The UNIVERSITY CONSORTIUM

Dr. Jessica Meyer

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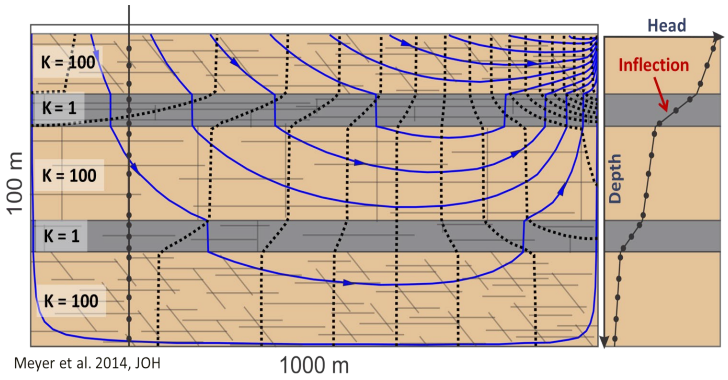
Dr. Meyer started as an Assistant Professor in the Department of Earth and Environmental Sciences at the University of Iowa in August 2018. Previously, she was a senior research associate with the G^{360} Institute for Groundwater Research.

Characterizing the flow system is essential to nearly every hydrogeological investigation, from determining contaminant impacts at a water supply well to understanding groundwater-surface water interactions. Flow system characterization is quantitative description of flow path attributes (e.g., three-dimensional trajectory, associated groundwater residence time, evolution of biogeochemical conditions). Quantification of these attributes is challenging for 3 main reasons, 1) generally, they cannot be directly observed; 2) measurements of hydrogeologic properties and processes are typically sparse compared to the subsurface volume of interest; and 3) the primary data collection instrument, a well or borehole, fundamentally alters the flow system of interest. As a field based, physical hydrogeologist Dr. Meyer looks for creative ways to collect and interpret field data to overcome these challenges and provide insight into natural flow system conditions.



Meyer et al. 2014, JOH

Dr. Meyer's approach to groundwater studies involves three broad strategies: 1) prioritizing data collection from continuous cores, temporarily sealed boreholes, and high resolution, depth discrete multilevel systems (MLSs) to be most representative of flow system conditions away from the altered condition of the borehole, 2) collecting field data at the highest spatial and temporal resolutions possible to reduce uncertainty, 3) collecting numerous, complementary field data sets to provide multiple lines of evidence to constrain interpretations and conclusions. Currently, Dr. Meyer is applying this approach to advance quantitative characterization of sedimentary rock flow systems in three ways 1) using hydraulic head profiles as a fundamental diagnostic tool for flow system characterization, 2) defining the relationship between hydraulic conductivity contrasts and stratigraphy, and 3) advancing our understanding of bedrock aquitards.

Dr. Meyer also has interest and experience in developing relational data management structures for hydrogeological data and improving geological logging for hydrogeological studies. In addition to her research experience, Dr. Meyer has 15 years of experience managing multi-faceted field based research programs at active industrial sites.

Selected Papers and Theses

Selected Publications

Meyer, J.R., Parker, B.L., 2020 in advanced stages of preparation, A multiple lines of evidence approach to evaluating aquitard integrity for a contaminated sedimentary rock aquifer system. *Journal of Hydrology*.

Steelman, C.M., Meyer, J.R., Wanner, P., Swanson, B.J., Conway-White, O., Parker, B.L., 2020 in revision, Depth-discrete groundwater sampling along transects to assess variation in contaminant concentrations and redox conditions within a mixed organic plume discharging to a pond. *Journal of Contaminant Hydrology*.

Harvey, T.M., Arnaud, E., Meyer, J.R., Steelman, C.M., and Parker, B.L. 2019. Characterizing scales of hydrogeological heterogeneity in ice marginal sediments, Wisconsin USA. *Hydrogeology Journal*, 27, 1949-1968, DOI: 10.1007/s10040-019-01978-1.

Lima, G., Meyer, J.R., Khosla, K., Dunfield, K.E., and Parker, B.L. 2018. Spatial variability of microbial communities in a fractured sedimentary rock matrix impacted by a mixed organics plume. *Journal of Contaminant Hydrology*, 218, 110-119, DOI: 10.1016/j.jconhyd.2018.10.001.

Runkel, A.C., R.G. Tipping, J.R. Meyer, J.R. Steenberg, A.J. Retzler, B.L. Parker, J.A. Green, J. Barry, and P.M. Jones. 2018. A multidisciplinary based conceptual model of a fractured sedimentary bedrock aquitard: improved prediction of aquitard integrity. *Hydrogeology Journal*, 26, 2133-2159, DOI: 10.1007/s10040-018-1794-2.

Haslauer, C.P., J.R. Meyer, A. Bárdossy, and B.L. Parker. 2017. Estimating a representative value and proportion of true zeros for censored analytical data with applications to contaminated site assessment. *Environmental Science and Technology*, 51(13): 7502-7510, DOI: 10.1021/acs.est.6b05385.

Steelman, C.M., J.R. Meyer, and B.L. Parker. 2017. Multi-dimensional investigation of bedrock heterogeneity/unconformities at a DNAPL-impacted site. *Groundwater*, 55(4): 532-549, DOI: 10.1111/gwat.12514.

Meyer, J.R., B.L. Parker, E. Arnaud, and A.C. Runkel. 2016. Combining high resolution vertical gradients and sequence stratigraphy to delineate hydrogeologic units for a contaminated sedimentary rock aquifer system. *Journal of Hydrology*, 534: 505-523, DOI: 10.1016/j.jhydrol.2016.01.015.

Cherry, J.A., B.L. Parker, M. Einarson, S.W. Chapman, and J.R. Meyer. 2015. Overview of depth-discrete multilevel groundwater monitoring technologies: focus on groundwater monitoring in areas of oil and gas well stimulation in California. In Recommendations on Model Criteria for Groundwater Sampling, Testing, and Monitoring of Oil and Gas Development in California, Lawrence Livermore National Laboratory Technical Report 669645. 80 p.

Cherry, J.A., B.L. Parker, M. Einarson, S.W. Chapman, and J.R. Meyer. 2015. Overview of depth-discrete multilevel groundwater monitoring technologies: focus on groundwater monitoring in areas of oil and gas well stimulation in California. In Recommendations on Model Criteria for Groundwater Sampling, Testing, and Monitoring of Oil and Gas Development in California, Lawrence Livermore National Laboratory Technical Report 669645. 80 p.

Meyer, J.R., B.L. Parker, and J.A. Cherry. 2014. Characteristics of high resolution hydraulic head profiles and vertical gradients in fractured sedimentary rocks. *Journal of Hydrology*, 517: 493-507, DOI: 10.1016/j.jhydrol.2014.05.050.

Meyer, J.R. and B.L. Parker. 2014. Considerations for fracture network characterization bias imposed by long open boreholes. International Discrete Fracture Network Engineering Conference, October 19-22, Vancouver, Ontario. 10 p.

Lima, G., B.L. Parker, and J.R. Meyer. 2012. Dechlorinating microorganisms in a sedimentary rock matrix contaminated with a mixture of VOCs. *Environmental Science & Technology*, 46(11): 5756-5763, DOI: 10.1021/es300214f.

Meyer, J.R., B.L. Parker, and J.A. Cherry. 2011. Design strategies for high-resolution multilevel monitoring systems for fractured rock sites. Água E Meio Ambiente Subterrâneo, 3(22): 32-33.

Meyer, J.R., B.L. Parker, and J.A. Cherry. 2008. Detailed hydraulic head profiles as essential data for defining hydrogeologic units in layered fractured sedimentary rock. *Environmental Geology*, 56(1): 27-44, DOI: 10.1007/s00254-007-1137-4.

Theses

Buckley, A., 2017. Contaminant Mass Distribution of a Mixed Organic Contaminant Plume Downgradient of an Aged DNAPL Source Zone in Sedimentary Rock. MASc Thesis, University of Guelph, Guelph, Ontario, 86 pp.

Ribeiro, L.A.F.S., 2016. Constraining a Discrete Fracture Network Static Model for the Tunnel City Group Sandstones in Cottage Grove-WI using Outcrops and Boreholes. MASc Thesis, University of Guelph, Guelph, Ontario, 98 pp.

Morgan, C.A., 2019. Fracture Network Characterization of an Aquitard Surface within the Wonewoc Sandstone using Digital Outcrop Photogrammetry and Discrete Fracture Network (DFN) Modelling. MASc Thesis, University of Guelph, Guelph, Ontario, 118 pp.