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A Study and Application of High-Resolution Methods for Reef Reservoir Identification

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Abstract

Reefs represent a special type of carbonate trap that plays a key role in the migration, accumulation, and formation of a reservoir. They have commonly been the targets of exploration and development. However, reefs have complex interior structures and easily grow as thin, interbedded geological frames with reef microfacies that include the cap, core, and base of the reef. Because of the inherent drawbacks of seismic signals, including their low frequencies and narrow bandwidths, it is difficult to accurately identify reef reservoirs. Fortunately, the seismic frequency, phase, energy, waveform and other dynamic and geometrical properties can be used to compensate for the energy, expand the frequency bandwidth, and decompose and reconstruct the wavelet to obtain high-resolution seismic data. These data can highlight certain seismic re-

sponses of reefs, including boundary reflections, dome-shaped reflections from the reef outline, strong reflections from the reef cap, reflections from the reef bottom, and onlap reflections from the reef flanks. Some impedance response regularities, such as the lower impedance of the reef cap relative to the reef core and biodetritus beach and the fluctuating impedance of the reef-flat complex, are observed by combining log data with geological and high-resolution seismic data for a reef reservoir inversion. These methods were applied to the Changxing Formation in the Yuanba Gas Field. Good prediction results were obtained with a high consistency between the log and seismic data in a comparative analysis with the original seismic data and well logs.

Key words: organic reef, seismic signal, decomposition, reconstruction, high resolution, reservoir prediction.

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