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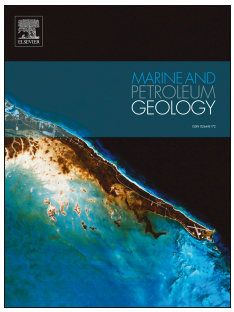

Complex resistivity spectra for estimating permeability in dolomites from the Mississippian Madison Formation, Wyoming

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Complex Resistivity Spectra for Estimating Permeability in Dolomites from the Mississippian Madison Formation, Wyoming

Jan Norbisrath, Gregor P. Eberli, and Ralf J. Weger

Abstract

Dolomite rocks constitute many important reservoirs due to the porosity-preserving and connectivity-enhancing effects of dolomitization. This study explores the correlation between resistivity and pore structure in dolomite rocks from the Mississippian Madison Formation in Wyoming and proposes a novel approach for predicting permeability from complex resistivity spectra (CRS).

Digital image analysis (DIA) on thin-sections is used to quantify the pore structure of 54 sucrosic dolomite samples. Pore-structure parameters derived from DIA are correlated to resistivity values of each plug and show that larger and simpler pore networks result in higher cementation factors.

Analyses of CRS are performed on brine-saturated core plugs in a log sweep from 0.1 – 100,000 Hz with a four-electrode setup at varying confining pressures. Results show that the frequency dispersion of CRS between 10 – 100 kHz is directly related to the porosity in these dolomites. The phase shift of CRS shows high variance in both low and high porosity samples with characteristic slopes β_{Phase} and $\beta_{Amplitude}$ for frequencies between 10 – 100 kHz. Modifying an empirical model of