Submission code: GMZ6NDQVM9

See this and other abstracts on our website: https://home.sbgf.org.br/Pages/resumos.php

ANALYSIS OF WELL LOGS, MINERALOGY, AND LITHOGEOCHEMISTRY IN THE UPPER SECTION OF THE MACABU FORMATION (PRE-SALT, CAMPOS BASIN) FROM 3-BP-11-RJS WELL .

Ana Clara Da Silva Feitosa (Universidade Federal Fluminense), Jéssica De Souza Gabi Barcellos, Victor Matheus Joaquim Salgado Campos (Universidade Federal Fluminense - UFF), Paloma De Queiroz Cardoso (Universidade Federal Fluminense), Otto Borges (Universidade Federal Fluminense), Carla Semiramis Silveira (Universidade Federal Fluminense), Antonio F. M. Freire (UFF)

ANALYSIS OF WELL LOGS, MINERALOGY, AND LITHOGEOCHEMISTRY IN THE UPPER SECTION OF THE MACABU FORMATION (PRE-SALT, CAMPOS BASIN) FROM 3-BP-11-RJS WELL.

Introduction

Situated along the coasts of Rio de Janeiro and Espírito Santo, the Campos Basin plays a significant role in Brazil's economy due to its petroleum potential.The Macabu Formation, part of the Pre-salt Oil System of the Campos Basin, is characterized as a carbonate reservoir comprising limestones, marls, and shales. Mineralogical and lithogeochemical analyses are crucial for understanding its paleoenvironmental characterization, as they allow for qualitative and quantitative determination of sedimentary rock components. This is essential for understanding the response of different lithologies in well logs, as well as the poropermeability properties exhibited by the lithologies. However, the integration of these analyses with well logs has been limited in studies of the Macabu Formation, hindering more advanced investigations for identifying potential intervals of interest. This research aims to develop the integration of lithogeochemical, mineralogical, and well log analyses of the Macabu Formation to enhance exploration and production strategies in the oil and gas industry.

Method and/or Theory

For this purpose, drill cutting samples from well 3-BP-11-RJS, located in the southern portion of block C-M-473, were studied using a multiproxy approach involving stereomicroscopic description, X-ray diffraction (XRD), X-ray fluorescence spectrometry (XRF), and well log data acquired during drilling.

Results and Conclusions

The multiproxy approach revealed key reservoir features.The mineralogical composition of the samples indicated the presence of calcite (29–48%), Mg-clay minerals (21–46%), mica (7–19%), quartz (7–15%), dolomite (2–9%), plagioclase (2–7%), pyrite (0–1%), barite (0–1%), and K-feldspar (0–3%). In specific intervals, increases in CaO and decreases in MgO suggested that magnesium was present in clay minerals rather than dolomite. In well logs, the neutron porosity (NPHI) ranged from 0.13 to 0.20, while gamma-ray (GR) values increased from 72 to 110 gAPI. Throughout the well log data, feldspar content was low (3%), but uranium concentrations were significant (average of 2.9 ppm), indicating a potential increase in organic matter. Spearman correlations revealed a negative relationship between dolomite and gamma-ray (GR) logs, while the correlation between dolomite and resistivity (AT) logs was positive. A negative correlation between dolomite and neutron porosity was observed, suggesting dolomitization processes that resulted in pore filling. The depositional setting is interpreted as lacustrine, characterized by calcite precipitation and the formation of Mg-clays in a saline environment with elevated pH levels. Cutting sample analyses and well log data from the Macabu Formation aligned closely with the overall well information and the XRD and XRF techniques provided valuable insights into the formation’s mineralogy and lithogeochemistry. An important outcome was the impact of dolomite on rock porosity, highlighting its importance in reservoir quality.The results underscore the significance of integrating well logs, mineralogy, and lithogeochemistry as essential tools to optimize oil and gas exploration and production in the Campos Basin.