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EDUCATION:

- 1991 Ph.D. Civil Engineering, Specialization: Hydrology and Hydraulics, Michigan State University. Dissertation topic: Aqueous Phase Transport in Soils Contaminated With a Multi-Component Liquid Hydrocarbon and Subjected to Vapor Flow.
- 1986 M.S. Civil Engineering, Specialization: Water Resources and Geotechnical Engineering, Michigan Technological University. Thesis Topic: The Estimation of Sediment Movement in a Transient Water Velocity Field.
- 1983 B.S. Geology with Geophysics option, Michigan State University.

EXPERIENCE:

- 2004 – Present Professor, Department of Environmental Engineering Sciences, University of Florida, Gainesville, FL 32611.
- 1998 - 2004 Associate Professor, Department of Environmental Engineering Sciences, University of Florida, Gainesville, FL 32611.
- 1992 - 1998 Assistant Professor, Department of Environmental Engineering Sciences, University of Florida, Gainesville, FL 32611.
- 1991 - 1992 Research Associate, Division of Engineering Research, Michigan State University, East Lansing, MI 48824.
- 1991 Course Instructor, Civil and Environmental Engineering Department, Michigan State University, East Lansing, MI 48824.
- 1986 - 1991 Graduate Research Assistant, Civil and Environmental Engineering Department and the Institute of Water Research, Michigan State University, East Lansing, MI 48824.
- 1988 Student Intern Hydrologist, Land and Water Management Division, Hydrologic Studies Section, Michigan Department of Natural Resources, Lansing, MI 48909.
- 1983 - 1984 Well Logging Geologist, Summit Log, Schlumberger The Analyst, EXLOG, Ventura, CA.

ACHIEVEMENTS:

- 2007 Outstanding Faculty Member of the Year
Department of Environmental Engineering Sciences
- 2006 ES&T Best Paper of the Year in Technology
- 1998 American Society of Engineering Education South Eastern Section
Outstanding Contributions in Research Award
- 1997 Professional Engineering License, State of Florida (PE51279)
- 1995 ASCE Gainesville Branch President
- 1986 Graduate Recruitment Fellowship, MSU
- 1983 Exxon Scholarship for Geological Field Studies

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PUBLICATIONS IN REFEREED JOURNALS: (68 journal articles)

Kaye, A.J., J. Cho, N.B. Basu, X. Chen, M.D. Annable, J.W. Jawitz. Laboratory Investigation of Flux Reduction from Dense Non-Aqueous Phase Liquid (DNAPL) Partial Source Zone Remediation by Enhanced Dissolution. Accepted, Journal of Contaminant Hydrology.

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Totten, C.T., M.D. Annable, J.W. Jawitz, J.J. Delfino. Fluid and Porous Media Property Effects on Dense Non-Aqueous Phase Liquid Migration and Contaminant Mass Flux. Environmental Science & Technology. Vol. 41, 2007, pp. 1622-1627.

Lee, J., P.S.C. Rao, I.C. Poyer, R.M. Toole, M.D. Annable, K. Hatfield. Oxyanion Flux Characterization Using Passive Flux Meters. Development and Field Testing of Surfactant-Modified Sorbents. Journal of Contaminant Hydrology, 92 (3-4): 208-229, 2007.

Fure, A.D., J.W. Jawitz, M.D. Annable, DNAPL Source Depletion: Linking Architecture and Flux Response, Journal of Contaminant Hydrology, 85, 2006, pp. 118-140.

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Klammler, H., K. Hatfield, M. D. Annable, E. Agyei, B. L. Parker, J. A. Cherry, and P. S. C. Rao (2007), General analytical treatment of the flow field relevant to the interpretation of passive fluxmeter measurements, Water Resour. Res., 43, W04407, doi:10.1029/2005WR004718.

Campbell, T.J., K. Hatfield, H. Klammler, M.D. Annable, and P.S.C. Rao. Magnitude and Directional Measures of Water and Cr(VI) Fluxes by Passive Flux Meter, Environmental Science & Technology. Vol. 40, 2006, pp. 6392-6397.

Kim, H., K.M. Choi, J.W. Moon, M.D. Annable. Changes in Air Saturation and Air-Water Interfacial Area During Surfactant-Enhanced Air Sparging in Saturated Sand, Journal of Contaminant Hydrology, 88, 2006, pp. 23-35.

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Watson, B.J., L.H. Motz, M.D. Annable. Water budget and average vertical conductance for Magnolia Lake. Journal of Hydrologic Engineering, Vol. 6, No. 3, 2001, pp. 208-216.

Wise, W.R., M.D. Annable, J.E. Walser, R.S. Switt, and D.T. Shaw. A wetland-aquifer interaction test. Journal of Hydrology, Vol. 227, 2000, pp. 257-272.

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Rao, P.S.C, M.D. Annable, and H. Kim, NAPL Source Zone Characterization and Remediation Technology Performance Assessment: Recent Developments and Applications of Tracer Techniques. Journal of Contaminant Hydrology, Vol. 45, 2000, pp. 63-78.

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James, A.I., W.D. Graham, K. Hatfield, P.S.C. Rao, and M.D. Annable. Estimation of Spatially Variable Residual Non-Aqueous Phase Liquid (NAPL) Saturations in Non-Uniform Flow Fields Using Partitioning Tracer Data. Water Resources Research. Vol. 36, No. 4, 2000, p. 999-1012.

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Kim, H., M.D. Annable, and P.S.C. Rao. Influence of Air-Water Interfacial Adsorption and Gas-Phase Partitioning on the Transport of Organic Chemicals in Unsaturated Porous Media. Environmental Science and Technology, Vol. 32, No. 9, 1998, pp. 1253-1259.

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Sillan, R.K., M.D. Annable, P.S.C. Rao, D. Dai, K. Hatfield, W.D. Graham, A.L. Wood, and Carl G. Enfield. Evaluation of in situ cosolvent flushing dynamics using a network of spatially distributed multilevel samplers. Water Resources Research, Vol. 34, No. 9, 1998, p. 2191-2201.

Jawitz, J.W., M.D. Annable, and P.S.C. Rao. Miscible Fluid Displacement Stability in Unconfined Porous Media. Journal of Contaminant Hydrology Vol. 31, No. 3-4, 1998, pp. 1-20.

Jawitz, J.W., M.D. Annable, P.S.C. Rao, and R.D. Rhue. Field Implementation of a Winsor Type I Surfactant/Alcohol Mixture for In-Situ Solubilization of a Complex LNAPL as a Single-Phase Microemulsion. Environmental Science and Technology, Vol. 32, No. 4, 1998, pp. 523-530.

Annable, M.D., J. W. Jawitz, P.S.C. Rao, D.P. Dai, H. Kim, and A.L. Wood. Interfacial and Partitioning Tracers for Characterization of Effective NAPL-Water Contact Areas. Ground Water. Vol. 36, No. 3, 1998, pp. 495-502.

Saripalli, K.P., P.S.C. Rao, M.D. Annable. Determination of Specific NAPL-water Interfacial Areas of Residual NAPLs in Porous Media Using Interfacial Tracers Technique. Journal of Contaminant Hydrology Vol. 30, No. 3-4, 1998, pp. 375-391.

Saripalli, K.P., M. D. Annable, and P.S.C. Rao. Estimation of Nonaqueous Phase Liquid-Water Interfacial Areas in Porous Media following Mobilization by Chemical Flooding. Environmental Science and Technology, Vol. 31, No. 12, 1997, pp. 3384-3388.

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PUBLICATIONS IN REFEREED JOURNALS: (continued)

Kim, H., P.S.C. Rao, M.D. Annable. Determination Of Effective Air-Water Interfacial Areas In Partially Saturated Porous Media Using Surfactant Adsorption. Water Resources Research, Vol. 33, No. 12, 1997, pp. 2705-2712.

James, A.I., W.D. Graham, K. Hatfield, P.S.C. Rao, and M.D. Annable. Optimal Estimation of Residual NAPL Saturations using Partitioning Tracer Concentration Data. Water Resources Research, Vol. 33, No. 12, 1997, pp. 2621-2636.

Rao, P.S.C., M.D. Annable, R.K. Sillan, D.P. Dai, K. Hatfield, W.D. Graham, A.L. Wood, and C.G. Enfield. Field-Scale Evaluation of *In-Situ* Cosolvent Flushing for Remediation of a Shallow, Unconfined Aquifer Contaminated with Residual LNAPL. Water Resources Research, Vol. 33, No. 12, 1997, pp. 2673-2686.

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Nandita B Basu; P Suresh C Rao; Irene C Poyer; Subhas Nandy; Megharaj Mallavarapu; Ravi Naidu; Greg B Davis; Bradley M Patterson; Michael D Annable; Kirk Hatfield Integration of Traditional and Innovative Characterization Techniques for Flux-Based Assessment at a TCE Contaminated Site in Australia, submitted to Journal of Contaminant Hydrology.

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Kim, H., Annable, M.D., Rao, P.S.C., Cho, J. Evaluation of Surfactant-Enhanced Air Sparging for PCE Source Mass Depletion. Submitted to Journal of Contaminant Hydrology.

FUNDED RESEARCH PROJECTS:

Impacts of DNAPL Source Zone Treatment: Laboratory and Field Assessment of the Benefits of Partial Source Removal, EPA Cooperative Agreement/SERDP, \$403,000 (with Jawitz), Nov. 2002 – Nov. 2005.

Nano technologies for environmental flux monitoring, NASA, Co-PI (PI K. Hatfield), \$80,000, Oct. 2002 – April 2004.

Watershed Nutrients Flux Measurement. USDA. Co-PI (PI-J.W. Jawitz, K. Hatfield), Nov. 2002-Nov. 2004, \$135,000.

Bench Scale Testing of Cosolvent Flushing for Application at a former Dry Cleaner in Rockledge, Florida. HAS Scientists and Engineers, PI, Feb. 2001-May 2001, \$8,000.

Bench Scale Testing of Ethyl Lactate Flushing for Application at the Phenix Supply Accidental PCE Spill Site in Polk County Florida. HAS Scientists and Engineers, PI, Feb. 2001-July 2001, \$9,000.

Phosphorous Retention and Storage by Isolated and Constructed Wetlands in the Lake Okeechobee B Florida Department of Agricultural and Consumer Services. Oct. 2002-Oct. 2006, co-PI (PI-Ramesh Reddy), \$600,000.

Leaching Potential Of CCA In Florida Soils. Florida Center for solid and Hazardous Waste Management. Co-PI (PI Clayton Clark), April 2002-April 2003, \$50,000.

Development of a Method for Measuring Contaminant Flux in Groundwater, ESTCP, March 2001 - March 2004; Co-Principal Investigator (PI K. Hatfield), \$640,000.

Assessment of Septic Drainfields on Seasonally Inundated Areas, Department of Health, Co-PI, (PI- M. Brown, Delfino), Sept. 1999 - June 2001, \$65,000

Assessment of cosolvent flooding at a dry cleaner site in Jacksonville FL. Florida Center for solid and Hazardous Waste Management. PI (co-PI Suresh Rao), March 1998-March 1999, \$40,000.

Assistance on a cosolvent flood at a dry cleaner site in Jacksonville FL. Lavine-Fricke Recon LFR, co-PI (PI Suresh Rao), March 1998-Oct. 1998, \$44,000.

An in-situ tracer method for establishing the presence and predicting the activity of heavy metal-reducing microbes in porous media, Department of Energy, October 1997 - October 2000; Co-investigator, \$790,000.

Evaluation of surface-water ground-water interaction in isolated wetland systems. South Florida Water Management District and USGS. Co- Principal Investigator (PI W. Wise), Oct. 1998-Oct. 1999, \$100,000.

Innovative Techniques for DNAPL Source Delineation and In-Situ Flushing Techniques for Enhanced Source Removal: Pilot Scale Demonstration at the GRFL, Dover AFB, DE. Armstrong Laboratory, Tyndall AFB, July 1997-July 2001; Principal Investigator, \$854,000.

Lab & Field Evaluation of Single-Phase Microemulsions (SPME) for Enhanced *In-Situ* Remediation of Contaminated Aquifers, Advanced Applied Technology Demonstration Facility, DOD / Rice University, July 15, 1995 - August 31, 1997; Co-Principal Investigator, \$580,000.

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Impacts of spatio-temporal variability of source morphology on field-scale predication of subsurface solute transport. Air Force Office of Sponsored Research, April 1995 - April 1998; Co-Principal Investigator, \$600,000.

Investigation of Lake and Surficial Aquifer Interaction in the Upper Etonia Creek Basin, 2nd year, St. Johns River Water Management District, August 31, 1994 - August 31, 1995; Principal Investigator; \$26,000.

Field Evaluation of Cosolvent-Enhanced In-Situ Remediation, U.S. Environmental Protection Agency, Ada Oklahoma, Project Number: EPA-CR-821990, October 15, 1993 - October 15, 1995; Principal Investigator; \$430,000.

Investigation of Lake and Surficial Aquifer Interaction in the Upper Etonia Creek Basin, St. Johns River Water Management District, August 31, 1993 - August 31, 1994; Principal Investigator; \$38,000.

Hydraulic Interaction Between Irrigation/Drainage Ditches and Adjacent Wetlands, U.S. Geological Survey through Florida's Center for Wetlands & Water Resources, April 1, 1993 - April 1, 1995, Principal Investigator; \$25,000.

UNIVERSITY COURSES TAUGHT

ENV 6932	Fluid Flow in Environmental Systems
ENV 5820	Field Methods in Subsurface Hydrology
ENV 4601	Environmental Resources Management
ENV 4052	Environmental Hydrology II (Subsurface Hydrology)
ENV 6932	Wetland Hydrology
ENV 6050	Pollutant Transport
ENV 6052	Immiscible Fluids in Porous Media
CE 580	Flow Thru Porous Media (Michigan State University)

Ph.D. Students Completed/Current Position

(currently - 2 Ph.D. students)

Chris Martinez, 2006. Assistant Professor, University of Florida

Diane Bondehaggen, 2006. Assistant Professor, Florida Gulf Coast University

Chris Totten, 2005. US Air Force, Brooks AFB

Adrian Fure, 2005. Project Engineer, TriMedia Consultants, Marquette, MI

Jaehyun Cho, 2001. Post-Doctoral Research Associate, University of Florida

James Jawitz, 1999. Assistant Professor, University of Florida

Clayton Clark, 1999. Assistant Professor, University of Florida

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Michael Van Valkenburg, 1999. Department Chair, US Air Force Academy

Heonki Kim, 1999. Associate Professor, Hylum University, Korea

Randal Sillan (co-chair), 1999. Senior Engineer, LFR Levine-Fricke, Tallahassee, FL

Prasad Saripalli, 1996. Research Scientist, Idaho National Engineering Laboratory