

Jordan F. Clark  
Department of Earth Science  
University of California, Santa Barbara  
Santa Barbara, CA 93106  
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## **Education:**

Columbia University, New York City, New York

M.A., May, 1991

Ph.D., May, 1995

Advisors: Peter Schlosser and H. James Simpson

Yale University, New Haven, Connecticut

B.S., Cum Laude, and Distinction in Major, May, 1988

Belknap Prize for excellence in Geology, May, 1988

Senior Advisor: Karl K. Turekian

## **Professional Employment**

2008-present Professor, Dept. of Earth Science and Program of  
Environmental Studies, University of California, Santa Barbara  
1996-2008 Assistant & Associate Professor, Dept. of Geological Sciences and Program  
of Environmental Studies, University of California, Santa Barbara  
1995-1996 Post-doctoral Fellowship, Isotope Hydrology Group, Lawrence  
Livermore National Laboratory  
1989-1995 Graduate Research Assistant, Columbia University

## **Awards**

DOE Global Change Distinguished Postdoctoral Fellowship, 1995  
Lawrence Livermore National Laboratory Graduate Fellowship, 1994  
Heezen Award for Graduate Research in Geology, Columbia University, 1994

## **Professional Activities**

2000 NAS NRC Committee on Oil in the Sea: Natural Seeps Working Session  
2002 NATO Advance Research Workshop: Hydrocarbon Seeps and Slicks in the  
World Ocean and the Caspian Sea  
2003-2007 Water Resources Center Coordinating Board  
2004 Visiting Scientist, CSIRO Land and Water, Adelaide, Australia  
2005 IAEA planning committee on Isotopes in Managed Aquifer Recharge  
2010 Visiting Scientist, University College London

## **Research Interests**

Dr. Clark's research interests lie in the general field of aqueous geochemistry and center on 1) the transport of water and dissolved material in groundwater, surface waters, and the coastal ocean, 2) how flow patterns effect water chemistry and quality, 3) gas exchange across the air-

water interface, and 4) paleoclimate information stored in ground water aquifers. He utilizes two distinct geochemical tools. First, short term experiments are conducted by introducing chemical tracers such as sulfur hexafluoride into the water bodies. Second, flow patterns, residence times, mixing rates, paleotemperatures, and paleo-recharge rates are inferred from the distribution of natural and anthropogenic tracers such as chlorofluorocarbons, tritium, dissolved noble gases, radiocarbon, and stable isotopes of water.

## Publication

- 1) Clark, J. F. and K. K. Turekian (1990) Time scale of hydrothermal water - rock reactions in Yellowstone National Park based on radium isotopes and radon. *Journal of Volcanology and Geothermal Research*, 40, 169-180.
- 2) Clark, J. F., H. J. Simpson, R. F. Bopp, and B. Deck (1992) Geochemistry and loading history of phosphate and silicate in the Hudson estuary. *Estuarine, Coastal and Shelf Science*, 34, 213-233.
- 3) Stute, M., P. Schlosser, J. F. Clark, and W. S. Broecker (1992) Paleotemperatures in the southwestern United States derived from noble gas measurements in groundwater. *Science*, 256, 1000-1003.
- 4) Clark, J. F., H. J. Simpson, W. M. Smethie, Jr., and C. Toles (1992) Gas exchange in a contaminated estuary inferred from chlorofluorocarbons. *Geophysical Research Letters*, 19, 1133-1136.
- 5) Stute, M., J. F. Clark, F. M. Phillips, and D. Elmore (1993) Reconstruction of late glacial climates from the groundwater archive: Cl and  $^{36}\text{Cl}$  in the Carrizo aquifer, Texas. *Applications of Isotope Techniques in Studying Past and Current Environmental Changes in the Hydrosphere and the Atmosphere*, IAEA, Vienna, 259-270.
- 6) Clark, J. F., R. Wanninkhof, P. Schlosser, H. J. Simpson (1994) Gas exchange in the tidal Hudson River using a dual tracer technique. *Tellus*, 46B, 274-285.
- 7) Clark, J. F., P. Schlosser, R. Wanninkhof, H. J. Simpson, W. S. F. Schuster, D. T. Ho (1995) Gas transfer velocities for  $\text{SF}_6$  and  $^3\text{He}$  in a small pond at low wind speeds. *Geophysical Research Letters*, 22, 93-97.
- 8) Stute, M., J. F. Clark, P. Schlosser, W. S. Broecker, and G. Bonani (1995) A high altitude continental paleotemperature record derived from noble gases dissolved in groundwater from the San Juan Basin, New Mexico. *Quaternary Research*, 43, 209-220.
- 9) Clark, J. F., H. J. Simpson, R. F. Bopp, and B. Deck (1995) Dissolved oxygen in lower Hudson estuary: 1978-93. *Journal of Environmental Engineering, ASCE*, 121, 760-763.
- 10) Stute, M., M. Forster, H. Frischkorn, A. Serejo, J. F. Clark, P. Schlosser, W. S. Broecker, and G. Bonani (1995)  $5^\circ\text{C}$  cooling of tropical Brazil during the last glacial maximum. *Science*, 269, 379-383.
- 11) Clark, J. F., W. M. Smethie, Jr., and H. J. Simpson (1995) Chlorofluorocarbons in the Hudson estuary during summer months. *Water Resources Research*, 31, 2553-2560.
- 12) Clark, J. F., P. Schlosser, H. J. Simpson, M. Stute, R. Wanninkhof, and D. T. Ho (1995) Relationship between gas transfer velocities and wind speeds in the tidal Hudson River determined by the dual tracer technique. In: *Air-Water Gas Transfer*, eds. Jähne, B. and E. Monahan, Aeon Verlag, Hanau, 785-800.
- 13) Clark, J. F., P. Schlosser, M. Stute, and H. J. Simpson (1996)  $\text{SF}_6$ - $^3\text{He}$  tracer release experiment: A new method of determining longitudinal dispersion coefficients in large rivers. *Environmental Science and Technology*, 30, 1527-1532.

- 14) Clark, J. F., M. Stute, P. Schlosser, S. Drenkard, and G. Bonani (1997) An isotope study of the Floridan aquifer in Southeastern Georgia: Implications for groundwater flow and paleoclimate. *Water Resources Research*, 33, 281-289.
- 15) Macfarlane, P. A., J. F. Clark, D. O. Whittemore, M. L. Davisson, and G. B. Hudson (1997) Holocene and late Pleistocene climate conditions in the central Great Plains deduced from noble gases, stable isotopes, Cl, and  $^{36}\text{Cl}$  in shallow groundwater. Kansas Geological Survey Open-File-Report #97-77, 28 p.
- 16) Aeschbach-Hertig, W., P. Schlosser, M. Stute, H. J. Simpson, A. Ludin, and J. F. Clark (1998) A  $^3\text{H}/^3\text{He}$  study of groundwater flow in a fractured bedrock aquifer, *Ground Water*, 36, 661-670.
- 17) Clark, J. F., M. L. Davisson, G. B. Hudson, and P. A. Macfarlane (1998) Noble gases, stable isotopes, and radiocarbon as tracers of flow in the Dakota aquifer, Colorado and Kansas. *Journal of Hydrology*, 211, 151-167.
- 18) Quigley, D. C., J. S. Hornafius, B. P. Luyendyk, R. D. Francis, J. F. Clark, and L. Washburn (1999) Decrease in natural marine hydrocarbon seepage near Coal Oil Point, California associated with offshore oil production. *Geology*, 27, 1047-1050.
- 19) Macfarlane, P. A., Clark, J. F., Davisson, M. L., Hudson, G. B., and Whittemore, D. O. (2000) Late Quaternary recharge determined from chloride in shallow groundwater in central Great Plains. *Quaternary Research*, 53, 167-174.
- 20) Clark, J. F., Washburn, L., Hornafius, J. S., and Luyendyk, B. P. (2000) Dissolved hydrocarbon flux from natural marine seeps to the southern California Bight. *Journal of Geophysical Research*, 105, 11,509-11,522.
- 21) Leifer, I., J. F. Clark, and R. F. Chen (2000) Modifications of the local environment by natural marine hydrocarbon seeps. *Geophysical Research Letters*, 27, 3711-3714.
- 22) Clark, J. F. and G. B. Hudson (2001) Quantifying the flux of hydrothermal fluids into Mono Lake by use of helium isotopes. *Limnology and Oceanography*, 46, 189-196.
- 23) Gamlin, J. D., J. F. Clark, G. Woodside, and R. Herndon (2001) Large-scale tracing of ground water with sulfur hexafluoride. *Journal of Environmental Engineering, ASCE*, 127, 171-174.
- 24) Rademacher, L. K., J. F. Clark, G. B. Hudson, D. C. Erman, and N. A. Erman (2001) Chemical evolution of shallow groundwater as recorded by springs, Sagehen basin, Nevada County California. *Chemical Geology*, 179, 37-51.
- 25) Clark, J. F., G. Woodside, J. D. Gamlin (2001) Tracing groundwater artificially recharged from a river using sulfur hexafluoride, Proceedings of the American Water Resources Association Annual Spring Specialty Conference, 91-96.
- 26) Boles, J. R., J. F. Clark, I. Leifer, L. Washburn (2001) Temporal variation in natural methane seep rate due to tides, Coal Oil Point area, California. *Journal of Geophysical Research*, 106, 27,077-27,086.
- 27) Rademacher, L. K., J. F. Clark, and G. B. Hudson (2002) Temporal changes in stable isotope composition of spring waters: Implications for recent changes in climate and atmospheric circulation, *Geology*, 20, 139-142.
- 28) Aeschbach-Hertig, W., M. Stute, J. F. Clark, R. Reuter, and P. Schlosser, (2002) A paleotemperature record derived from dissolved noble gases in groundwater of the Aquia Aquifer (Maryland, USA). *Geochimica et Cosmochimica Acta*, 66, 797-817.
- 29) Clark, J. F. (2002) Defining transport near ASR operations using sulfur hexafluoride gas tracer experiments. In: Dillon, P. J. (ed.) *Management of Aquifer Recharge for Sustainability*, A. A. Balkema, Lissa, 257-260.

- 30) Leifer, I. and J. F. Clark (2002) Modeling trace gases in hydrocarbon seep bubbles: Application to marine hydrocarbon seeps in the Santa Barbara Channel. *Russian Geology and Geophysics*, 47, 572-579. English translation published by the American Geophysical Union.
- 31) Rademacher, L. K., J. F. Clark, and J. R. Boles (2003) Groundwater residence times and flow paths in fractured rock determined using environmental tracers in the Mission Tunnel; Santa Barbara County, California, USA. *Environmental Geology*, 43, 557-567.
- 32) Thomas, J. M., M. Stute, J. F. Clark, G. B. Hudson (2003) Noble gas loss may indicate groundwater flow across flow barriers in southern Nevada. *Environmental Geology*, 43, 568-579.
- 33) Clark, J. F. (2003) Application of geochemical tracers for flow characterization near artificial recharge operations. *Proceedings of the 11<sup>th</sup> Biennial Symposium on Groundwater Recharge*.
- 34) Avisar, D. and J. F. Clark (2003) A gas tracer study in the El-Rio spreading ponds, Ventura County, California. *Proceedings of the 11<sup>th</sup> Biennial Symposium on Groundwater Recharge*.
- 35) Fram, M. S., B. A. Bergamaschi, K. D. Goodwin, R. Fujii, and J. F. Clark (2003) Processes affecting the trihalomethane concentrations associated with the third injection, storage, and recovery test at Lancaster, Antelope Valley, California, March 1998 through April 1999. Water-Resources Investigations Report 03-4062, 72 p.
- 36) Clark, J. F., I. Leifer, L. Washburn, B. P. Luyendyk (2003) Compositional changes in natural gas bubble plumes: Observations from the Coal Oil Point Seep Field. *Geo-Marine Letters*, 23, 187-193.
- 37) Leifer, I., J. F. Clark, B. Luyendyk, and D. Valentine (2003) Identifying future directions for subsurface hydrocarbon migration research. *EOS*, 84, 364-371.
- 38) Clark, J. F., G. B. Hudson, M. L. Davisson, G. Woodside, and R. Herndon (2004) Geochemical imaging of flow near an artificial recharge facility, Orange County, CA. *Ground Water*, 42, 167-174.
- 39) Cook, P. G., T. Stieglitz, J. Clark (2004) Groundwater discharge from the Burdekin Floodplain aquifer, North Queensland, CSIRO Land and Water Technical Report N. 26/04, 118 p.
- 40) Leifer, I., J. R. Boles, B. P. Luyendyk and J. F. Clark (2004) Transient discharges from marine hydrocarbon seeps: Spatial and temporal variability. *Environmental Geology*, 46, 1038-1052.
- 41) Rademacher, L. K., J. F. Clark, D. W. Clow, G. B. Hudson (2005) Old groundwater influence on stream hydrochemistry and catchment response in a small Sierra Nevada catchment: Sagehen Creek, California. *Water Resources Research*, 41, W02004, doi:10.1029/2003WR002805.
- 42) Clark, J. F., G. B. Hudson, and D. Avisar (2005) Gas transport below artificial recharge ponds: Insights from dissolved noble gases and a dual gas (SF<sub>6</sub> and <sup>3</sup>He) tracer experiment. *Environmental Science and Technology*, 39, 3939-3945.
- 43) Washburn, L., J. F. Clark, and P. Kyriakidis (2005) The spatial scales, distribution, and intensity of natural marine hydrocarbon seeps near Coal Oil Point, California. *Marine and Petroleum Geology*, 22, 569-578.
- 44) Luyendyk, B. P., J. P. Kennett, and J. F. Clark (2005) Hypothesis for increased atmospheric methane input from hydrocarbon seeps on exposed continental shelves during glacial low sea level. *Marine and Petroleum Geology*, 22, 591-596.
- 45) Avisar, D. and J. F. Clark (2005) Evaluating travel times beneath an artificial recharge pond using sulfur hexafluoride. *Environmental and Engineering Geoscience*, 11, 309-317.

- 46) Clark, J. F., K. Schwager, and L. Washburn (2005) Variability of gas composition and flux intensity in natural marine hydrocarbon seeps. New Energy Development and Technology (EDT) Working Paper, 008, UCEI, 15 p.
- 47) Leifer, I., B. P. Luyendyk, J. R. Boles, J. F. Clark (2006) Natural marine seepage blowout: Contribution to atmospheric methane. *Global Biogeochemical Cycles*, 20, GB3008 10.1029/2005GB002668.
- 48) Cook, P. G., S. Lamontagne, D. Berhane, J. F. Clark (2006) Quantifying groundwater discharge to Cockburn River, southeastern Australia, using dissolved gas tracers  $^{222}\text{Rn}$  and  $\text{SF}_6$ . *Water Resources Research*, 42, W10411, doi:10.1029/2006WR004921.
- 49) Clark, J. F. (2006) Managing aquifer recharge: How can isotope hydrology help? *Water & Environment News*, Newsletter of the Isotope Hydrology Section, International Atomic Energy Agency, 21, 10.
- 50) Avisar, D., J. F. Clark, J. D. McDermott, and G. B. Hudson (2006) A comparison of three methods for determining travel times near a large artificial recharge facility. In: *Recharge Systems for Protecting and Enhancing Groundwater Resources*, IHP-VI, Series on Groundwater No. 13, UNESCO, 247-252. Available at [www.iah.org/recharge/downloads/Recharge\\_systems.pdf](http://www.iah.org/recharge/downloads/Recharge_systems.pdf)
- 51) Clark, J. F. and G. B. Hudson (2006) Excess air: A new tracer for artificially recharged surface water. In: *Recharge Systems for Protecting and Enhancing Groundwater Resources*, IHP-VI, Series on Groundwater No. 13, UNESCO, p. 342-347. Available at [www.iah.org/recharge/downloads/Recharge\\_systems.pdf](http://www.iah.org/recharge/downloads/Recharge_systems.pdf)
- 52) Clark, J. F. and T. Stieglitz (2007) 2.2.2 Isotope and Tracer Techniques. In: *Submarine Groundwater*, ed. Zektser, I., L. G. Everett, and R. G. Dzhamalov, CRC Press, p. 110-117.
- 53) Clark, J. F. (2007) Tracing Recharge Water from Spreading Ponds: A Decade of Studies. In: *Management of Aquifer Recharge for Sustainability*, ed. Fox, P., Acacia, Phoenix, p. 285-295.
- 54) Mau, S., D. L. Valentine, J. F. Clark, J. Reed, R. Camilli, and L. Washburn (2007) Dissolved methane distributions and air-sea flux in the plume of a massive seep field, Coal Oil Point, California. *Geophysical Research Letter*, 34, L22603, doi:10.1029/2007GL031344.
- 55) Duffy, M., F. S. Kinnaman, D. L. Valentine, E. A. Keller, and J. F. Clark (2007) Gaseous Hydrocarbon Fluxes from Natural Seeps in the Upper Ojai Valley, CA. *Environmental Geosciences*, 14, 197-207.
- 56) Blumhagen, E. D. and J. F. Clark (2008) Carbon sources and signals through time in an alpine groundwater basin, Sagehen California. *Applied Geochemistry*, 23, 2284-2291, doi:10.1016/j.apgeochem.2008.03.010.
- 57) McDermott, J. A., D. Avisar, T. Johnson, and J. F. Clark (2008) Groundwater travel times near spreading ponds: Inferences from geochemical and physical approaches. *Journal of Hydrologic Engineering*, ASCE, 13, 1021-1028.
- 58) Meillier, L. H. Loáiciga, and J. F. Clark (2008) Ground water dating and flow-model calibration in the Kern Water Bank, California. *Journal of Hydrologic Engineering*, ASCE, 13, 1029-1038.
- 59) Schmieder, P. J., D. T. Ho, P. Schlosser, J. F. Clark, and S. G. Schladow (2008) An  $\text{SF}_6$  tracer study of the flow dynamics in the Stockton Deep Water Ship Channel: Implications for dissolved oxygen dynamics. *Estuaries and Coasts*, 31, 1038-1051, doi:10.1007/s12237-008-9093-0.
- 60) Schladow, S. G. and J. F. Clark (2008) Use of Tracers to Quantify Subsurface Flow Through a Mining Pit. *Ecological Applications*, 18 Supplement, A55-A71.

- 61) Rueda, F. J., S. G. Schladow and J. F. Clark (2008) Mechanisms of contaminant transport in a multi-basin lake. *Ecological Applications*, 18 Supplement, A72-A87.
- 62) MacIntyre, S., J. F. Clark, R. Jellison (2009) Turbulent mixing induced by nonlinear waves in Mono Lake. *Limnology and Oceanography*, 54, 2255-2272.
- 63) Clark, J. F., L. Washburn, and K. Schwager (2010) Variability of gas composition and flux intensity in natural marine hydrocarbon seeps. *Geo-Marine Letters*, 30, 379-388, doi:10.1007/s00367-009-0167-1.
- 64) Morrissey, S. K., J. F. Clark, M Bennett, E. Richardson, and M. Stute (2010) Groundwater reorganization in the Floridan aquifer following Holocene sea-level rise. *Nature Geoscience*, 3, 683-687, doi:10.1038/NGEO956.
- 65) Kline, K. R., D. M. Mackay, L. Rastegarzadeh, Y. M. Nelson, J. F. Clark (2011) In-Situ Rates of Ethanol Biodegradation in a Sulfate-Reducing Aquifer Determined using Single Well Push-Pull Tests. *Ground Water Monitoring and Remediation*, 31, 103-110 doi:10.1111/j1745-6592.2011.01347.x.
- 66) Fisher, A. T., J. Cowen, C. G. Wheat, and J. F. Clark (2011), Preparation and injection of fluid tracers during IODP Expedition 327, eastern flank of Juan de Fuca Ridge in *Proc. IODP 327*, edited by A. T. Fisher, T. Tsuji and K. Petronotis. doi:10.2204/iodp.proc.327.108.2011, Integrated Ocean Drilling Program Management International, Inc., Tokyo.
- 67) Manning, A. H., J. F. Clark, S. H. Diaz, L. K. Rademacher, S. Earman, L. N Plummer (2012) Evolution of groundwater age in a mountain watershed over a period of thirteen years. *Journal of Hydrology*, 460, 13-28, doi:10.1016/j.jhydrol.2012.06.030.
- 68) Stieglitz, T. C., J. F. Clark, and G. Hancock (2013) The Mangrove Pump: rapid tidal Flushing of Animal Burrows in Mangrove Forests, a major driver of Land-Ocean Solute Fluxes in the Tropics. *Geochimica et Cosmochimica Acta*, 102, 12-22, doi.org/10.1016/j.gca.2012.10.033.

### Students Advised

Eric Blumhagen (M.S. 2004)	Timothy E. Becker (M.S. candidate)
Heather Berry (B.S., 2009)	Michael Davis (B.S., 2009)
Stephanie Diaz (Ph.D. candidate)	Eric T. Eglund (M.S., 2000)
Jeff Gamlin (B.S., 1999)	Kimberly Kline (M.S. 2009)
Jeni McDermott (M.S. 2006)	Laurent Meillier (M.S. 2001)
Sheila Morrissey (M.S. 2009)	Mary Pack (B.S. 2005)
Daniel Petersen (B.S. 2008)	Laura Rademacher (Ph.D. 2002)
Margo Ragland (B.S. 2002)	Justin Reed (B.S. 2007)
Katherine Schwager (M.S. 2005)	Jason Stormo (B.S., 2000)
Man Yin Tsang (B. S. 2012-Hong Kong)	Kylah Wyatt (B.S. 2007)
William Wells (B.S. 2002)	Matthew Zane (B.S. 2010)

### Classes Taught

Air Quality (ES 147)	Intro to Geochemistry (GEOL 124)
Aqueous Transport (ES/GEOL 168)	Tracer Hydrology (ES/GEOL 169)
Isotope Hydrology (GEOL 269)	Groundwater Hydrology (GEOL 173)
Environmental Geology (ES/GEOL 170)	Environmental Chemistry (ES 15)
Isotope Methods in MAR (Graduate Seminar, GEOL 270)	

Drinking Water in the 21<sup>st</sup> Century (Freshman & Honors Seminar)

**Professional Membership**

American Geophysical Union, Geological Society of America, International Association of Geochemistry and Cosmochemistry, National Ground Water Association, Sigma Xi