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Shale Volumes Have Large Uncertainties in the Lower Tertiary Deepwater

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Abstract

Exploration in the Gulf of Mexico has progressively moved farther and farther offshore. Initially oil companies concentrated on the shelf and then moved into the deep water and the Miocene trend. With the acquisition and processing of data farther offshore, attention has switched to a new trend in the Lower Tertiary.

This is an emerging play in the deepwater Gulf of Mexico, to date there have been 12 announced discoveries out of 19 wells drilled. Geoscientists expect to see well developed stacked turbidites that define basin floor fans. This trend data is only for Alaminos Canyon, Keathley Canyon and Walker Ridge.

Shale is a mud rock that can have an extremely variable assortment of minerals, and is usually a non-reservoir rock. This kind of sedimentary rock contains a significant volume of clay minerals has many types of clay minerals with widely varying different compositions and log responses. So estimations of shale/clay volume carry large uncertainties. For our purposes we will assume the minerals in the shale are the clay minerals, plus the same minerals that are in the adjacent “sand” seen by the ECS mineral model.

With help from the integration of spectroscopy and triple-combo logs, the important variable the apparent grain density, can be calculated as a function of the 4 measured elements Si, Ca, Fe and S. This method becomes even more certain when the method is calibrated to a core data base to correlate the weight fractions of elements. We will convert bulk density, and with grain density from SI, FE, CA and S to porosity. Mr. Herron’s paper SPE 77631 gives the formulas for this methodology for four types of combinations of non-arkose, sub-arkose and arkose.

The advantages and shortcomings of this method will be discussed and how they involve the spectrometer measurements with the element-mineral relationships. It is extremely important to have core with porosity, grain density, water saturation and permeability. But the key information from the core is quantitative XRD to truly have confidence in the significance of this method.