

Total Organic Carbon, Porosity and Permeability Correlation: A Tool for Carbon Dioxide Storage Potential Evaluation in Irati Formation of the Parana Basin, Brazil

Authors : Richardson M. Abraham-A., Colombo Celso Gaeta Tassinari

Abstract : The correlation between Total Organic Carbon (TOC) and flow units have been carried out to predict and compare the carbon dioxide (CO₂) storage potential of the shale and carbonate rocks in Irati Formation of the Parana Basin. The equations for permeability (K), reservoir quality index (RQI) and flow zone indicator (FZI) are redefined and engaged to evaluate the flow units in both potential reservoir rocks. Shales show higher values of TOC compared to carbonates, as such, porosity (Φ) is most likely to be higher in shales compared to carbonates. The increase in Φ corresponds to the increase in K (in both rocks). Nonetheless, at lower values of Φ , K is higher in carbonates compared to shales. This shows that at lower values of TOC in carbonates, Φ is low, yet, K is likely to be high compared to shale. In the same vein, at higher values of TOC in shales, Φ is high, yet, K is expected to be low compared to carbonates. Overall, the flow unit factors (RQI and FZI) are better in the carbonates compared to the shales. Moreso, within the study location, there are some portions where the thicknesses of the carbonate units are higher compared to the shale units. Most parts of the carbonate strata in the study location are fractured in situ, hence, this could provide easy access for the storage of CO₂. Therefore, based on these points and the disparities between the flow units in the evaluated rock types, the carbonate units are expected to show better potentials for the storage of CO₂. The shale units may be considered as potential cap rocks or seals.

Keywords : total organic content, flow units, carbon dioxide storage, geologic structures

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