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2024 Birdsdall-Dreiss Distinguished Lecture – Part 1

Lithium in brines (Duperow aquifer) in southeast Saskatchewan: a modern-day gold rush

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Institute of Applied Geosciences: Hydrogeology, Engineering Geology, Geochemistry and Economic Geology, Structural Geology, Technical Petrophysics

There is currently an enormous exploration interest in brine-hosted lithium from the Duperow/Leduc aquifer in Western Canada. Published concentrations of lithium up to 259 mg/L are found in southeast Saskatchewan, significantly higher than those currently being exploited further west in west central Saskatchewan and Alberta. Yet, the origin of this difference within a single formation has received little attention in the open literature. The question remains: what controls the distribution of lithium in subsurface brines? A second question is: why are there extreme variations in lithium concentrations mapped very close together?

An exploration and testing program was conducted in 2020-2022 to better understand the distribution of lithium in the Duperow aquifer in southeast Saskatchewan. First, a refined lithostratigraphy was developed subdividing the Duperow Formation into 24 mappable units across the area. Second, lithium concentration data were inserted into this refined lithostratigraphy. This led to the identification of widespread continuous zones with correlatable lithium concentrations across the area. Furthermore, putting multiple measurements from a single well (or nearby wells) in their correct stratigraphic position explains the origin of some of the large differences in concentration measurements from the same well: different zones in the Duperow aquifer in the same location can have different lithium concentrations. An exploration program followed, which included drilling one new well, re-completing a nearby well, and re-entering and deepening a third well. This talk will review this new type of brine-hosted lithium resource from southeast Saskatchewan and provide the latest public results from this active exploration play.