Geophysical well log data analysis: A wavelet perspective

V. Eswara Rao (1), E Chandrasekhar (1), R D Chourasia (2), and G C Khatiar (2)

(1) Department of Earth Sciences, Indian Institute of Technology Bombay, Powai, Mumbai-400076,
India.(esekhar@iitb.ac.in), (2) Oil and Natural Gas Corporation Ltd., Bandra-Kurla Complex, Bandra (E), Mumbai-400 056,
India.

Continuous wavelet transformation has been performed on resistivity, density, velocity, neutron-porosity and gamma-ray log data sets to determine the space-localization of oil and/or gas formation zones (pay zones) beneath the Bombay High oil field, India. We have used a variety of wavelets to determine the optimum wavelets that best characterize the pay-zones. Among those, the Morlet and the family of Gaus wavelets (up to 5th order) have demonstrated to be the most appropriate ones to determine the space-localization of pay zones. We believe that the choice of wavelet is dictated by the intrinsic properties of the rocks that vary greatly as a function depth. An attempt has also been made to employ complex wavelets in this study to check whether the phase data will provide any useful information to identify the depth to the top of the pay zones. Extracting the frequency information from the scalograms (obtained by wavelet analysis), spectral decomposition technique has been implemented to identify the pay zones, based on their frequency content. Results of above analyses will be discussed.