Identification of Tulare Sand & Diatomite in California, USA, using Adrok's Atomic Dielectic Resonance Technology

Data was acquired at the Belridge Oil Field in San Joaquin Valley, California (USA). The reservoir is the oil-bearing Diatomite Formation is a high porosity primarily composed of phytoplankton meaning it is 80-90% silica with the remaining attributed to aluminium & iron oxide. These phytoplankton were later buried by muds & eventually the Tulare sands

Introduction

- The overall objectives are two-fold. Firstly, to see if we can use our latest ADR results to differentiate between sand, shales, water & oil. Secondly to accurately identify the key boundary between the Tulare Sands & the Diatomite Unit beneath.
- Data was collected from 3 Virtual Boreholes (V-bores) at Belridge Oil Field (figure 1).

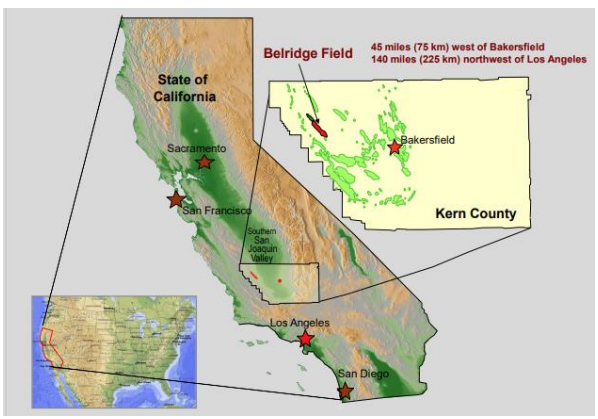


Figure 1: Location of the study area in Belridge Oil Field, California, USA.

Background & Geological Context

Located in Kern County, Calif. approximately 45 miles west/northwest of Bakersfield, the Belridge Producing Complex covers an area roughly 22 miles long and 2.5 miles wide (figure 3). The Belridge Producing Complex includes exploration and production (E&P) operations in the North and South Belridge, Lost Hills, Cymric, and McKittrick oil fields. Oil and gas production includes heavy oil production from the Tulare formation and light oil production from the diatomite formation. Nearly 64,000 barrels of oil equivalent per day are produced at Belridge. Situated on a southeast-plunging anticline, in which the oil has collected in pools in structural traps sealed by both above-lying impermeable units as well as tar seals. Most of the oil has pooled in the Tulare Formation, of Pleistocene age, and in the Diatomite Formation, of Pliocene–Miocene age. The oil itself probably originated in the underlying Monterey Formation, migrating upward to structural and stratigraphic traps over time (figure 2).

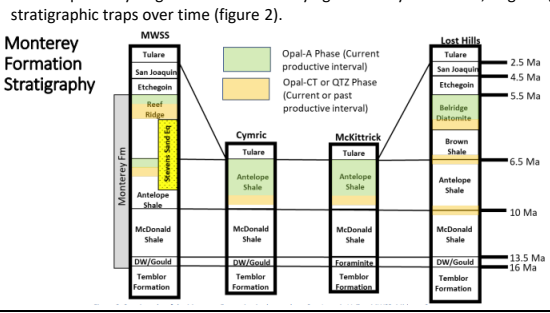
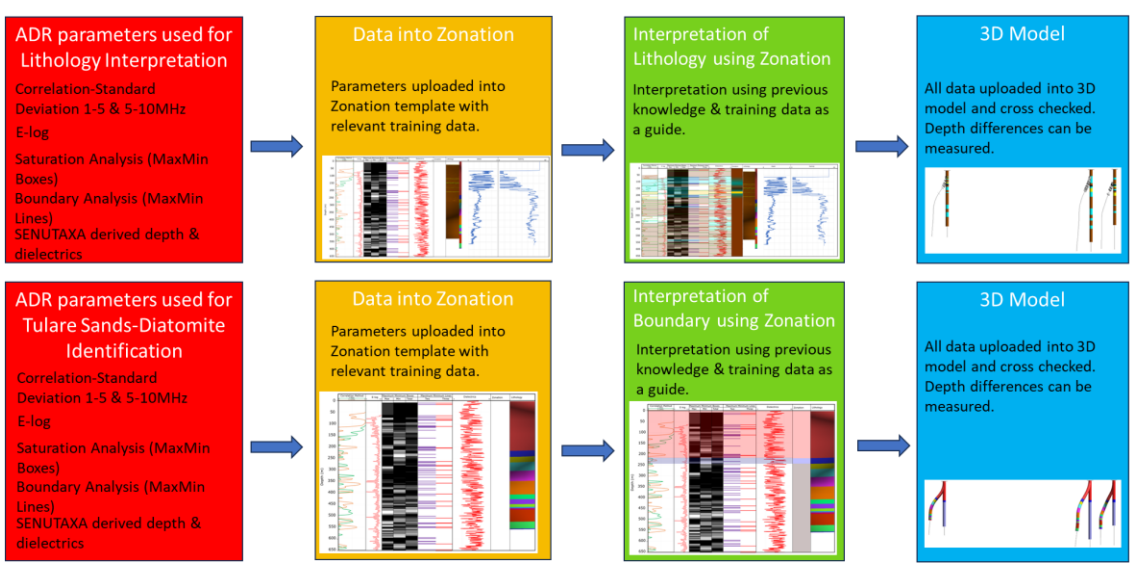


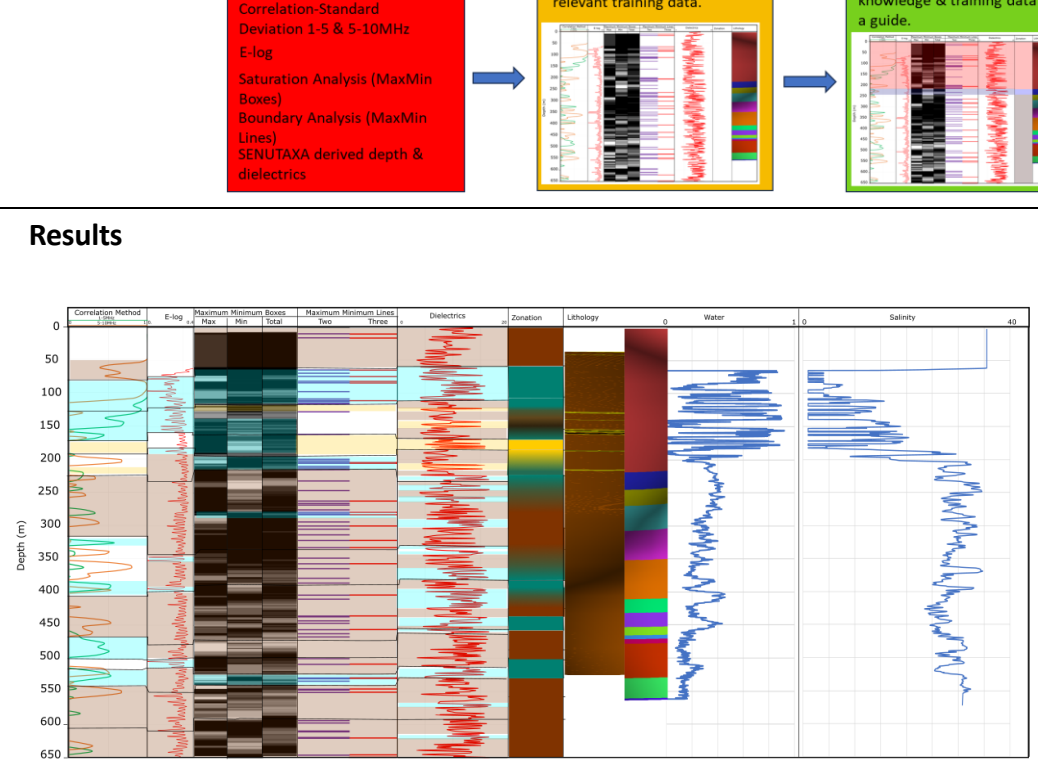
Figure 2: Larue et al (2018) Characterization of Five Unconventional Diatomaceous (Opal A) Reservoirs Monterey Formations, San Joaquin Valley

Figure 3: Location of the 3 Virtual Boreholes collected next to drilled groundtruth wells

Methods

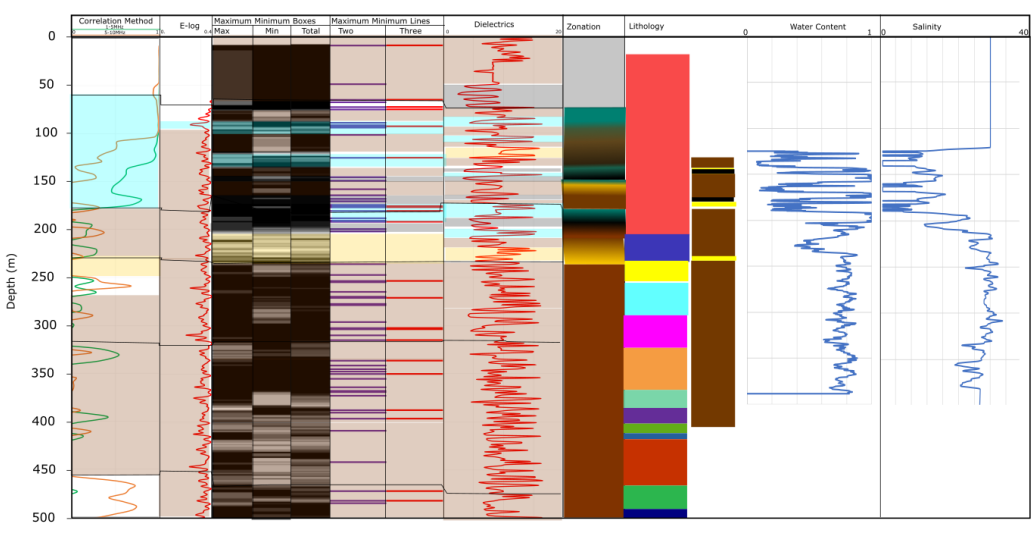


Results



Site: 565L2-33

The interpretation suggests these peaks in the dielectrics between 150m-200m are either related to water or sand depending on the correlation results and saturation & boundary analysis. Sands are generally associated with an absence of peaks or troughs in any parameter. In contrast appears to be associated with peaks and troughs.



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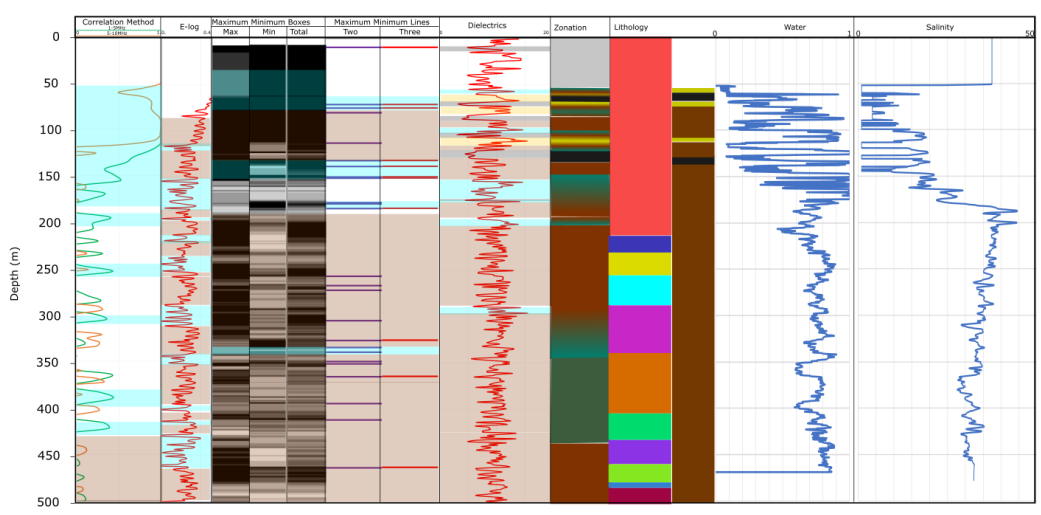
The interpretation suggests these peaks in the dielectrics between 70m-220m are usually related to water saturation especially where the saturation analysis is low & boundary analysis values high (greater presence of two & three lines). An absence of this boundary analysis and values of zero in the correlation values may indicate the presence of sands.



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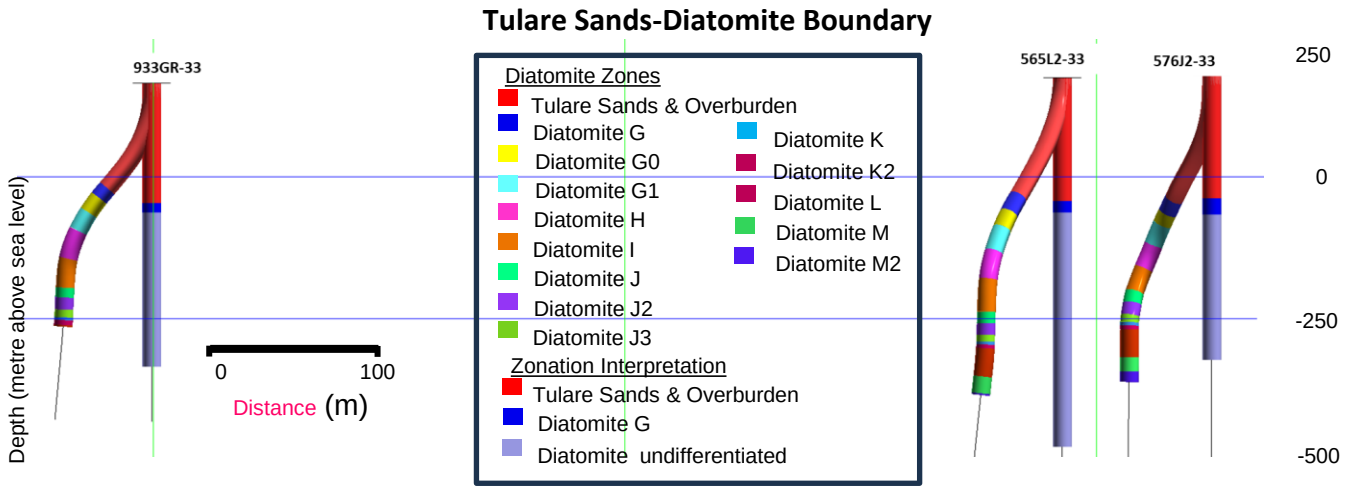
The interpretation suggests much greater proportion of water than the previous V-bores because of the higher saturation values & higher values for correlation-standard deviation. The E-log values are also much regularly below 0.2, when these correspond to high dielectrics there is some validation that this combination can identify water.

Conclusions



Adrok's revised zonation technique **successfully identifies the key boundary between the Tulare Sand & the Diatomite Zones.** Oil horizons are also successfully identified by this technique. These are excellent results.