



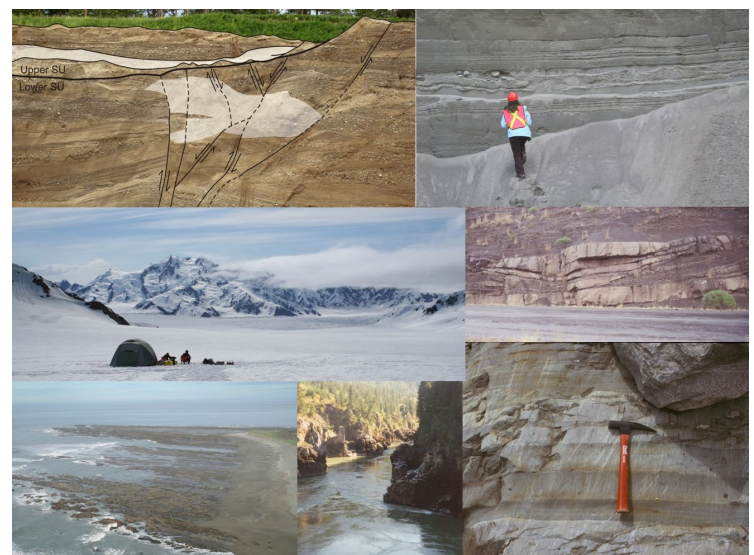
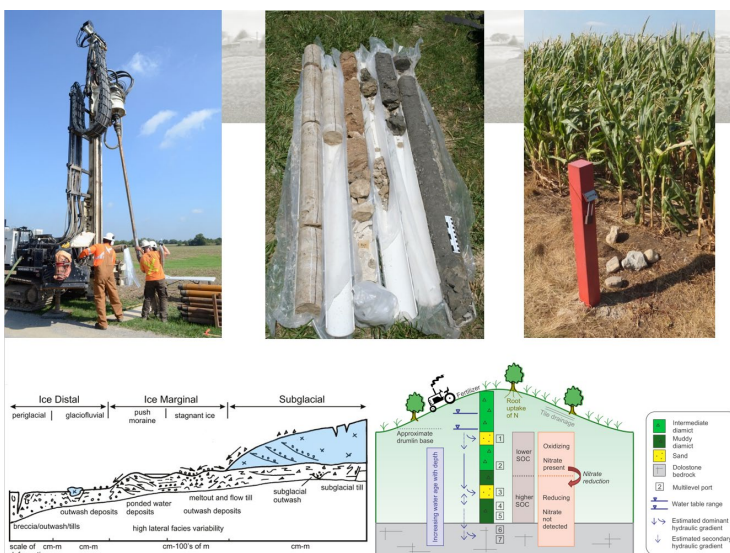
Dr. Emmanuelle Arnaud

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Dr. Emmanuelle Arnaud holds an MSc degree in Geography and a PhD in Geology. She is a glacial geologist with expertise in the field-based analysis of glacial sediments and sedimentary rocks in Canada, Norway, Scotland, and Alaska. Her research is focused on identifying physical sedimentary characteristics to reconstruct past glaciations and to document and predict the nature and extent of these glacial deposits for various environmental and resource management applications. She has been a leader of multidisciplinary and multi-institutional projects that combine various proxies to reconstruct past environmental changes in glaciated regions. She has also led several studies on subsurface heterogeneity of glacial sediments and its impact on groundwater recharge and contaminant transport as well as a study related to non-point source pollution of groundwater (specifically nitrate and pathogens) in agricultural settings.

Research areas of interest include:

- Geological controls on groundwater quality in industrial and agricultural settings
- Buried bedrock valleys, their origin and evolution over time and impacts on bedrock aquifers
- Glaciation and bedrock aquifer evolution
- Integration of LIDAR and subsurface data to improve subsurface geological models
- Spatial analysis of geology and water quality at regional scale



Examples of Research Activities

Types of Applicable Environments

Selected Papers and Theses

Selected Publications

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

McCormack, K., Arnaud, E., Parker, B. L. 2018. Using a multivariogram approach to improve the accuracy of subsurface geological models. *Canadian Journal of Earth Sciences, Special issue on Quaternary geology of Southern Ontario and applications to hydrogeology*, 55:786-801.

Arnaud, E., McGill, M., Trapp, A., Smith, J.E. 2017. Subsurface heterogeneity in the geological and hydraulic properties of the hummocky Paris Moraine, Guelph, Ontario. *Canadian Journal of Earth Sciences, Special issue on Quaternary geology of Southern Ontario and applications to hydrogeology*. 55: 768-785.

Stelman, C.M., Arnaud, E., Pehme, P., Parker, B. L., 2017. Geophysical, geological and hydrogeological characterization of a tributary buried bedrock valley in Southern Ontario. *Canadian Journal of Earth Sciences, Special issue on Quaternary geology of Southern Ontario and applications to hydrogeology*. 55: 641-658.

Meyer, J., Parker, B. L., Arnaud, E., Runkel, A.C., 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.

Arnaud, E., Best, A., Parker, B., Aravena, R., Dunfield, K. 2015. Transport of *Escherichia coli* through a thick vadose zone. *Journal of Environmental Quality, Special Issue on Microbial Fate and Transport in the Subsurface*, 44 (5): 1424-1434.

Best, A., Arnaud, E., Parker, B. L., Aravena, R., Dunfield, K. 2015. Effects of glacial sediment type and land use on nitrate patterns in groundwater. *Groundwater Monitoring and Remediation Special Focus Issue on Monitoring and remediation of agricultural non-point sources impacting groundwater quality*, 35: 68-81.

Undergraduate Research Assistant Supervisor

Daniel Bayley (2020), research assistant, spatial analysis of hydrogeological datasets, southern Ontario

Rhiannon James (2019), research assistant, soil and water dynamics in the Claybelt of Northern Ontario

Grant Hagerdorn (2015) research assistant, susceptibility mapping in Guelph

Tara Harvey (2012-2013) research assistant, hydrogeology of glaciated margins project

Ramita Kedia (2012) research and field assistant, Guelph Quaternary mapping project

Kathleen Nesbitt (2011-2012) research & field assistant, Guelph Quaternary mapping project

Erica Gilbeaut-Ryan & Kyle Press (2011): research and field assistant, Guelph Quaternary mapping project

Colin Gutcher (2010, 2011): field assistant, Guelph Quaternary mapping project

Selected Theses

PhD

Jonathan Munn (2013-2018): Quantifying Secondary Porosity and its associated permeability in a fractured Silurian dolostone aquifer in Guelph, Ontario (co-advisor).

Jessica Meyer (2008-2013): Three-Dimensional Delineation and Characterization of Hydrogeologic Units in Fractured Sedimentary Rock (co-advisor)

MSc

Jesse Brown (2020-2022): Geological evolution of buried bedrock valleys and hydrogeological implications

Celina Trang (2019-2021): Impacts on soil characteristics related to land conversion in the claybelt of northern Ontario (Asim Biswas, co-advisor)

Zexia Li (2018-2020): Groundwater dynamics related to land conversion in the claybelt of northern Ontario (J. Levison, co-advisor)

Nazia Nawrin (2018-2020): Geological controls on ambient groundwater geochemistry, southern Ontario

Sam Jacobson (2017-2019): Novel characterization of 1,4-Dioxane in the karstic Floridian aquifer (B. Parker, co-advisor)

Kelly Whelan (2014-2017): Hydrogeological and geochemical characterization, Clarington Transformer Station, Ontario, (Jim Smith-Co-advisor), McMaster University.

Tara Harvey (2014-2016): Quaternary geology and hydrogeology at a contaminated site in a complex ice marginal system, Cottage Grove, Wisconsin

Sydney Duggan (2014-2016): Hydrogeological characterization, Clarington Transformer Station, Ontario, (Jim Smith-Co-advisor), McMaster University.

Andrew Trapp (2012-2015): Hydrostratigraphy of the Paris Moraine in the Guelph area, Ontario, Canada (Jim Smith-Co-advisor), McMaster University.

Anna Best (2011-2013): Distribution of agricultural contaminants in the subsurface, ON.

Jonathan Munn (2009-2012): Angled coreholes and fracture characterization (co-advisor).

Michael McGill (2009-2011): Subsurface investigation of the Paris Moraine, Guelph, ON.