Using airborne time-domain electromagnetic data and normalized gamma-ray logs to interpret the internal stratigraphy of a buried valley network

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ABSTRACT
Buried valleys have been identified in glaciated terrains in North America and northern Europe, and can have complex internal stratigraphy and heterogeneous fill. Permeable sediments within their fill can be attractive targets for groundwater exploitation, but the potential level of development of buried valley aquifers depends on their extent and continuity. In this study, high-quality geophysical datasets are used to delineate and examine the internal stratigraphy of a large buried valley network in the Peace River region of Northeast British Columbia. The geophysical datasets include airborne time-domain electromagnetic (TEM) interpretations from a SkyTEM survey conducted over the study area, and gamma-ray logs from oil and gas wells that have been normalized to remove the attenuation of the gamma-rays caused by the steel casing in the upper portion of the well. The airborne TEM interpretations of resistivity data are used to differentiate fine and coarse-grained material within the valley fill, and lithological differences in bedrock. The normalized gamma-ray logs supplement the airborne TEM data by confirming the depth to bedrock, and verifying the geological interpretation from the TEM data. The combination of the normalized gamma-ray logs and TEM data also allow the visualization of the structure of the buried valleys. The geophysical interpretation of the internal stratigraphy and the delineation of permeable units within the buried valleys are conducted using the reservoir modeling software Petrel.

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