Lithofacies, Organic Carbon and Petrophysical Evaluation of the Montney and Doig Formations (Western Canada): Contribution of Quantitative Cuttings Analysis and Electrofacies Classification

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Abstract

The Western Canadian Montney-Doig Formations forms an overall prograding wedge that was deposited along the western margin of the Pangea during the Lower Triassic (Davies et al., 1997; Zonneveld et al., 2011). This depositional system contains a large spectrum of play types, including conventional, dry and liquid-rich tight gas as well as source rock reservoirs. Conventional reservoirs are associated with shallow marine coquina beds and more distal sandy turbidites and have been producing oil and gas for several decades. However, it is only recently, and thanks to the rapid development of horizontal drilling and multistage fracturing technologies, that the industry has started to focus on the unconventional part of the Montney-Doig petroleum system.

Unconventional reservoirs of the Montney-Doig Formations mainly consist of storm and flood-related thin-bedded fine-grained sediments, deposited in lower shoreface, offshore transition and offshore environments. Optimizing the development of these resources depends on our ability to understand and map the spatial distribution of reservoir quality, organic richness, fluid saturations as well as mechanical properties. However, quantifying these parameters from well log data is challenging because of their combined effects on the log response and the non-unique solution associated with them. For instance, the total organic carbon (TOC) is commonly quantified by methods that strongly depend on the deep resistivity log (Passey 1990; Nieto et al., 2013), while the same log may be used to quantify the bulk volume of water (Wood 2012). Integrating well log data with various other sources of information is key to address non-uniqueness and to reduce the uncertainty in quantitative well log analysis of these unconventional reservoirs.

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