Characterization of the petrophysical properties of deep saline aquifers for CO2 storage in the Bécancour area, Québec, Canada

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The Intergovernmental Panel on Climate Change has identified deep saline aquifers as a promising geological storage option of carbon dioxide (CO_2). Saline aquifers are identified in the Bécancour area, Québec, Canada. The characterization of the deep saline aquifers is an essential step to meet required storage performance criteria such as the subsurface geological structure, the trapping mechanism, the formation pressure, and hydrogeological flow to ensure a secure storage of CO_2 in the underground aquifer. Thirty post-stack seismic lines acquired between 1970 and 2008 and 15 borehole logs are currently available to characterize the petrophysical properties of the reservoir. The 2D post-stack seismic data are used to constrain the subsurface velocities at boreholes and to delineate the lateral and vertical extents of the deep saline aquifers in the Bécancour area. Problems encountered include the absence of check shot surveys to complete the time to depth conversion from seismic lines, the limited depth interval sampled on most sonic logs, and low resolution of some seismic lines. Seismic signatures were identified for three saline aquifers targeted: the Trenton limestone, Beekmantown dolomite, and Potsdam sandstone. The seismic signatures were correlated to known gamma-ray signatures to complete the time to depth conversion. Coefficients of correlation between synthetic traces generated from sonic logs and observed seismic traces were used to fine-tune the time to depth conversion. Tying velocities to reflections corresponding to geological units by using available seismic lines is the first step necessary to build a geostatistical model of the deep saline aquifers in the Bécancour area. The use of borehole logs and 2D seismic lines allows the determination of initial parameters concerning the spatial distribution of petrophysical properties of the reservoir and the integrity of the seal.

Key words: petrophysical properties, CO_2 storage, saline aquifer, 2D seismic, borehole sonic logs