Use of wireline logs to estimate strength of cap-rock lithologies

Elizabeth S. Petrie
Utah State University

James P. Evans
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/graduate_posters

Recommended Citation
Use of wireline logs to estimate strength of cap-rock lithologies

ES Petrie and JP Evans
Utah State University, Logan UT

Background

The presence of fractures in subsea fields affects their mechanical and hydrogeophysical properties. Understanding and modeling these properties is important for the accurate assessment of petroleum reservoir behavior and storage systems. This research is focused on characterizing the fracture parameters and, specifically, the rock strength of cap-rock lithologies associated with the full unconformity in the eastern North Sea. The study will investigate the rock strength of cap-rock lithologies estimated from the well logs.

Research Objectives:
- Characterization of fracture parameters and rock strength in cap-rock lithologies
- Estimation of rock strength from wireline logs

Methodology

Outcrop Observations
- Lithology: Limestone, dolomite, sandstone
- Fracture density: Description of fracture density from outcrop samples
- Fracture orientation: Analysis of fracture orientation in the outcrop
- Fracture fill: Description of fracture fill materials

Well Log Analysis
- Gamma Ray: Description of gamma ray log in different rock types
- Sonic: Measurement of sonic wave travel time
- Density: Measurement of density logs
- Neutron: Measurement of neutron logs
- Wireline logs: Analysis of wireline logs with specific parameters

Fracture Analysis
- Fault Plane Imaging: Analysis of fault plane imaging
- Fracture Map: Mapping of fracture distribution
- Fracture Orientation: Analysis of fracture orientation
- Fracture Density: Description of fracture density
- Fracture Fill: Description of fracture fill materials

Well Calculations
- Darcy's Law: Application of Darcy's Law
- Poisson's Ratio: Measurement of Poisson's Ratio
- Young's Modulus: Measurement of Young's Modulus
- S-wave velocity: Analysis of S-wave velocity

Results
- Integration of outcrop and well log data for the Jurassic Canmore Formation study
- Fracture orientation changes slightly up section but maintain a NW-SE orientation
- Fracture intensity increases with increased fault thickness and shale content
- Strong correlation between fracture strike and gamma ray values - indicating a lithologic control
- Variability in fracture index and Young's Modulus obtained from well logs at an inspection point scale

Drilling and log data - relationship between fracture strike and gamma ray values

Remainder Questions
- How does fracture orientation change with depth and lithology?
- How does fracture density vary with well log type?
- What fractures are observed across the entire section?
- How are fracture density and orientation related to rock strength?

Acknowledgements


References

