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Dr. Kowalsky's research involves the development of approaches for the integrated characterization, modeling, and monitoring of subsurface processes in applications including environmental remediation, gas hydrates, nuclear waste disposal, and CO_2 sequestration. He has experience applying numerical, geostatistical, and inverse modeling techniques to a variety of problems in hydrology and geophysics.

EXPERIENCE

2006 - Present **Research Scientist**, Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA
2004 - 2005 **Post-Doctoral Fellow**, LBNL, Berkeley, CA
2000 - 2003 **Graduate Student Researcher**, University of California, Berkeley, CA
1999 - 2000 **Annual Research Grant Recipient (DAAD)**, University of Tübingen, Germany
1997 - 1999 **Graduate Student Researcher**, LBNL, Berkeley, CA
1995 - 1997 **Undergraduate Research Assistant**, University of Notre Dame, IN

EDUCATION

- **Ph.D.** University of California, Berkeley, Civil and Environmental Engineering (2003)
- **M.S.** University of California, Berkeley, Civil and Environmental Engineering (1999)
- **B.S.** University of Notre Dame, Indiana, Engineering and Environmental Science (1997)

RECOGNITIONS

- Author of 6th most requested article in *Advances in Water Resources* journal (Apr. 2004 – Mar. 2005)
- On teams receiving Tech. Transfer Award (2005), Outstanding Performance Award (2006) at LBNL.

SOFTWARE DEVELOPED

1. Moridis, G.J., M.B. Kowalsky, and K. Pruess (2008), TOUGH+HYDRATE v1.0 User's Manual: A Code for the Simulation of System Behavior in Hydrate-Bearing Geologic Media, Report LBNL-149E, Lawrence Berkeley National Laboratory, Berkeley, Calif.
2. Finsterle, S., and M.B. Kowalsky (2007), iTOUGH2-GSLIB User's Guide, Report LBNL/PUB-3191, Lawrence Berkeley National Laboratory, Berkeley, Calif.

JOURNAL PUBLICATIONS AND BOOK CHAPTERS

1. Kowalsky, M.B., S. Finsterle, M. Commer, K.H. Williams, C. Murray, D. Newcomer, A. Englert, C.I. Steefel, and S.S. Hubbard, On parameterization of the inverse problem for estimating aquifer properties using tracer data, *Water Resour. Res.* (submitted).
2. Kowalsky, M.B., S. Finsterle, A. Englert, K.H. Williams, and S.S. Hubbard, Inversion of time-lapse tracer data for estimating changes in field-scale flow properties during biostimulation, *Journal of Hydrology* (submitted).
3. Li, L., N. Gawande, C. Steefel, M.B. Kowalsky, S. Hubbard, Uranium Bioremediation Efficacy at the Field scale: the Control of Physicochemical Heterogeneity, *Env. Sci. and Tech.* (submitted).
4. Reagan, M.T., M.B. Kowalsky, G.J. Moridis, S. Silpngarmlert, The effect of reservoir heterogeneity on gas production from hydrate accumulations in the permafrost, SPE 132649, JPSE (submitted).
5. Finsterle, S., and M.B. Kowalsky (2011), A truncated Levenberg-Marquardt algorithm for the calibration of highly parameterized nonlinear models, *Computers and Geosciences, 37,* 731-738. doi:10.1016/j.cageo.2010.11.005.
6. Kowalsky, M.B., E. Gasperikova, S. Finsterle, D. Watson, G. Baker, and S.S. Hubbard (2011), Coupled modeling of hydrogeochemical and electrical resistivity data for exploring the impact of recharge on subsurface contamination, *Water Resour. Res.*, 47, W02509, doi:10.1029/2009WR008947.

7. Moridis, G.J., T.S. Collett, M.S. Pooladi-Darvish, M. S. Hancock, C. Santamarina, R. Boswell, T. Kneafsey, J. Rutqvist, M.B. Kowalsky, M.T. Reagan, E.D. Sloan, A.K. Sum and C. Koh (2011), Challenges, Uncertainties, and Issues Facing Gas Production From Gas-Hydrate Deposits, *SPE Res. Eval. and Eng.*, 14(1), 76-112. SPE-131792-PA. doi: 10.2118/131792-PA.
8. Kowalsky, M.B., S. Nakagawa, and G.J. Moridis (2010), Feasibility of monitoring gas hydrate production with time-lapse vertical seismic profiling, *SPE Journal*, 15(3), 634-645. SPE-132508-PA. doi: 10.2118/132508-PA.
9. Lehikoinen, A., J.M.J. Huttunen, S. Finsterle, M.B. Kowalsky, and J.P. Kaipio (2010), Dynamic inversion for hydrological process monitoring under model uncertainties, *Water Resour. Res.*, 46, W04513, doi:10.1029/2009WR008470.
10. Hinnell, A. C., T. P. A. Ferré, J. A. Vrugt, J. A. Huisman, S. Moysey, J. Rings, and M. B. Kowalsky (2010), Improved extraction of hydrologic information from geophysical data through coupled hydrogeophysical inversion, *Water Resour. Res.*, 46, W00D40, doi:10.1029/2008WR007060.
11. Li, L., Steefel, C.I., Kowalsky, M.B., Englert, A., Hubbard, S.S. (2010), Effects of physical and geochemical heterogeneities on mineral transformation and biomass accumulation during biostimulation experiments at Rifle, Colorado, *Journal of Contaminant Hydrology*, 112, 45–63.
12. Lehikoinen, A., S. Finsterle, A. Voutilainen, M.B. Kowalsky, and J.P. Kaipio, Dynamical inversion of geophysical ERT data: state estimation in the vadose zone (2009), *Inverse Problems in Sci. and Eng.*, 17(6), 715-736, doi: 10.1080/17415970802475951.
13. Kowalsky, M.B., J. Birkholzer, J. Peterson, S. Finsterle, S. Mukhopadhyay, and Y. Tsang (2008), Sensitivity analysis for joint inversion of GPR and thermal-hydrological data from a large-scale underground heater test, *Nuclear Technology*, 164(2), 196-206.
14. Finsterle, S., C. Doughty, M.B. Kowalsky, G.J. Moridis, L. Pan, T. Xu, Y. Zhang, and K. Pruess (2008), Advanced vadose zone simulation using TOUGH, *Vadose Zone Journal*, 7, 601-609, doi:10.2136/vzj2007.0059.
15. Finsterle, S.A., and M.B. Kowalsky (2008), Joint hydrological-geophysical inversion for soil structure identification, *Vadose Zone Journal*, 7, 287–293, doi:10.2136/vzj2006.0078.
16. Salve, R., N.Y. Krakauer, M.B. Kowalsky, and S. Finsterle (2008), A qualitative assessment of microclimatic perturbations in a tunnel, *International J. of Climatology*, doi: 10.1002/joc.1697.
17. Kowalsky, M.B., and G. J. Moridis (2007), Comparison of kinetic and equilibrium reactions in simulating the behavior of gas hydrates, *Energy Conversion and Management*, 48, 1850-1863, doi:10.1016/ j.enconman.2007.01.017.
18. Moridis, G., M.B. Kowalsky, and K. Pruess (2007), Depressurization-induced gas production from Class 1 Hydrate Deposits, *SPE Reservoir Evaluation and Engineering, 10(5), 458-481*.
19. Moridis, G., and M.B. Kowalsky (2007), Response of Oceanic Hydrate-Bearing Sediments to Thermal Stresses, *SPE Journal*, 12(2), 253-268, doi:10.2118/111572-PA.
20. Kowalsky, M.B., J. Chen, and S.S. Hubbard (2006), Joint inversion of geophysical and hydrological data for improved subsurface characterization, *The Leading Edge*, 25(6), 730-734.
21. Gupta, A., T.J. Kneafsey, G.J. Moridis, Y. Seol, M.B. Kowalsky, and E.D. Sloan (2006), Composite Thermal Conductivity in a Heterogeneous Porous Methane Hydrate Sample, *J. Phys. Chem. B.*, 110, 16384-16392.
22. Linde, N., J. Chen, M.B. Kowalsky, and S. Hubbard (2006), Hydrogeophysical parameter estimation approaches for field scale characterization, in *Applied Hydrogeophysics*, edited by H. Vereecken et al., Chap. 2, pp. 9-44, Springer.
23. Moridis, G.J. and M.B. Kowalsky (2006), Gas Production from Unconfined Class 2 Hydrate Accumulations in the Oceanic Subsurface, in *Economic Geology of Natural Gas Hydrates*, M. Max, A.H. Johnson, W.P. Dillon and T. Collett, Eds., Kluwer Academic/Plenum Publishers.
24. Kowalsky, M.B., S. Finsterle, J. Peterson, S. Hubbard, Y. Rubin, E. Majer, A. Ward, and G. Gee (2005), Estimation of field-scale soil hydraulic and dielectric parameters through joint inversion of GPR and hydrological data, *Water Resour. Res., 41*, W11425, doi:10.1029/2005WR004237.
25. Kowalsky, M.B., S. Finsterle, and Y. Rubin (2004), Estimating flow parameter distributions using ground-penetrating radar and hydrological measurements during transient flow in the vadose zone, *Adv. in Water Res.*, *27*(6), 583–599.

26. Kowalsky, M.B., Y. Rubin, and P. Dietrich (2004), The use of ground-penetrating radar for characterizing sediments under transient flow conditions, in *Aquifer characterization*, Bridge, J.S. and D. W. Hyndman, Eds., SEPM Special Publication 80, 107–127.
27. Kowalsky, M.B., P. Dietrich, G. Teutsch, and Y. Rubin (2001), Forward modeling of ground-penetrating radar data using digitized outcrop images and multiple scenarios of water saturation, *Water Resour. Res.*, *37*(6), 1615–1625 (2001WR900015).
28. Geller, J.T., M.B. Kowalsky, P.K. Seifert, and K. Nihei (2000), Acoustic detection of immiscible liquids in sand, *Geophys. Res. Letters. 27*(3), 417–420 (1999GL010483).

REPORTS AND PROCEEDINGS

1. Kowalsky, M.B., E. Gasperikova, S. Finsterle, D. Watson, G. Baker, and S.S. Hubbard (2010), Coupled modeling of hydrogeochemical and electrical resistivity data for exploring the impact of recharge on subsurface contamination, Abstract H11E-0840, presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.
2. Commer, M., M.B. Kowalsky, S. Finsterle, G.A. Newman (2010), Enhanced subsurface fluid characterization using joint hydrological and geophysical imaging, Abstract H23L-02 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.
3. Gasperikova, E., M.B. Kowalsky, S.S. Hubbard, J.E. Peterson, G.S. Baker, M. Smith, D.B. Watson (2010), Long-term time-lapse surface and borehole electrical resistivity monitoring of natural recharge-induced contaminant plume behavior, expanded abstract for SEG2010, Denver, 3-5 Oct.
4. Finsterle, S., M. Kowalsky (2010), A truncated Levenberg-Marquardt algorithm for the calibration of highly parameterized nonlinear models, XVIII International Conference on Computational Methods in Water Resources, June 21 – 24 2010.
5. Hubbard, S.S., D. Watson, G.S. Baker, J. Chen, M. Kowalsky, E. Gasperikova, D.B. Gaines, M. Smith, S. Brooks (2010), Hydrogeophysical quantification of plume-scale flow architecture and recharge processes, *Geochimica et Cosmochimica Acta*, 74(12), Suppl. 1, A433-A433.
6. Reagan, M.T., M.B. Kowalsky, G.J. Moridis, S. Silpngarmlert (2010), The effect of reservoir heterogeneity on gas production from hydrate accumulations in the permafrost, SPE 132649, 2010 SPE Western North American Regional Meeting, Anaheim, California, 27-29 May 2010.
7. Jadoon, K.Z. M. B. Kowalsky, S. Finsterle, S. S. Hubbard, H. Vereecken, S. Lambot (2010), Coupled Hydrogeophyiscal Inversion of Off-Ground GPR and Hydrological Data, European Geosciences Union, General Assembly 2010, Vienna, Austria, May 2-7.
8. Chiaramonte, L, M.B. Kowalsky, J. Rutqvist, and G.J. Moridis (2009), Design of a potential long-term test of gas production from a hydrate deposit at the PBU-L106 site in North Slope, Alaska: Geomechanical system response and seismic monitoring, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract OS24A-08.
9. Kowalsky, M.B., S. Finsterle, G. Moridis, and S.S. Hubbard (2009), Hydrogeophysical approaches with the TOUGH family of codes, *Proc. TOUGH Symp. 2009*, Berkeley, Calif. (8 pages).
10. Englert, A., S.S. Hubbard, J. Chen, L. Li, M.B. Kowalsky, K.H. Williams, F. Spane, D. Newcomer, P. Long, C. Steefel, (2008), Evidence of Flow Rerouting Caused by Bioremediation-Induced Clogging at the Uranium Contaminated DOE Integrated Field Challenge Site, Rifle, Colorado, Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abs H51K-04 INVITED.
11. Li, L., C. Steefel, M.B. Kowalsky, A. Englert, S.S. Hubbard (2008), Effects of Physical and Chemical Heterogeneities on Biogeochemical Processes Associated With Uranium Bioremediation at Rifle, Colorado, Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abs H24B-02 INVITED.
12. Kowalsky, M.B., S. Nakagawa, and G. Moridis (2008), Feasibility of monitoring gas hydrate production with geophysical methods, Paper OTC-19489-PP presented at the Offshore Technology Conference, Houston, Texas, May 5-8, 2008.
13. Kowalsky, M.B., S. Finsterle, and S. Hubbard (2008), Use of Coupled Hydrological-Geophysical Modeling Framework for Exploring the Impact of Recharge on TDS, 2008 CMWR International Conference, July 6-10, 2008, San Francisco, California.
14. Englert, A., M.B. Kowalsky, K. Williams, J. Peterson, J. Chen, F. Spane, D. Newcomer, P. Long and S. Hubbard (2008), Estimation of a three dimensional hydraulic conductivity field at the Rifle, CO

Integrated Field Challenge site using a sequential Bayesian-Inverse Approach, 2008 CMWR International Conference, July 6-10, 2008, San Francisco, California.

15. Zhang, Y., S. Finsterle, M.B. Kowalsky, and S. Hubbard (2008), Impact of groundwater pumping on near-river hydrology, 2008 CMWR International Conference, July 6-10, 2008, San Francisco, California.
16. Kowalsky, M.B., S.S. Hubbard, J. Chen, J.E. Peterson, G.P. Flach (2007), Multiscale Hydrogeophysical Data Integration for Parameterization of Transport Model at Savannah River Site, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abs. H14C-01 INVITED.
17. Hubbard, S., A. Englert, M. Kowalsky, J. Chen, J. Peterson, K.H. Williams (2007), Exploring Hydrological and Biogeochemical Processes Associated With Remedial Treatments Using Geophysical Methods, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abs. NS13A-08 INVITED.
18. Englert, A., M. Kowalsky, L. Li, P. Long, and S. Hubbard (2007), Characterization of Transient Transport Behavior During Biostimulation Field Experiments Using Novel Breakthrough Analysis Approaches, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abs. H21C-0707.
19. Finsterle, S., M.B. Kowalsky, C. Oberdoerster, A. Lehikoinen (2007), Joint Inversion of Hydrological and Geophysical Data: Too Much Information?, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abs. NS43A-04 INVITED.
20. Li, L., C.I. Steefel, M.B. Kowalsky (2007), Biogeochemical Reaction Kinetics Associated with Uranium Bioremediation at Multiple Scales, Eos Trans. AGU, 88(52), Fall Meet., Abs. H32D-03.
21. Moridis, G.J., M.B. Kowalsky (2006), Geomechanical implications of thermal stresses on hydrate-bearing sediments, *Fire In The Ice*, NETL Methane Hydrates R&D Program Newsletter, Fall 2006.
22. Kowalsky, M.B., and G. Moridis (2006), Comparison of kinetic and equilibrium reactions in the simulation of the behavior of gas hydrates, *Proc. TOUGH Symp. 2006*, Berkeley, Calif.
23. Moridis, G. M.B. Kowalsky, S. Finsterle, K. Pruess (2006), TOUGH+: The New Generation of Object-Oriented Family of Codes for the Solution of Problems of Flow and Transport in the Subsurface, *Proc. TOUGH Symp. 2006*, Berkeley, CA.
24. Gupta, A., T. Kneafsey, G.J. Moridis, Y. Seol, M.B. Kowalsky, and E.D. Sloan, Jr. (2006), Estimation of composite thermal-conductivity of a heterogeneous methane hydrate sample using iTOUGH2, *Proc. TOUGH Symp. 2006*, Berkeley, Calif.
25. Moridis, G. and M.B. Kowalsky, 2006. Depressurization-Induced Gas Production from Class 1 and Class 2 Hydrate Deposits, *Proc. TOUGH Symp. 2006*, Berkeley, Calif.
26. Finsterle, S.A., and M.B. Kowalsky (2006), Joint Hydrological-Geophysical Inversion for Soil Structure Identification, *Proc. TOUGH Symp. 2006*, Berkeley, Calif.
27. Kowalsky, M.B., E. Majer, J.E. Peterson, S. Finsterle and A. Mazzella (2006), Coupled geophysical-hydrological modeling of controlled NAPL spill, American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, Dec. 11-15.
28. Lehikoinen, A., S. Finsterle, A. Voutilainen, M.B. Kowalsky, and J.P. Kaipio (2006), A nonstationary geophysical inversion approach with modeling-error correction for imaging fluid flow, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abs. H44B-02.
29. Kowalsky, M.B., and S.A. Finsterle (2006), Joint inversion of ground-penetrating radar and thermal-hydrological measurements: overview and recent progress, 2006. European Geosciences Union, General Assembly 2006, Vienna, Austria, April 2-7 (INVITED).
30. Kowalsky, M.B., and G. Moridis (2006), Comparison of kinetic and equilibrium reactions in the simulation of gas hydrates in porous media, Amer. Assoc. of Petrol. Geol. (AAPG) Annual Convention, Apr. 9-12, 2006.
31. Kowalsky, M.B., J. Peterson, S. Finsterle, S. Mukhopadhyay, Y. Tsang (2005), Joint inversion of ground-penetrating radar and thermal-hydrological data collected during a large-scale heater test, *Eos Trans. AGU*, 86(52), Fall Meet. Suppl., Abs. H44C-04.
32. Moridis, G.J., M.B. Kowalsky (2005), Numerical study of hydrate preservation during core recovery, *Eos Trans. AGU*, 86(52), Fall Meet. Suppl., Abs. C11A-1070.
33. Finsterle, S., and M.B. Kowalsky (2005), Model Structure Identification through Joint Inversion of Hydrological and Geophysical Data, *Eos Trans. AGU*, 86(52), Fall Meet. Suppl., Abs. H41G-08.

34. Linde, N., J. Chen, M.B. Kowalsky, S. Finsterle, Y. Rubin, S.S. Hubbard (2004), Improved characterization through joint hydrogeophysical inversion: Examples of three different approaches, *NATO ASI Hydrogeophysics 2*, St. Petersburg, Russia, July 20-27, LBNL-55782.
35. Kowalsky, M.B., S.A. Finsterle, J.E. Peterson, S.S. Hubbard, Y. Rubin, E.L. Majer, A.L. Ward, G.W. Ward (2004), Estimating field-scale soil hydraulic properties and petrophysical models through joint GPR/hydrological inversion, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abs. H23A-1101.
36. Kowalsky, M.B., S.A. Finsterle, J.E. Peterson, S.S. Hubbard, Y. Rubin, E. Majer, A. Ward, and G. Gee (2004), Estimating field-scale soil hydraulic properties through joint inversion of cross-borehole GPR travel times and hydrological measurements, Annual Mtg. of Geol. Soc. of America (GSA), Denver, Colorado, Nov. 7-10, 2004.
37. Kowalsky, M.B., S. Finsterle, and Y. Rubin (2003), Estimating Flow Parameters Using Ground-Penetrating Radar and Hydrological Data during Transient Flow in the Vadose Zone, *TOUGH Symp. 2003*, Lawrence Berkeley National Laboratory, Berkeley, Calif., Report LBNL-52504.
38. Kowalsky, M.B., Y. Rubin, J. Peterson, S. Finsterle (2003), Estimation of Flow Parameters Using Crosshole GPR Travel Times and Hydrological Data Collected During Transient Flow Experiments, *Eos Trans. AGU*, 84(46), Fall Meet. Suppl., Abs. H21F-07.
39. Majone, B., M.B. Kowalsky, Y. Rubin (2003), Experimental Design Considerations for Estimating Flow Parameters with GPR and Hydrological Measurements, *Eos Trans. AGU*, 84(46), Fall Meet. Suppl., Abs. H31B-0445.
40. Kowalsky, M.B., Y. Rubin, S. Finsterle (2002), Inversion of Hydrogeological and Time-lapsed GPR Data for Flow Parameters, *Eos Trans. AGU*, 83(47), Fall Meet. Suppl., Abs. H61A-0750.
41. Rubin, Y., J. Chen, S. Hubbard, M.B. Kowalsky, A. Woodbury (2002), A structured approach to Bayesian data fusion, *Eos Trans. AGU*, 83(47), Fall Meet. Suppl., Abs. H52F-05 INVITED.
42. Kowalsky, M.B., Y. Rubin (2002), Monitoring Subsurface Moisture Distributions with GPR, Presented at the NATO Advanced Study Institute, Trest, Czech Republic, July 17-27, 2002.
43. Williams, K.H., M.B. Kowalsky, and J.E. Peterson (2002), High resolution imaging of vadose zone transport using surface and crosswell ground penetrating radar methods, Report LBNL-53151.
44. Kowalsky, M.B., and Y. Rubin (2002), Suitability of GPR for characterizing variably saturated sediments during transient flow, *Proc. Ground Penetrating Radar 2002*, Santa Barbara, CA, April 28-May 2, 2002.
45. Kowalsky, M.B., Y. Rubin and P. Dietrich (2002), Effects of fluid distribution and subsurface structural heterogeneity on ground-penetrating radar, *Proc. 2002 International Groundwater Symp.*, Berkeley, CA, Mar.
46. Hubbard, S.S., K. Grote, M.B. Kowalsky, and Y. Rubin (2002), High-Resolution Estimation of Near Subsurface Water Content using GPR Ground-Wave Information, *Proc. 2002 International Groundwater Symp.*, Berkeley, CA, March, 2002.
47. Kowalsky, M.B., Y. Rubin (2001), Improved Characterization of the Vadose Zone with Time-Lapsed Ground-Penetrating Radar, *Eos Trans. AGU*, 82(47), Fall Meet. Suppl., Abs. GP22A-0261.
48. Hubbard, S.S., K. Grote, M.B. Kowalsky, Y. Rubin (2001), Investigating Temporal and Spatial Variations in Near Surface Water Content using GPR, *Eos Trans. AGU*, 82(47), Fall Meet. Suppl., Abs. GP11B-09.
49. Dietrich, P., M.B. Kowalsky, T. Fechner, and J. Whittaker (2000), Aquifer analogs: a possibility to evaluate hydrogeophysical approaches, *Proc. 6th Mtg. of Environ. & Engin. Geophys.*, Bochum, Germany, September.
50. Kowalsky, M.B., P. Dietrich, G. Teutsch, Y. Rubin (2000), Effect of Soil Heterogeneity on GPR Data and its Impact on Hydrogeologic Characterization: a Study Based on a Gravel-Quarry Outcrop in Herten, Germany, *Eos Trans. AGU*, 81(48), Fall Meet. Suppl., Abs. H72B-07.
51. Kowalsky, M.B., P. Dietrich, G. Teutsch, and Y. Rubin (2000), GPR Modeling of Outcrop, Summer meeting of German Geophysical Society (DGG) in Munich, Germany.
52. Kowalsky, M.B., J.T. Geller, P.K. Seifert, K.T. Nihei, R. Gritto, J.E. Peterson, Jr., and L.R. Myer (1998), Acoustic visibility of immiscible liquids in poorly consolidated sand, *Proc. Soc. Exp. Geophysics*, 1041-1044.
53. Pyrak-Nolte, L.J. and M.B. Kowalsky (1997), Compressional wave anisotropy in fractured rock, *Int. J. Rock Mech. & Min. Sci.* 34:3-4, Paper No. 250.

54. Kowalsky, M.B., S. Nakagawa, K. Nihei, and L. Myer (1997), Acoustic properties of poorly consolidated sediments during saturation, AGU Fall Meeting, San Francisco, CA, Dec. 8-12, Abs. T32B-14.
55. Pyrak-Nolte, L.J. and M.B. Kowalsky (1997), Compressional wave anisotropy in fractured rock, AGU Fall Meeting, San Francisco, CA, Dec. 8-12, Abs. T32B-02.
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