

Influence of Till Provenance on Regional Groundwater Geochemistry

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Abstract

A regional groundwater geochemistry study was conducted in the Paskapoo Formation of southern Alberta, Canada. Our study area focused on a region where two continental ice sheets, the Cordilleran and Laurentide met. The glacial deposits transported by these ice sheets have different bulk characteristics reflective of the bedrock of the source region of the ice. Recharge through these two different glacial deposits generates distinctly different water geochemistry within the underlying Paskapoo Formation, such that bedrock aquifers acquire a geochemical signature of the immediately overlying glacial deposits through which recharge occurs. Oxidation of pyrite in Laurentide till generates high sulphate groundwater, and associated acid generation leads to enhanced mineral weathering. This generates high TDS high Na-SO₄ groundwater in underlying bedrock aquifers. This process appears transitory, where thin Laurentide drift deposits are completely oxidized and have reduced capacity to generate high sulphate water. The same bedrock underlying carbonate dominated Cordilleran drift deposits have low TDS Ca-HCO₃ groundwater.