www.bubbleology.com">www.bubbleology.com</a> web site describing aspects of bubble research and hydrodynamics. The site has generated downloads and inquiries from all over the world including developing countries.

### Employment

2014 – Present	CEO Bubbleology Research International
2014 – 2014	Research Associate 1, Marine Sciences Institute and Institute of Crustal Studies, University of California, Santa Barbara, CA
201?-2014	Associate Researcher 3, Marine Sciences Institute and Institute of Crustal Studies, University of California, Santa Barbara, CA.
2008 – 201?	Associate Researcher 2, Marine Sciences Institute and Institute of Crustal Studies, University of California, Santa Barbara, CA.
2006 - 2008	Associate Researcher 1, Marine Sciences Institute and Institute of Crustal Studies, University of California, Santa Barbara, CA.

2005 - 2006 Assistant Researcher 4, Marine Sciences Institute and Institute of Coastal Studies, University of California, Santa Barbara, CA.

2003 - 2005 Assistant Researcher 3, Marine Sciences Institute, University of California, Santa Barbara, CA.

2001 - 2003 Assistant Researcher I, Marine Sciences Institute and Chemical Engineering Department, University of California, Santa Barbara, CA.

Sept 1999 - 2001 Post Doctoral Researcher, Chemical Engineering Department, University of California, Santa Barbara, CA.

Jun 1998-Aug 1999 Visiting Scientist, TNO Physics and Electronics Laboratory, The Hague, The Netherlands.

Jan 1996-Jun 1998 Post Doctoral Researcher, Martin Ryan Institute of Marine Science, National University of Ireland, Galway, Ireland.

1993 - Dec 1995 NORCUS Graduate Research Assistant, Georgia Institute of Technology, School of Earth and Atmospheric Sciences, Atlanta, Georgia.

1992 - 1993 NORCUS Graduate Research Assistant, Battelle Marine Sciences Laboratory, Physical Oceanography, Sequim, Washington.

1990 - 1992 Graduate Research Assistant, Georgia Institute of Technology, School of Earth and Atmospheric Sciences, Atlanta, Georgia.

1985 - 1989 Graduate Research Assistant, University of Michigan, Atmospheric Oceanic and Space Sciences Department, Ann Arbor, Michigan.

1984 - 1984 Research Technician, State University of New York at Stony Brook, Low Temperature Physics Laboratory, Stony Brook, New York.

### **Active Research Areas**

Arctic methane emissions processes. Methane and oil slick remote sensing. Atmospheric air pollution and methane measurements. Bubble chemico-hydrodynamics. Breaking wave bubble plumes. Bubble formation. Bubble observations (sonar, video) of marine hydrocarbon seep bubble plumes. Hydrocarbon seep gas and oil geochemistry. Field studies of oil slick evolution. Numerical modeling of bubble processes. Numerical modeling of oil slick evolution. Oil droplet and oily bubble hydrodynamics. Turbulence visualization and digital particle imaging velocimetry (DPIV). Slick microbial processes. Bubble music.

### **Major Cruise/Campaign Participation**

COMEX Airborne Campaign 6-9/2014. Multi-aircraft NASA/ESA campaign to measure methane from S. California sources Lead PI.

RV Pelican. 10/2010. Hydrate observatory sonar deployment. MC118, Gulf of Mexico. Participant scientist.

North Sea 22/4b Expedition, 8/2010, Chief Scientist

Expedition *Methane America!!* 10/2010. Lead PI/Chief Scientist, Transcontinental surface methane measurements.

NASA ER2, Aerospace Twin Otter 5/2010. Airborne response to the Gulf of Mexico Oil Spill, lead PI/Chief mission coordinating scientist

RV Cormorant and SeBASS Twin Otter, 4/2010. Hyperspectral methane plume characterization. Lead scientist, Coal Oil Pt CA.

RV Cormorant, 10/2009. In situ mass spectrometer and gas chromatograph characterization of dissolved hydrocarbon plumes from natural seepage. Coal Oil Pt, CA.

RV Kvichak, 9/2009. Bubble and bubble plume and biological characterization of marine seepage, Grays Harbor, WA.

RV Brooks McCall, 7/2009. Bubble measurements at hydrate seepage and plume characterization, Gulf of Mexico.

RV Jan Mayen, 5/2009. Bubble calanus fisheries technology. Norway

RV Zephyr, Coal Oil Pt, CA, 3/2008 - Seep methane in the water and atmosphere using sonar (USGS), field gas chromatograph measurements, and coordination with NASA overflight in-situ methane sampling - Chief Scientist.

RV Garibaldi, Summerland, CA 10/2005. Follow-up, quantification of oil emissions from natural seeps and abandoned oil wells - chief scientist.

RV Velero - Delta Submersible, Coal Oil Pt, CA 9/2005. Submarine cruise to study marine hydrocarbon seeps - Co-chief scientist.

RV Shearwater, Coal Oil Pt, CA, 3/2005 - Seep methane in the water column and atmosphere using sonar, in-situ FID measurements, and remote sensing techniques - Chief Scientist.

Garibaldi, Summerland, CA, 11/2003 - Quantification of oil emissions from natural seeps and abandoned oil wells.

Point Sur, Pt Conception, CA, 3/2002 - Location of marine hydrocarbon seeps.

Seward/Johnson RV Link, Gulf of Mexico, 7/2001 - Seep bubble visualization, tracking bubble plume.

RV/Edwin Link Gulf of Mexico, 8/2000 - Seep bubble visualization from submersible.

Spirit of Santa Barbara - Santa Barbara Channel - 11/2001 - Geochemical and bubble visualization of a diver accessible hydrocarbon seep - Chief Scientist.

**Peer-Reviewed Publications (114/117/4) (Submitted/InPrep/not peer reviewed)**

- .... Leifer, I. Thermal infrared oil stuff.
- .... Yurganov, L., **I. Leifer**, X. Xiong, 2014. Atmospheric methane over the Arctic Ocean: Thermal IR satellite and ship-based observations. *J. Integrative Environmental Sciences. In Progress.*
- .... Wright, I.C., James, R.H., T.A. Minshull, G.K. Westbrook, C.A. Graves, D.P. Connely, B. Alker, T.P. Le Bas, B.J.P. Berges, C. Cole, H. Czerski, B. Ferre, V. Hühnerbach, I. Leifer, T.G. Leighton, D. Lowry, A. Ogor, C. Scalabrin, Y. Thomas, M. Tomczyk, M.E. Vardy, P.R. White. 2015. Methane venting to the atmosphere from the seabed of the Arctic continental shelf, Offshore Svalbard. *In Prep.*
- ... **I. Leifer**, 2015. Oil flux estimates from a super-prolific natural hydrocarbon seep in the Gulf of Mexico, GC600, *Earth and Planetary Sciences, In Preparation.*
99. Solomon, E., **I. Leifer**, M. Kastner, J. Levine, G. Rehder, et al., 2015. Type 2 hydrates enables deepsea methane to reach the atmosphere. *Nature Geoscience, In Progress.*
109. Yurganov, L., F. Muller-Karger, **I. Leifer**. (2018), Methane variation over terrestrial and marine Arctic areas (2010-2016): IASI satellite data. *Global Biological Cycles, Under Review, 2017GB005811.*
- 113.** Leifer, I., D.S. Green, J. Murray (2017) Remote Sensing for disaster science in a changing world. *In progress*
- 117. Leifer I.**, Bubble Shuttle
- 116 Leifer, I.** Thermal oil remote Sensing
- 115. Leifer, I.**, WCS data analysis
- 114. Leifer, I.**, C. Melton, M.L. Fischer, R. Chatfield, M. Fladeland, W. Gore, D. Hvlaka, L. Iraci, J. Marrero, J-M. Ryoo, T. Tanaka, E. Yates, J. Yorks, Air pollution inputs to the Mojave Desert by fusing

- surface mobile and airborne *in situ* and airborne and satellite remote sensing: A case study of interbasin transport with numerical model validation. *Atmospheric Environments*, Submitted.
113. Leifer, I., C. Melton, D.M. Tratt, C. Gulden, C. Chang, K.N. Buckland, (2019). Mobile surface and airborne remote sensing and mobile *in situ* investigations into emissions from a producing Central California oil field. *Total Science of the Environment*, Submitted.
112. Leifer, I., C. Melton, D.M. Tratt, K.N. Buckland, C.C. Chang, C. Lieven, J.L. Hall, B. Leen, T. Lundquist, M. Van Damme, S. Vigil., S. Whitburn (2019) A dual tracer approach to derive H<sub>2</sub>S exposure from satellite remote sensing. *Total Science of the Environment*. Submitted.
111. Leifer, I., L. Yurganov, T. McClimans, F. Muller-Karger, R.F. Chen (2019) Satellite ice extent, sea surface temperature, and atmospheric methane trends in the Barents and Kara Seas, *Progress In Oceanography*, Submitted.
110. Leifer, I. (2019). A synthesis review of emission and fates for the Coal Oil Point marine hydrocarbon seep field and California marine seepage, *Geofluids*, In Press.
109. Hall, J., I. Leifer, D.W. Warren, T.L. Hayhurst, D.M. Tratt (2018) Multi-Order Carbon Spectral Imager (MOCSD): A sensor concept for carbon cycle investigations. *Earth and Space Science*. In press, doi:10.1029/2018EA000419.
108. Leifer, I., C. Melton, D.M. Tratt, K.N. Buckland, C.C. Chang, J. Frash, J.L. Hall, A. Kuze, B. Leen, C. Lieven, T. Lundquist, K. Shiomi, M. Van Damme, S. Vigil. (2018) Validation of trace gas husbandry emissions by fusion of surface mobile, stationary, and airborne remote sensing with *in situ* mobile surface data: Chino Dairy Complex, Los Angeles Basin, *Environmental Pollution*, doi:10.1016/j.envpol.2018.03.078.
107. Leifer, I., C. Melton, M.L. Fischer, M. Fladeland, W. Gore, L. Iraci, J. Marrero, J.-M. Ryoo, T. Tanaka, E. Yates (2018), Atmospheric characterization through fused mobile airborne and surface *in situ* surveys: Methane emission quantification from a producing oil field, *Atmospheric Measurement Techniques*, 11, 1689-1705. doi:10.5194/amt-1689-2018.
106. Hu, C., L. Feng, J. Holmes, G. Swayze, I. Leifer, C. Melton, O. Garcia, I. MacDonald, M. Hess, F. Muller-Karger, G. Graettinger, R. Green (2018). Remote sensing estimation of surface oil volume during the 2010 Deepwater Horizon oil blowout in the Gulf of Mexico: Scaling up AVIRIS observations with MODIS measurements. *Remote Sensing*, 9(11), 1162. doi:10.3390/rs9111160.
105. Krings, T., I. Leifer, S. Krautwurst, K. Gerilowski, M. Hortsjann, H. Bovensmann, M. Buchwitz, J.P. Burrows, R.W. Koyler, H. Jonsson, M.M. Fladeland (2017). Reduced methane emissions from Santa Barbara marine seeps. *Remote Sensing*, 9(11), 1162. doi:10.3390/rs9111162.
104. Leifer, I., A. Judd, J. Hildebrandt, (2017). Life Aquatic Chemosynthetic in the photic zone – Up the food chain? *Fisheries and Oceanography*, 4(3), 555636. doi:10.19080/OFOAJ.2017.04.555636.
103. Krautwurst, S., K. Gerilowski, H.H. Jonsson, D.R. Thompson, R.W. Koyler, A.K. Thorpe, M. Hortsjann, M. Eastwood, I. Leifer, S. Vigil, T. Krings, J. Borchardt, M. Buchwitz, M.M. Fladeland, J.P. Burrows, H. Bovensmann, 2016. Detected methane emissions from landfills in the Los Angeles Basin during the COMEX campaign by the Methane Airborne MAPper (MAMAP) instrument and an airborne greenhouse gas *in situ* analyzer. *Atmospheric Chemistry and Physics*. 10(9) 3429-3452. doi:10.5194/amt-10-3429-2017.
102. Zhang, M., I. Leifer, C. Hu (2017) Challenges in methane column retrievals from AVIRIS NG imagery over spectrally cluttered surfaces: A sensitivity analysis. *Transactions of Geoscience and Remote Sensing*, 9(8), 835, doi:10.3390/rs9080835.
101. Leifer, I., D. Chernykh, I. Semiletov, N. Shakhova. (2017) Sonar gas flux estimation by bubble insonification: Application to methane bubble fluxes from the East Siberian Arctic Shelf seabed. *The Cryosphere*, 11(3), 1333-1350. doi:10.5194/tc-2016-156.

100. Sun, S., C. Hu, L. Feng, G.A. Swayze, J. Holmes, G. Graettinger, I. MacDonald, O. Garcia, **I. Leifer** (2016) Oil slick morphology derived from AVIRIS measurements of the Deepwater Horizon oil spill: Implications for spatial resolution requirements of remote sensors. *Marine Pollution Bulletin* 103(1/2), 276-285. doi: 10.1016/j.marpolbul.2015.12.003
99. Yurganov, L., **I. Leifer** (2016) Abnormal concentrations of atmospheric methane over the Sea of Okhotsk during 2015.2016 winter. *Current Problems in Remote Sensing of Earth from Space (Sovremennye Problemy Distantionnogo Zondirovaniya Zemli iz Kosmosa)*, 1(3) 231-234.
98. Yurganov, L., **I. Leifer** (2016) Estimates of methane emission rates from some arctic and sub-Arctic areas based on orbital interferometer IASI data. *Current Problems in Remote Sensing of Earth from Space (Sovremennye Problemy Distantionnogo Zondirovaniya Zemli iz Kosmosa)*, 13(2) 173-183.
- 97 Yurganov, L., **I. Leifer**, C. Lund-Myrhe, Seasonal and interannual variability of atmospheric methane over Arctic Ocean from satellite data, 2016. *Current Problems in Remote Sensing of Earth from Space (Sovremennye Problemy Distantionnogo Zondirovaniya Zemli iz Kosmosa)*, 13(2) 107-119.
- 96. Leifer, I.**, C. Melton, D.M. Tratt, J. Frash, M.X. Gupta, B. Leen, K.N. Buckland, P. Clarisse, P. Coheur, J. Frash, M.X. Gupta, P.D. Johnson, B. Leen, M. van Damme, S. Whitburn, L. Yurganov, Remote sensing and in situ measurements of methane and ammonia emissions from a megacity dairy complex: Chino, CA, *Environmental Pollution*, **221**, 37-51.
- 95. Leifer, I.**, C. Melton, D.M. Tratt, K.N. Buckland, L. Clarisse, P. Coheur, J. Frash, M.X. Gupta, P.D. Johnson, Comparing imaging spectroscopy and in situ observations of Chino Dairy Complex emissions, *8<sup>th</sup> Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing*, August 21-24 2016, Los Angeles
- 94. Leifer, I.**, C. Melton, J. Frash. M.L. Fischer, X. Cui, J. Murray (2016), Fusing mobile in situ observations and satellite remote sensing of chemical release emissions towards improved disaster response, *Frontiers in Science*, **4(59)** 1-14.
93. James, R., P. Bousquet, I. Busseman, M. Haeckel, R. Kipfer, **I. Leifer**, I. Ostrovsky, H. Niemann, J. Piskozub, G. Rehder, T. Treude, L. Vielstädte, J. Greinert, (2016). Effects of climate change on methane emissions from seafloor sediments in the Arctic Ocean: A review. *Limnology and Oceanography*, **61**, 5281-5299. doi: 10.1002/no.10307.
92. Sun, S., C. Hu, L. Feng, G.A. Swayze, J. Holmes, G. Graettinger, I. MacDonald, O. Garcia, **I. Leifer**, Oil slick morphology derived from AVIRIS measurements of the Deepwater Horizon oil spill: Implications for spatial resolution requirements of remote sensors. *Marine Pollution Bulletin* **103(1-2)** 276-285. doi:10.1016/j.marpolbul.2015.12.003.
91. Thompson, D., **I. Leifer**, M. Eastwood, M. Fladeland, C. Frankenberg, K. Gerilowski, R. Green, B. Luna, A. K. Thorpe (2015), Real-time remote detection and measurement for airborne imaging spectroscopy: A case study with methane, *Atmospheric Measurement Technology*, **8**, 1-46.
90. MacDonald, I.R., O. Garcia-Pineda, A. Beet, S. Daneshgar-Asl, L. Feng, D. French-McCay, G. Graettinger, D.J. Holmes, C. Hu, **I. Leifer**, F. Muller-Karger, A. Solow. G. Swayze. Natural and unnatural oil slicks in the Gulf of Mexico. *J. Geophysical Research Oceans*, **120**, 8364-8380.
- 89. Leifer, I.**, A. Judd, The 22/4b Study, Preface, *Journal of Marine Petroleum Geology*, **68B**, 705.
- 88. Leifer, I.**, A. Judd, The UK22/4b blowout 20 years on: Investigations of continuing methane emissions from sub-seabed to the atmosphere in a North Sea context *Journal of Marine Petroleum Geology*, **68B**, 706-717.
87. Wiggins, S., I. Leifer, J. Hildebrandt, 2013. Long-term acoustic monitoring at the North Sea well site 22/4b. *Journal of Marine Petroleum Geology*, **68B**, 776-788.
86. Wilson, D.S., I. Leifer, E. Maillard, 2013. Bubble megaplume process visualization by 3D multibeam sonar mapping. *Journal of Marine Petroleum Geology*, **68B**, 753-765.

- 85 Nauw, J., P. Linke, **I. Leifer**, Bubble momentum plume as a possible mechanisms for an early breakdown of the seasonal stratification in the North Sea. *Journal of Marine Petroleum Geology*, 68B, 789-805.
- 84 Leifer, I.**, E. Solomon, J. Schneider von Deimling, G. Rehder, R. Coffin. 2013. The fate of bubbles in a large, intense bubble megaplume for stratified and unstratified water: Numerical simulations of 22/4b expedition field data. *Journal of Marine Petroleum Geology*, 68B 743-752.
- 83 Leifer, I.**, Seabed bubble flux estimation by calibrated video-survey for a large blowout seep in the North Sea, *Journal of Marine Petroleum Geology*, 68B, 743-752.
- 82 Schmale, O., I. Leifer, C. Stölle, J. Schneider von Deimling, S. Krause, K. Kieslich, A. Frahm, T. Treude, 2015. Bubble Transport Mechanism : Indications for a gas bubble-mediated inoculation of benthic methanotrophs into the water column. *Continental Shelf Research*, 103, 70-78.
- 81 Leifer, I.**, J. Murray, D. Street, T. Stough, E. Ramirez, S. Gallegos, B.K. Jones, 2015. The Federal Ocean Spill Team for Emergency Response Remote Sensing, FOSTERRS: Enabling remote sensing technology for marine disaster response, Chapter 7, 91-111.
80. Warzinski, R.P., R. Lynn, I. Hajasmaa, **I. Leifer**, F. Shaffer, B.J. Anderson, J.S. Levine, 2014. Dynamic morphology of gas hydrate on a methane bubble in water: Observations and new insights for hydrate film models. *Geophysical Research Letters*, **41(19)**, 6841-6847. doi: 10.1002/2014GL061665
- 79. Leifer, I.**, T. McClimans, S.H. Gjosund, E. Grimaldo, 2015. Fluid motions associated with engineered area bubble plumes. *Applied Ocean Research*, **04015015**. doi: 10.1061/(ASCE)WW.1943-5460.0000292
78. Tratt, D.M., K.N. Buckland, J.L. Hall, P.D. Johnson, **I. Leifer**, K.R. Westberg, S.J. Young, 2014. Airborne visualization and quantification of discrete methane sources in the environment. *Remote Sensing of Environment*, **154**, 74-88. doi:10.106/j.rse.2014.08.011
77. Refaat, T., S. Ismail, A.R. Nehrir, J.W. Hair, J. Crawford, **I. Leifer**, A. Fix, T. Shuman, 2013. Performance Evaluation of a 1.6- $\mu$ m Methane DIAL System from Ground, Aircraft and UAV Platforms, *Optics Express*, **21(25)**, 30415-30432..doi: 10.1364/OE.21.030415
76. Shakhova, N., I. Semiletov, **I. Leifer**, A. Salyuk, D. Kosmach, C. Stubbs, D. Nicolsky, J. Fochesatto, V. Alexeev, Ö. Gustafsson, 2013. Ebullition and storm-induced methane release from the East Siberian Arctic Shelf. *Nature Geoscience* **7(1)**, 64-70. doi: 10.1038/geo2007
- 75. Leifer, I.**, D. Culling, O. Schneising, P. Farrell, M. Buchwitz, J.P. Burrows, 2013. Transcontinental methane measurements: Part 2. Mobile surface investigation of fossil fuel industrial fugitive emissions, *Atmospheric Environments*, 74, 432-441. doi: 10/1016/j.atmospenv.2013.02.014
74. Farrell, P., D. Culling, **I. Leifer**, 2012. Transcontinental methane measurements: Part 1. A mobile surface platform for source investigations, *Atmospheric Environments*, 74, 422-431. doi: 10/1016/j.atmospenv.2013.02.014
72. Thorpe, A.K., D.A. Roberts, E.S. Bradley, C.C. Funk, P.E. Dennison, **I. Leifer**, 2013. High resolution mapping of methane emission from marine and terrestrial sources using a cluster-tuned matched filter technique and imaging spectrometry. *Remote Sensing of Environment*. 134, 305-318. doi:10.1016/j.rse.2013.03.018
- 71. Leifer, I.**, D.M. Tratt, V.J. Realmuto, K. Gerilowski, J.P. Burrows, Infrared atmospheric trace gases imaging spectroscopy. *EOS Forum*, **93(5)**, 525. 11 Dec 2012. doi: 10.1029/2012EO500006.
- 70. Leifer, I.**, B. Lehr, D. Simcek-Beatty, E. Bradley, R. Clark, P.E. Dennison, Y. Hu, S. Matheson, C. Jones, B. Holt, M. Reif, D.A. Roberts, J. Svejkovsky, G. Swayze, J. Wozencraft, 2012. State of the art satellite and airborne marine oil spill remote sensing: Application to the BP *Deepwater Horizon* Oil Spill. *Remote Sensing of Environment*, 124, 185-209. doi:10.1016/j.rse.2012.03.024
68. McClimans, T., **I. Leifer**, S.H. Gjosund, E. Grimaldo, P. Daling, and F. Leirvik. 2012. Pneumatic Oil Barriers: The Promise of Bubble Rafts. *Journal of Engineering for the Maritime Environment, Part M*, 0(0), 1-17. doi:10.1177/1475090212450273

67. Bradley, E.S., D.A. Roberts, P.E. Dennison, R.O. Green, M. Eastwood, S.R. Lundeen, I.B. McCubbin, **I. Leifer**, Google earth and Google fusion tables in support of time-critical collaboration: Mapping the Gulf of Mexico Oil Spill with the AVIRIS Airborne Spectrometer. 2011. *Earth Science Informatics*, 4(4), 169-179. doi: 10.1007/s12145-011-0085-4
66. Salmi, M., Johnson, P.H., **I. Leifer**, and J.E. Keister, 2011. Behavior of methane seep bubbles over a pockmark on the Cascadia Continental Margin, *Geospheres*, 7(6), 1273-1283. doi: 10.1130/GES00648.1
65. Bradley, E.S., **I. Leifer**, D.A. Roberts, P.E. Dennison, L. Washburn, 2011. Remote sensing of marine methane emissions with AVIRIS imaging spectrometer band ratios. *Geophysics Research Letters*, 38, L10702, doi:10.1029/2011GL046729
- 64.** Joye, S.B., **I. Leifer**, I.R. MacDonald, J.P. Chanton, C.D. Meile, A. P. Teske, J.E. Kostka, L. Chistoserdova, R. Coffin, D. Hollander, M. Kastener, J.P. Montoya, G. Rehder, E. Solomon, T. Treude, T.A. Viillareal, 2011. Technical comment on "A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico" by Kessler et al. *Science*, 332(6033), 1033. doi:10.1126/science.1203307
- 63.** **Leifer, I.**, M. Hovland, T. Zemska, 2011. Two decades of community research on gas in shallow marine sediments. *EOS, Transactions of the American Geophysical Union*, 92(15), 128. doi:10.1029/2011EO150007
62. Patro, R.K., **I. Leifer**, 2011. Gas transfer velocity of single CO<sub>2</sub> bubbles, Eds. S. Komori, W. McGillis, and R. Kurose, In Gas Transfer at Water Surfaces-2010, Kyoto University Press, Japan, 249-261.
61. Valentine, D., J. Payne, **I. Leifer**, 2010. Chemical Oceanography and Geochemistry (Resources), Ch.3. In Updated Summary of Knowledge: Selected Areas of the Pacific Coast, Eds. B. Kaplan, C.J. Beegle-Krause, D.F. McCay, A. Copping, and S. Geerlofs. US Dept. of Interior, BOEMRE, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2010-014
60. Valentine, D., J. Payne, **I. Leifer**, 2010. Chemical Oceanography and Geochemistry (Impacts), Ch.17. In Updated Summary of Knowledge: Selected Areas of the Pacific Coast, Eds. B. Kaplan, C.J. Beegle-Krause, D.F. McCay, A. Copping, and S. Geerlofs. US Dept. of Interior, BOEMRE, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2010-014
59. Joye, S.M., I.R. MacDonald, **I. Leifer**, and V. Asper, 2011. Magnitude and oxidation potential of hydrocarbon gases released from the BP oil well blowout. *Nature Geoscience*, 4, 160-164, doi:10.1038/NGEO1067.
58. Grimaldo, E., **I. Leifer**, S.H. Gjøvsund, R.B. Larsen, H. Jeuthe, S. Basedow, 2010 Field demonstration of a novel towed, area bubble-plume zooplankton (*Calanus* sp.) harvester. *Fisheries Research*, **107(1-3)** 147-158. doi: 10.1016/j.fisheries.2010.10.018.
58. Lehr, B., S. Bristol, A. Possolo, A. Allen, M. Boufadel, T. Coolbaugh, P. Daling, M. Fingas, D. French-McCay, R. Goodman, R. Jones, A. Khelifa, P. Lambert, K. Lee, **I. Leifer**, A. Mearns, E. Overton, J. Payne, Oil Budget Calculator Deepwater Horizon Technical Document, Coastal Response Research Center, 206 pp.
- 57.** **Leifer, I.**, Appendix 6: Riser pipe flow estimate, in Deepwater Horizon Release Estimate of Rate by PIV. Ed. Bill Lehr, *Technical Flow Rate Group Report, US Dept of Interior*. pp 67-106,
- 56.** Bradley, E., **I. Leifer**, M. Moritsch, and D. Roberts, 2009. Long-term monitoring of a marine geologic methane source by a coastal air-pollution station. *Atmosphere Environments* **44**, 4973-4981. doi:10.1016/j.atmosenv.2010.08.010
55. Clark, R.N., Swayze, G.A., **Leifer, I.**, Livo, K.E., Kokaly, R., Hoefen, T., Lundeen, S., Eastwood, M., Green, R.O., Pearson, N., Sarture, C., McCubbin, I., Roberts, D., Bradley, E., Steele, D., Ryan, T., Dominguez, R., and the Airborne Visible Infrared Imaging Spectrometer (AVIRIS) Team, 2010. A method for quantitative mapping of thick oil spills using imaging spectroscopy, USGS Open File Report 2010-1167. pp. 51.
- 54.** Clark, R.N., Swayze, G.A., **Leifer, I.**, Livo, K.E., Lundeen, S., Eastwood, M., Green, R.O., Kokaly, R., Hoefen, T., Sarture, C., McCubbin, I., Roberts, D., Steele, D., Ryan, T., Dominguez, R., Pearson, N., Airborne Visible Infrared Imaging Spectrometer (AVIRIS) Team, 2010. A method for

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### **Conferences and Workshops (\*Presenting author)**

#### **2014**

- A13F-3243** K. Gerilowski, S. Krautwurst, R. Kolyer, H. Jonsson, T. Krings, M. Horstjann, **I. Leifer**, D. Schuettemeyer, M. M. Fladeland, J. P. Burrows, H. Bovensmann. Remote sensing of large scale methane emission sources with the Methane Airborne MAPper (MAMAP) instrument over the Kern River and Kern Front Oil fields and validation through airborne in-situ measurements - Initial results from COMEX
- A41G-3142** M. L. Fischer, S. Jeong, J. E. Bagley, C. Frankenberg, N. Parazoo, R. F. Keeling, H. D. Graven. Pseudo-data Inversions of California CO<sub>2</sub> Fluxes Combining Tower Measurements of CO<sub>2</sub> and 14CO<sub>2</sub> with OCO<sub>2</sub> Column CO<sub>2</sub> Retrievals
- Leifer, I.\***, B. Anderson, I. Haljasmaa, M. Kastner, J. Levine, R. Lynn, F. Shaffer, E. Solomon, S.C. Velaga, R. Warzinski. A reassessment of the deep methane contribution to the atmosphere: The well hydrated bubble plume express. *Gordon Research Seminar. Natural Gas Hydrates: Occurrence and Dynamics Behavior*. March 23-24 2013. Galveston, TX.
- Leifer, I.,\*** H. Bovensmann, J.P. Burrows, E.T. Eglund, K. Gerilowski, T. Krings, O. Schneising, C. Melton, D. Tratt. Mobile, in situ surface greenhouse gas validation of satellite greenhouse gas anomalies - Fossil fuel industrial contributions. *94<sup>th</sup> Annual American Meteorological Society Meeting*, February 2-6, 2014, Atlanta, GA.

#### **2013**

- Leifer, I.**, N. Shakhova, I. Semiletov, L. Yurganov, C.A. Stubbs, Implications of a warming Arctic – Methane emissions from submerged permafrost underlying the rapidly warming East Siberian Arctic Sea. *American Geophysical Union, Fall Meeting* Dec. 9-13, 2013, San Francisco, CA. B311-01.
- Leifer, I.**, N. D. Tratt, E.T. Eglund, K. Gerilowski, S.A. Vigil, M. Buchwitz, T. Krings, H. Bovensmann, S. Krautwurst, J.P. Burrows, Investigation of greenhouse gas emissions by surface, airborne, and satellite on local to continental scale. *American Geophysical Union, Fall Meeting* Dec. 9-13, 2013, San Francisco, CA. abstract# A21G-0156, poster: [https://live.blueskybroadcast.com/bsb/client/\\_new\\_details.asp?t=ep&id=63008](https://live.blueskybroadcast.com/bsb/client/_new_details.asp?t=ep&id=63008)
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- Chadwick, W.W., S.G. Merle, R.W. Embley, N. Buck, J.A. Resing, W.J. Lavelle, **I. Leifer**, Bubble plumes above erupting NWRota-1 submarine volcano, Mariana Arc. *American Geophysical Union, Fall Meeting* Dec. 9-13, 2013, San Francisco, CA. V41D-2841.

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## Seminars and Talks and Presentation

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- Leifer, I.\***, Lessons that need to be learned from the Great Macondo Oil Spill. *Santa Ynez Historical Society, Oct. 14, 2010.*
- Leifer, I.\***, Petroleum, NASA, and a 21<sup>st</sup> Century Oil Spill Response, Jet Propulsion Laboratory, Pasadena, CA, Oct. 21, 2010.
- Leifer, I.\***, Petroleum, NASA, and a 21<sup>st</sup> Century Oil Spill Response, Caltech Management Association, Caltech, Pasadena, CA, Oct. 21, 2010.
- Leifer, I.\***, The Coal Oil Point Seep Field: Learning from Natural Oil and Gas Emissions: Application to the Gulf of Mexico Oil Spill, *UCSB Vice Chancellors Research Briefing June 6 2010.*
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- Leifer, I.\***, Feb 4, 2008. Marine bubbles, Hard working agents of change, StatoilHydro, Trondheim, Norway.
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- Aquatic Science Class Talk, August 2006, "Catastrophic seepage and climate change."
- Shoreline Preservation Class, Santa Barbara, CA, Oct. 22, 2004. "Where does the tar on the Coal Oil Point beaches come from?"
- Nagoya Institute of Technology, Dept. of Mechanical Engineering, Mar 22, 2004. Bubbles or turbulence and breaking waves: The false Dichotomy.
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- MMS Camarillo, CA, May 16, 2002. Marine hydrocarbon seeps: A natural laboratory for studying processes related to petroleum exploration, spill mitigation, and ecological adaptation
- Woods Hole Oceanographic Institute, Woods Hole, MA. Sep. 2002. The contribution to marine hydrocarbon seepage from catastrophic seepage events.
- Venoco Inc., Carpinteria, CA. Aug. 2002. The Shane Seep blowout and our understanding of the role of marine hydrocarbon seeps to the global environment
- California State Lands Commission, Long Beach, CA. Oct. 2001. The unique environment of marine hydrocarbon seeps.

## **Research Experience**

Experience was gained in developing and deploying a video based system for observing bubble plumes with Dr. Peter Bowyer as a postdoctoral researcher at the National University of Ireland, Galway. Responsibilities included circuit and physical design, purchasing, developing computer algorithms, managing technical staff, and trouble shooting. Experience in image processing and analysis of bubble plumes was also gained. During this time period, further modeling experience was gained as a result of additional model development in collaboration with Dr. William E. Asher.

Experience was gained in theoretical and computational modeling of bubble mediated air-sea gas transfer gained under research conducted by Dr. William E. Asher for U. S. Department of Energy, Office of Health and Environmental Research. Laboratory experience was gained in measuring air-sea gas transfer including gas chromatography. The primary focus was the development a computer model for predicting the bubble component of air-sea gas transfer. The model has been validated by comparison of theoretical predictions with experimental measurements. Model development continued at Georgia Institute of Technology under the guidance of Dr. Bob Roper and Dr. William E. Asher.

Experience was gained in molecular ion spectroscopy working under Dr. Fred Eisle, while a graduate student at Georgia Institute of Technology, prior to beginning work with Dr. William E. Asher. Research responsibilities primarily involved measurements and technical support.

At the University of Michigan, plasma physics in the upper atmosphere and magnetosphere was studied, while a graduate student. The study of plasma physics was continued at Georgia Institute of Technology through the completion of a minor in fusion physics.

Experience was gained in cryogenics under Dr. Chaz Archie in the Low Temperature Physics Laboratory, while an undergraduate senior at the State University of New York, Stony Brook.

## **Computational Skills**

MACINTOSH, IBM DOS, UNIX, MATLAB, FORTRAN, BASIC.

## **Interests**

Photography, linguistics, backpacking, electronics, public policy, metal work, economics, eagle scout.

## **Research Goals**

To further the development of bubble mediated air/sea gas transfer model, and to apply the models to oceanic conditions. Other goals include gaining experience in modeling non-bubble air-sea gas transfer, including the effects of chemistry and biology. In addition, a further important goal is to broaden capabilities in experimental techniques, particularly measurement of bubble distributions, and gas transfer rates.

REFERENCES AVAILABLE UPON REQUEST

### **Biography**

Ira Leifer's study has moved from the stars (BS - Astronomy/Physics at SUNY Stony Brook) to the solar system (MS - Planetary Atmospheres, University of Michigan) to the air-sea interface (PhD from Georgia Tech). After a PhD that was primarily (but not entirely) theoretical, he went to the National University of Ireland, Galway, where he developed a system to measure bubbles at the air-water interface due to breaking waves. Next, Ira Leifer went to TNO FEL, a NATO laboratory in The Hague, The Netherlands, where he worked on data analysis, and became interested in Hydrocarbon Seepage. Ira Leifer then accepted a position as a scientist at the University of California, Santa Barbara in the Chemical Engineering Department where he investigated microscale breaking wave generation of turbulence, and hydrocarbon seepage. He is now involved in many seep related projects in collaboration with researchers at various universities and government agencies