

Summary

19 years Hydrogeology experience, 12 years Geophysics experience.

Education

Ph.D., Hydrology and Water Resources. University of Arizona. Tucson, Arizona.

M.S., Civil and Environmental Engineering. West Virginia University. Morgantown, West Virginia.

B.S., Mechanical Engineering. West Virginia Institute of Technology. Montgomery, West Virginia.

Experience

2010 – Present. Chief Technical Officer. hydroGEOPHYSICS, Inc. Tucson, Arizona.

As CTO, I have been responsible for bringing new technologies into the HGI business and expanding the toolbox for site characterization and monitoring. The new technologies are mostly geared towards the mining and nuclear waste industries.

Other specific projects, with which I have been involved include:

- Waste Form Evaluation for Hanford - Investigated different release rates that could be expected from a mineralized waste form that is proposed for treatment of Hanford's liquid nuclear waste.
- C Tank Farm Performance Assessment - Part of the modeling team for conducting long term hydrogeological performance of tank residuals from the C tank farm.
- Design, build, testing of new 180-channel resistivity acquisition for field monitoring

2004 – 2010. Senior Project Manager. hydroGEOPHYSICS, Inc. Tucson, Arizona.

Duties include project management and research on geophysically-based projects related to environmental risk management, mineral exploration, precious and base metal production, and geotechnical problems.

- Environmental Risk Management - Projects have included imaging underground waste plumes on the Hanford Nuclear Site (eastern Washington) using electrical resistivity, mapping acid rock drainage from reclaimed and abandoned mines, and landfill characterization.
- Mineral Exploration - Managed million dollar exploration program for copper and gold in South America (Peru and Chile) using electrical resistivity, induced polarization, and magnetometry.
- Precious and Base Metal Production - Managed several projects involving electrical resistivity imaging of low grade ore heaps to find dry areas after primary leaching cycle.

Currently developing techniques to reduce uncertainty in identifying remaining inventory for secondary recovery.

- Geotechnical Analysis - Managed and developed techniques for upscaling geophysical parameters for geotechnical analyses. Largest project was the Panama Canal, where borehole data combined with electrical resistivity data were used to determine soft and hard sediments in support of the expansion.

2003 – 2004. Post Doctoral Research Assistant. University of Arizona. Tucson, Arizona.

Research included developing three-dimensional analytical solutions for unsaturated flow and contaminant transport in heterogeneous media. The solution relied on the analytical element method with flow through multiple spherical inclusions. Additionally, the method focused on non-Gardner type soils (Brooks-Corey and van Genuchten) in the solution.

2000 – 2003. Graduate Research Assistant. University of Arizona. Tucson, Arizona.

Research included field experiments using ground penetrating radar (GPR) to indirectly measure moisture content and inverse modeling with data obtained from the experiment to calculate hydraulic properties of soils.

1997 – 2000. Environmental Engineer. Environmental Evaluation Group. New Mexico.

Duties at EEG included hydrological modeling of the Waste Isolation Pilot Plant (WIPP) nuclear repository in southeastern New Mexico using computer codes specifically designed for the project, post-processing and visualization of data, and report documentation of work performed.

Publications

Rucker, D.F., D.A. Myers, B.D. Cabbage, M.T. Levitt, G.E. Noonan, M. McNeill, C. Henderson, and R.W. Lober, 2011. Surface Geophysical Exploration: Developing Noninvasive Tools to Monitor Past Leaks around Hanford's Tank Farms. *Environmental Monitoring and Assessment* (in review).

Rucker, D.F., and G.E. Noonan, 2011. Using marine resistivity to map geotechnical properties: A case study in support of dredging the Panama Canal. *Journal of Environmental and Engineering Geophysics* (in review).

Rucker, D.F., N. Crook, D.R. Glaser, and M.H. Loke, 2011. Pilot-Scale Field Validation of the Long Electrode Electrical Resistivity Tomography Method. *Geophysical Prospecting* (accepted).

Rucker, D.F., J.B. Fink, and M.H. Loke, 2011. Environmental monitoring of leaks using time lapsed long electrode electrical resistivity. *Journal of Applied Geophysics* 74(4):242-254.

Rucker, D.F., 2011. A FDTD modeling approach to investigate critical refraction from crosswell radar. *Journal of Environmental and Engineering Geophysics* 16(2):61-71.

Rucker, D.F., 2011. Inverse upscaling of hydraulic parameters during constant flux infiltration using borehole radar. *Advances in Water Resources* 34(2):215-226.

- Rucker, D.F., G.E. Noonan, and W.J. Greenwood, 2011. Electrical resistivity in support of geologic mapping along the Panama Canal. *Engineering Geology* 117(1-2):121-133.
- Rucker, D.F., M.H. Loke, G.E. Noonan, and M.T. Levitt, 2010. Electrical resistivity characterization of an industrial site using long electrodes. *Geophysics* 75(4):WA95-WA104.
- Rucker, D.F., 2010. The application of magnetic gradiometry and electromagnetic induction at a former radioactive waste disposal site. *Waste Management and Research* 28: 364-372.
- Rucker, D.F., 2010. Moisture Estimation Within a Mine Heap: An Application of Cokriging with Assay Data and Electrical Resistivity. *Geophysics* 75(1):B11-B23.
- Rucker, D.F., M.T. Levitt, and W.J. Greenwood, 2009. Three-Dimensional Electrical Resistivity Model Of a Nuclear Waste Disposal Site. *Journal of Applied Geophysics* 69:150-164.
- Rucker, D.F., M. McNeill, A. Schindler, and G.E. Noonan, 2009. Monitoring of a secondary recovery application of leachate injection into a heap. *Hydrometallurgy* 99(3-4):238-248.
- Rucker, D.F., A. Schindler, M.T. Levitt, and D.R., Glaser, 2009. Three-Dimensional Electrical Resistivity Imaging Of a Gold Heap. *Hydrometallurgy* 98(3-4):267-275.
- Rucker, D.F., D.R. Glaser, T. Osborne, and W.C. Maehl, 2009. Electrical resistivity characterization of a reclaimed gold mine to delineate acid rock drainage pathways. *Mine Water and Environment* 28(2):146-157.
- Rucker, D.F., 2009. A coupled electrical resistivity-infiltration model for wetting front evaluation. *Vadose Zone Journal* 8(2):383-388. doi : 10.2136/vzj2008.0080.
- Greenwood, W.J. and D.F. Rucker, 2009. Marine resistivity survey of the Panama Canal. *FastTimes* 14(1): 43-47.
- Rucker, D.F. and J.B. Fink, 2007. Inorganic Plume Delineation Using Surface High Resolution Electrical Resistivity at The BC Cribsa and Trenches Site, Hanford. *Vadose Zone Journal* 6(6):946-958.
- Rucker, D.F. and T.P.A. Ferré, 2007. The Effect Of a Dipping Layer On The First Arrival Travel Time From Zero-Offset and Fixed-Offset Borehole Radar. *Near Surface Geophysics* 5(3):151-159.
- Delin, K.A., S.P. Jackson, D.W. Johnson, S.C. Burleigh, R.R. Woodrow, J.M. McAuley, J.M. Dohm, F. Ip, T.P.A. Ferré, D.F. Rucker, V.R. Baker, 2005. Environmental studies with the sensor web: Principles and Practice. *Sensors* 5:103-117.
- Rucker, D.F., A.W. Warrick, and T.P.A. Ferré, 2005. Parameter equivalence for the Gardner and van Genuchten soil hydraulic conductivity functions for steady vertical flow with inclusions. *Advances in Water Resources* 28(7): 689-699.
- Rucker, D.F. and T.P.A. Ferré, 2004. Automated Water Content Reconstruction of Zero Offset Borehole Ground Penetrating Radar Data Using Simulated Annealing. *Journal of Hydrology* 309(1-4):1-16.
- Rucker, D.F. and T.P.A. Ferré, 2004. Parameter estimation for soil hydraulic properties using zero-offset borehole radar. *Soil Science Society of America Journal* 68(5):1560-1567.
- Rucker, D.F. and T.P.A. Ferré, 2004. BGPR_Reconstruct: A MATLAB® ray-tracing program for nonlinear inversion of first arrival travel time data from zero-offset borehole radar. *Computers and Geosciences* 30(4):767-776.

- Rucker, D.F. and T.P.A. Ferré, 2004. Correcting water content measurement errors associated with critically refracted first arrivals on zero offset profiling borehole ground penetrating radar profiles. *Vadose Zone J.* 3(1):278-287.
- Dowman V, C.E., T.P.A. Ferré, J.P. Hoffmann, D.F. Rucker, and James B. Callegary, 2003. Quantifying ephemeral streambed infiltration from downhole temperature measurements collected before and after streamflow. *Vadose Zone J.* 2(4):595-601.
- Rucker, D.F. and T.P.A. Ferré, 2003. Near-Surface Velocity Estimation using Critically Refracted Waves with Borehole Ground Penetrating Radar. *Vadose Zone J.* 2(2):p247-252.
- Silva, M.K., D.F. Rucker, L. Chaturvedi, 1999. Resolution of the Long-term Performance Issues at the Waste Isolation Pilot Plant. *Risk Analysis*, V19(5):1003-1016.
- Rucker, D.F., L. Chaturvedi, and M.K. Silva, 2000. Is a Probabilistic Performance Assessment Enough? *Ground Water* 38(5) p645.

Conference Proceedings

- Rucker, D.F., B.D. Cabbage, D.A. Myers, M.T. Levitt, G.E. Noonan, M. McNeill, K. Rucker, 2011. Electrical Imaging of Industrially Complex Areas: Using Existing Infrastructure as Sensors for Characterization and Monitoring. NOVCARE 2011. Novel Methods for Subsurface Characterization and Monitoring, Cape Cod, MA. May 9-11, 2011.
- Rucker, D.F., 2011. Hydraulic Parameter Estimation using Geophysically-Constrained Analytical Flow Models. SAGEEP 2011, Annual meeting of the Environmental and Engineering Geophysical Society, Charleston, SC. April 10-14, 2011.
- Calendine, S., D.F. Rucker, J.B. Fink, M.T. Levitt, and J. Schofield, 2011. Automated Leak Detection of Buried Tanks using Geophysical Methods at the Hanford Nuclear Site. SAGEEP 2011, Annual meeting of the Environmental and Engineering Geophysical Society, Charleston, SC. April 10-14, 2011.
- McNeill, M., D.F., Rucker, T. Seal, J. Winterton, C. Baldyga, and J. Fink, 2011. Electrical Monitoring of Pressurized Injections into a Heap. SAGEEP 2011, Annual meeting of the Environmental and Engineering Geophysical Society, Charleston, SC. April 10-14, 2011.
- Noonan, G. and D.F., Rucker, 2011. Panama Canal Expansion Project: How Marine Electrical Resistivity was Used in Support of Canal Dredging. SAGEEP 2011, Annual meeting of the Environmental and Engineering Geophysical Society, Charleston, SC. April 10-14, 2011.
- Seal, T., J. Winterton, and D.F. Rucker, 2011. Hydro-Jex monitoring and operations at the Cripple Creek and Victor heap leach operation in Colorado, USA. Society of Mining Metallurgical and Exploration (SME) Annual Meeting, Phoenix, AZ. February 27-March 2, 2011.
- Gander, M.J., K.D. Leary, M.T. Levitt, C.W. Miller, D.F. Rucker, 2011. Geophysics and Site Characterization at the Hanford Site: The Successful Use of Electrical Resistivity to Position Boreholes to Define Deep Vadose Zone Contamination. Waste Management 2011, Phoenix, AZ. Feb. 27 - Mar 3, 2011.
- Fink, J.B., D.F. Rucker, M.T. Levitt, and M. Skorska, 2011. Detection of Historical Pipeline Leak Plumes Using Non-intrusive, Surface Based Geophysical Techniques at the Hanford Nuclear Site. Waste Management 2011, Phoenix, AZ. Feb. 27 - Mar 3, 2011.

Levitt, M.T., D.F. Rucker, D. Myers, and C. Henderson, 2010. Advancements in Three Dimensional Resistivity Imaging of Subsurface Contamination Plumes within Single Shell Tank Waste Management Areas at the Hanford Site. Waste Management 2008, Phoenix, Arizona. March 7-11, 2010.

Rucker, D.F., 2010. Geostatistical analysis of 3D electrical resistivity with gold and moisture assay data to characterize a gold heap. Society of Mining Metallurgical and Exploration (SME) Annual Meeting, Phoenix, Arizona. February 28-March 3, 2010.

Rucker, D.F. and J.B. Fink, 2009. Heap Characterization and Monitoring with Electrical Resistivity for Optimizing Secondary Leaching. HydroCopper2009. Antofagasta, Chile. May 13-15, 2009.

Rucker, D.F., 2008. Mapping the nitrate plume at Hanford's BC Cribs with electrical resistivity. Society of Exploration Geophysicists Annual Meeting. Las Vegas, Nevada. November 9-14, 2008

Rucker, D.F., M.T. Levitt, D.A. Myers, and C. Henderson, 2008. Development of an Electrical Resistivity Imaging Program for Subsurface Characterization at Hanford. Waste Management 2008, Phoenix, Arizona. February 24-28, 2008.

Rucker, D.F., M.T. Levitt, W.J. Greenwood, and X. Yang, 2008. Inversion of Large Electrical Resistivity Surveys on Multi-Processor Platforms. SAGEEP 2008, Annual meeting of the Environmental and Engineering Geophysical Society, Philadelphia, Pennsylvania. April 6-10, 2008.

Rucker, D.F., M.T. Levitt, and D.A. Myers, 2007. Imaging Beneath Hanford's Tank Farms with Electrical Resistivity Geophysics - An Innovative Approach. Waste Management 2007, Tucson, Arizona. February 25-March 1, 2007.

Rucker, D.F., B.D. Cabbage, M.T. Levitt, and D.R. Glaser II, 2007. Electrical Resistivity Imaging to Monitor a Simulated Leak From an Underground Storage Tank at a Radiological Waste Facility. SAGEEP 2007, Annual meeting of the Environmental and Engineering Geophysical Society, Denver, Colorado. April 4-8, 2007.

McGill, R., D.F. Rucker, and J.B. Fink, 2007. Characterizing Fracture Flow Aquifer Conditions and Locating Domestic Wells Using Multiple Data Sources. 2007 Regional Water Symposium, August 29-September 1, 2007.

Levitt, M., C. Henderson, C. Baldyga, B. Cabbage, S. Calendine, and D. Rucker, 2007. Subsurface Geophysical Exploration within and around Hanford's Tank Farms: Examples from T and S Farm. 6th Annual Washington Hydrogeology Symposium. Tacoma, Washington. May 1-3, 2007.

Benecke, M. and D.F. Rucker, 2006. The BC Cribs And Trenches Geophysical Characterization Project : One Step Forward In Hanford's Cleanup Process. Waste Management 2006, Tucson, Arizona. February 26-March 2, 2006.

Rucker, D.F., J.B. Fink, M.T. Levitt, D.R. Glaser II, C.A. Baldyga, 2006. Characterization of a Nitrate and Technetium Plume with Environmental Geophysics. Soils, Sediments, and Water, 22nd Annual Meeting. Amherst, Maine. October 16-19, 2006.

D. Glaser, D. Rucker, R. McGill, J. Fink, C. Baldyga, J. Hansen, and A. Magliocchino, 2005. Residual Potential Mapping of Contaminant Transport Pathways in Karst Formations of Southern Texas. Karst 2005, San Antonio, Texas. September 24-28, 2005.

- Rucker, D.F., J.B. Fink, M.T. Levitt, D.R. Glaser II, C.A. Baldyga, 2005. Estimating dipping angle with cross-borehole radar: No tomography required. SAGEEP 2005, Annual meeting of the Environmental and Engineering Geophysical Society, Atlanta, Georgia, April 14-17, 2005.
- D.R. Glaser II, Rucker, D.F., J.B. Fink, M.T. Levitt, C.A. Baldyga, 2005. A Comprehensive Geophysical Case Study At A Former Radioactive Waste Disposal Site In The Columbia River Valley, Southeastern Washington. SAGEEP 2005, Annual meeting of the Environmental and Engineering Geophysical Society, Atlanta, Georgia, April 14-17, 2005.
- Rucker, D.F., J.B. Fink, M.T. Levitt, D.R. Glaser II, C.A. Baldyga, 2005. High Resolution Resistivity (HRR) Delineation Of A Liquid Waste Plume At A Former Radioactive Waste Disposal Site, Hanford, Washington. Waste Management 2005, Tucson, Arizona. Paper Number 5324. February
- Rucker, D.F. and T.P.A Ferré, 2004. Hydraulic Parameter Estimation With A Constant Flux Boundary Using Zero-Offset Borehole Radar. GPR 2004, 10th International Conference on Ground Penetrating Radar, Delft, The Netherlands, June 21-26, 2004.
- Delin, K.A., S.P. Jackson, D.W. Johnson, S.C. Burleigh, R.R. Woodrow, M. McAuley, J.T. Britton, J.M. Dohm, T.P.A. Ferré, F. Ip, D.F. Rucker, V.R. Baker, 2004. Sensor Web for Spatio-Temporal Monitoring of a Hydrological Environment. Lunar And Planetary Science Conference (LPSC 2004), Houston, Texas, March 15-19, 2004.
- Doggett, T.C., R. Greeley, V. Baker, S. Chien, A.G. Davies J.M. Dohm T.P.A. Ferré, A. Hinnel, D.F. Rucker, K. Williams, 2004. Airborne Radar Study Of Soil Moisture At A Mars Analog Site: Tohachi Wash / Little Colorado River. Abstract Number 1326. Lunar And Planetary Science Conference (LPSC 2004), Houston, Texas, March 15-19, 2004.
- Rucker, D.F., J.M. Dohm, T.P.A. Ferré, F. Ip, V.R. Baker et al., 2004. Central Avra Valley Storage and Recovery Project (CAVSARP) Site, Tucson, Arizona: Floodwater and Soil Moisture Investigations with Extraterrestrial Application. Abstract Number 2114. Lunar And Planetary Science Conference (LPSC 2004), Houston, Texas, March 15-19, 2004.
- Rucker, D.F. and T.P.A. Ferré, 2003. Improved analysis of borehole ground penetrating radar to monitor transient water flow in the vadose zone. AGU Fall meeting Abstract Number: H31B-0465. San Francisco, CA, December 7-12, 2003.
- Rucker, D.F. and T.P.A. Ferré, 2003. Improved Analysis Of Zero Offset Profiling Borehole Ground Penetrating Radar Measurements For Hydrologic Monitoring. 2003 EGS-AGU-EUG Joint Assembly, 7-11 April 2003, Nice, France.
- Rucker, D.F., K. W. Blasch and P.A. Ferré, 2002. Neural Network Prediction of Ephemeral Streamflow Using Bed-Sediment Thermographs. AGU Fall meeting Abstract Number: H51B-0787. San Francisco, California, December 6-10, 2002.
- Rucker, D.F. and P. A. Ferré, 2002. Measuring the Advance of a Wetting Front Using Cross Borehole GPR. GPR 2002, 9th International Conference on Ground Penetrating Radar, Santa Barbara, California, April 29-May2, 2002.
- Rucker, D.F. and P. A. Ferré, 2002. A Back Propagation Neural Network for Identifying First-Break Times on Cross Borehole Ground Penetrating Radar Traces. GPR 2002, 9th International Conference on Ground Penetrating Radar, Santa Barbara, California, April 29-May2, 2002.
- Rucker, D.F. and P.A. Ferré, 2002. Direct Comparison of Ground Penetrating Radar Transillumination and In-Situ Time Domain Reflectometry for Monitoring the Advance of a

- Wetting Front. SAGEEP 2002, Annual meeting of the Environmental and Engineering Geophysical Society, Las Vegas, Nevada, February 10-1, 2002.
- Rucker, D.F. and P.A. Ferré, 2001. Quantifying the Redistribution of Pore Water After Infiltration Using Ground Penetrating Radar. Eos Trans. AGU, 82 (47), p. F417. Fall Meet. Suppl., Abstract H31B-0241. San Francisco, California, December 10-14, 2001.
- Rucker, D.F. and P.A. Ferré, 2001. The Determination of Sub-Antenna Scale Moisture Content from Cross-Borehole GPR Measurements. 14th Annual Symposium of the Arizona Hydrological Society, Tucson, Arizona, September 12-15, 2001.
- Rucker, D.F. and L. Chaturvedi, 2000. Performance Assessment Issues To Be Resolved At The Waste Isolation Pilot Plant, Proc. 8th Bi-Annual Spectrum Conference. Chattanooga, Tennessee, September 24-28, 2000.
- Rucker, D.F., 2000. A Reliability Assessment Of The WIPP During Postulated Accident Scenarios. Health Physics, V78 (6), p589. Abstracts for the 45th Annual Meeting of the Health Physics Society, Denver Colorado. June 25-29 2000.
- Rucker, D.F., 2000. Expected Dose During an Accident at WIPP - A Probabilistic Approach. Proc. (CD ROM) Waste Management 2000 Conf., Tucson, Arizona, February 27- March 2, 2000, Session 31, Paper # 40, Published by WM Symposia, Inc.
- Chaturvedi, L., M. K. Silva, D. F. Rucker, J. K. Channell, and R. H. Neill, 1999, Performance Assessment Issues for Recertification of the Waste Isolation Pilot Plant, Proc. , 7th International Conference on Radioactive Waste Management and Environmental Remediation (ICEM'99), Nagoya, Japan, September 26-30, 1999, Publication by ASME International on CD-ROM.
- Bartlett, W.T. and D.F. Rucker, 1999. Risks Associated with Emplacement of WIPP Contact-Handled Transuranic (CH-TRU) Waste. Waste Management Education and Research Consortium Conference. Albuquerque, New Mexico. April 1999.
- Chaturvedi, L., R.H. Neill, M.K. Silva, D.F. Rucker, J.K. Channell, W.T. Bartlett, 1999. Long Term Operational Safety Issues at the WIPP. WM '99 Conference Proceedings: HLW, LLW, Mixed Wastes and Environmental Restoration, February 28 - March 4, 1999, Tucson, Arizona. WM Symposia, Inc.
- Neill, R.H., L. Chaturvedi, D.F. Rucker, M.K. Silva, B.A. Walker, J.K. Channell, T.M. Clemo, 1998. Review of the EPA's Proposed Certification of WIPP. Proceedings of the Eighth International Conference for High-Level Waste Management, Sponsored by the American Nuclear Society and the U.S. Department of Energy, May 11-14, 1998.
- Knupp, P.T., D.F. Rucker, and T.F. Corbet, 1997. Unconfined Flow in Heterogeneous Media: The Dupuit Approximation versus the Phreatic Boundary Condition. Fourth SIAM Conference on Mathematical and Computational Issues in the Geosciences. Albuquerque, New Mexico, June 16-19, 1997.
- Roache, P.J. and D.F. Rucker, 1996. SECO Code Development for MADE-2 Simulations. Proceedings of the 3rd Army Groundwater Model Users Workshop, Albuquerque, New Mexico. July 31, 1996.
- Gray, D.D. and D.F. Rucker, 1995. Transport Modeling of tritium at the MADE-2 Site. Groundwater Management Proceedings of the International Symposium, sponsored by the Water Resources Engineering Division, ASCE pp.164-168.

Affiliations

- National and International Organizations: AGU, SME, EEGS, EAGE, SEG
- Associate Editor: Journal of Environmental & Engineering Geophysics (2005 - present) and Journal of Applied Geophysics (2010-present)
- Reviewer: Vadose Zone Journal, Soil Science Society of America, Near Surface Geophysics, Journal of Hydrology, IEEE
- Session Chair: SAGEEP 2005, 2008, 2011; AGU 2008
- Citizens Advisory Board: City of Tucson Environmental Services
- Technical Proposal Reviewer: City of Tucson

Certifications

MSHA certified

OSHA certified (29CFR 1910.120) Hazardous Materials Awareness

OSHA certified (29CFR 1910.1200) Hazard Communications (Department of Labor)