Improved Quality Control Methods for Legacy Well Logs in Geological Carbon Sequestration: A Case Study from the East Uinta Basin

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Abstract

Accurate characterization of subsurface reservoirs is critical for the effective implementation of geological carbon sequestration (GCS) projects. Legacy well logs provide an invaluable source of data on reservoir properties but are often associated with quality issues such as inconsistent measurement standards, equipment malfunctions, and data degradation over time. This work proposes an improved approach to the quality control (QC) of legacy well logs, aiming to enhance their reliability and utility for GCS applications. Our methodology integrates advanced statistical techniques, automated data correction algorithms, and machine learning models to identify and rectify errors in legacy well logs. We begin with a comprehensive assessment of prevalent quality issues, including depth mismatches, erroneous log readings, and incomplete data sets. Following this, we introduce a multi-step QC process involving data normalization, outlier detection, and cross-validation with geological and petrophysical information. A case study from the East Uinta Basin in Utah is presented to demonstrate the effectiveness of our approach. By applying our QC methods to legacy well logs from this region, we achieved significant improvements in data consistency and accuracy. This work highlights the importance of rigorous quality checks for legacy well logs in the context of GCS and provides a practical framework for their implementation. Our findings suggest that systematic QC of historical well logs can unlock valuable insights, thereby enhancing the overall efficiency and reliability of subsurface reservoir characterization for carbon sequestration.