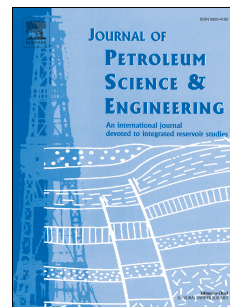


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A method for identifying the thin layer using the wavelet transform of density logging data

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ABSTRACT

In the late stage of oilfield development, thin reservoirs become particularly important for oil and gas exploration. However, current density logging, as a primary method of reservoir identification, has a lower resolution in identifying thin-layers. In this study, a discrete wavelet transform (DWT) is utilized in density logs to identify thin-layers. By adopting different Daubechies (dbN) wavelets and decomposition levels, we analyze the approximation coefficients (cA) and detailed coefficients (cD) and identify the thin-layer signal from detailed coefficients. And then, we reconstruct a new density curve with enhanced thin-layer signal for identifying the thin layer. Results show that db4 wavelet and 3 level are the optimum mother wavelet and decomposition level for the density logging. Detailed coefficients (cD3) from 3rd level decomposition are highly consistent with the thin-layer information, which is suitable for thin-layer identification. Besides, the reconstructed density curve shows a higher thin-layer resolution. This method is successfully applied in the oilfield, and the thin-layer resolution of density curve is improved from 30 cm to 15cm in accordance with microspherically focused logging (RXO).

Key words: wavelet transform, density logging, mother wavelet, decomposition level, thin-layer identification

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