RhoVe T Method Empirical Velocity–Density–Temperature–Effective Stress Transform

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ABSTRACT

The rhob–velocity–effective stress (RhoVe) method represents an empirical approach to pore pressure analysis and calibration that utilizes a series of model-driven, genetically-linked "virtual" rock property relationships. The method is fundamentally a two-parameter approach (*a*–term and *α*), that is used to construct a velocity-vertical effective stress (VES) and density–VES family of curves that can be applied to a well of interest where convergence of the two transformed properties offers a robust solution.

When the *a*–term is set as a function of *α* ($a = f(\alpha)$), the RhoVe method is reduced to a single parameter (*α'*) that includes the effects of compositional changes related to clay diagenesis and the effects of ongoing chemical compaction. Once calibrated, the construct represents a "fully-populated" petrophysical (shale-only) model volume that can be queried and interrogated to perform advanced calculations leading to a new empirical approach for calculating pore pressure from temperature that both frames the structural-stratigraphic history of fine-grained clastics in a sub-regional setting and allows for an interpretation of local diagenetic effects. The method utilizes a single master power law reference relationship between temperature (in degrees Fahrenheit) and *α'* that is applied as an instantaneous series. The same temperature–*α'* power law function transforms sonic and density data for the entire stratigraphic section.

Accounting for the effects of ongoing chemical compaction and diagenesis using alternate associations like temperature extends the predictability of high-velocity, high-density, low-effective stress rock types such as those found in the deepwater Gulf of Mexico lower Miocene and older Paleogene "Wilcox" equivalent mudstones and shales.

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