# Fractal Analysis of Geophysical Signals for Oil Reservoir Characterization

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Abstract

The primary objective in the oil industry is the recovery of hydrocarbon in the oil fields, this requires an intregrated analysis of data set such as pressure testing, cores, seismic data, among others. Nevertheless, in practice only a small percentege has cores, and seismic data is not recovered in most fields, while well-logs are often recovered in most of the wells. The adequate interpretation of well-logs allows to determine the different properties of rocks, such as permeability, density, resistivity, and porosity, among others. Therefore, the analysis and interpretation of geophysical well-logs signals are one of the most important tools in determining physical properties that allow the proper exploitation of the oil fields. According to recent studies, the geophysical signals show fractal properties which help us to obtain parameters that are useful to determine the reservoir characterization. Considering this, we propose the fractal analysis by calculating the fractal dimension of the geophysical series using three methodologies: rescaled range analysis, detrended fluctuation analysis and wavelet transform modulus maxima. The results indicate that the fractal dimension can locate and classify types of rock, among other properties. Also, these procedures provide correlation parameters and fractal coefficients that can be related to physical parameters. The methodologies are applied to a series of geophysical well-logs belonging to the Chicontepec formation located in the states of Puebla and Veracruz that belongs to the Tampico-Misantla basin, Mexico.