Changing Isotopic trends in groundwaters, Oak Ridges Moraine, Ontario

Lori Cicci, Emily Henkemans, Shaun Frape
Department of Earth Science, University of Waterloo, Waterloo, Ontario, Canada
mlcicci@uwaterloo.ca
Rick Gerber
Oak Ridges Moraine Hydrogeology Program, Toronto, Ontario, Canada
Matt Millar
Conservation Ontario, Newmarket, Ontario, Canada

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ABSTRACT

Fritz et al. (1987) undertook an extensive isotopic study of both precipitation and groundwater which allowed for the mapping of $\delta^{18}O$ values across Canada. Changing temperature and humidity conditions impact $\delta^{18}O$, $\delta^{2}H$ and deuterium excess in recharging groundwater (Rozanski et al. 1993). Therefore, it is anticipated that global climate change as well as more localized impacts from industrialization and urbanization will cause changes in the trends described by Fritz et al. (1987). Utilizing historic data, both on a national scale (Fritz et al. 1987) and a regional scale (Gerber et al. 2009), combined with new tracer studies, has allowed for a reassessment of the isotopic trends in Ontario groundwater. This initial phase of work made use of the collaborative efforts of provincial conservation authorities, partnership with the YPDT-CAMC and current and past research from the University of Waterloo.

In order to assess the usefulness of isotopic data in interpreting changing paleoclimatic impacts on groundwater signatures, the changing dynamics of regional flow systems must be evaluated. The second phase of the study involves a focus on the Oak Ridges Moraine in Southern Ontario. The Oak Ridges Moraine (ORM) is a 160-km long ridge of sand, silt and gravel deposits north of Lake Ontario, which extends west from the Niagara Escarpment to the Trent River in the east. Understanding the complex flow system is complicated by the regional geology, which, in addition to variable glacial sediment deposition, also includes eroded tunnel channels and bedrock valleys. The ORM is recognized as a regionally significant groundwater recharge area since it is the source of recharge to aquifers which provide drinking water for tens of thousands of residents, and also provide baseflow to the headwaters of many streams. Groundwater protection and management is an important issue for the entire region.

Combined with a more complete understanding of the groundwater flow system, a comparison of the current isotopic characteristics of moraine groundwaters with previous studies allows for a more in-depth investigation into climatic change aspects in ths part of Canada.

3. References

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