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Stress-Controlled Porosity in Overpressured Sands at Bullwinkle (GC65), Deepwater Gulf of Mexico

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Abstract

Porosities, calculated from wireline density logs, decrease from 33% to 30% over a vertical depth range of 1200 feet in the J3 sand of the Bullwinkle Field (GC65), Deepwater Gulf of Mexico. This 10% decrease in porosity results in a 58% decline in permeability (3.3 to 1.4 darcies). The spatial variation in porosity results in a 75% decrease in acoustic reflectivity over a depth range of only 500 feet. The decrease in porosity with depth is interpreted to result from compaction over geological time scales, which results from higher in-situ stresses at the reservoir low points than at the highpoints. The study provides an approach to predict the spatial variation of porosity and permeability expected in a homogenous, isotropic, and compressible reservoir. These rock properties are important parameters for reservoir simulation. The acoustic results imply that the reservoir will be imaged differently due to in-situ stress conditions alone and independent of changes in lithology or pore fluid.