Wavelet and Fourier Transforms Analysis of Stratigraphic Interfaces for Gas Hydrate Using Well Log Data

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The main objective of this work is to identify the formation interfaces from geophysical well log data using the wavelet, Fourier and hybrid of both transform. The wavelet transform can analyze a discontinuous signal where Fourier analysis fails to analyze a discontinuous signal. In the wavelet transform, the identification of formation interfaces is based on the wavelet coefficients. The developed algorithms are tested on synthetic well log data for applicability of the method and finally applied to field well log data (i.e. spontaneous potential log, gamma ray log, neutron log, resistivity log and sonic log obtained from Gulf of Mexico, USA) successively. The analyzed results of both transform method and results by conventional well log analysis are almost analogous and suggested that the wavelet transform cannot distinguish all geological interfaces alone. Therefore a combination of the wavelet transform and the Fourier transform methods is applied to the well log data. However the results by combined method for resolving the geological interfaces are better than results by the wavelet transform method and the conventional well log analysis and also provide well-structured signals for the stratigraphic interfaces which can provide more satisfactory results.

Key words: Fourier transform, Wavelet transform, Well logs, Stratigraphy and Gas hydrate.

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