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Type: Oral Presentation

Strength and stability of fractured rocks

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Strength and stability of rocks are essential information [1] for engineers and operators working in the field like petroleum production, geothermal installation and underground CO2 storage. During operations, sometimes fractures open-up at the well-boundaries and fractures are mostly seen as "disturbing elements" for the stability of wells and well-operations. It is a real challenge to plan a drilling operation in fracturedreservoirs (like chalk reservoirs) due to the presence of natural fracture network -drilling must be done in a controlled manner so that the well-integrity is not disturbed. Therefore, we need a better understanding on how pre-existing fractures can reduce the strength/stability of rocks. In addition, we need to develop tools for monitoring the opening-up of new fractures and their development. Our lab experiments [2,3] explored the stress-induced fracturing behavior of reservoir rocks during fluid injection scenarios. Using the acoustic emission (AE) monitoring system, we could count new fractures (micro-cracks) and track the major fracture propagation. In addition, we have developed a discrete element model (DEM) simulation code based on Fiber bundle model [4,5] to analyze the role of fractures (damage) on the strength/stability of porous rocks. Our simulation code can take into account both long-range and short-range load-sharing scenarios [6,7].

Time Block Preference

Time Block B (14:00-17:00 CET)

References

- 1. E. Fjær, R. M. Holt, P. Horsrud, A. M. Raaen and R. Risnes, Petrolum Related Rock Mechanics (Elsevier, 2008).
- S. Pradhan, A. Stroisz, E. Fjær, J. Stenebråten, H.K. Lund and E. F. Sønstebø, "Stress-induced fracturing of reservoir rocks: Acoustic monitoring and mCT image analysis", Int. J. of Rock Mechanics and Rock Engineering, DOI 10.1007/s00603-015-0853-4 (2015).
- 3. S. Pradhan, A. Stroisz, E. Fjær, J. Stenebråten, H.K. Lund, E. F. Sønstebø and S. Roy, "Fracturing tests on reservoir rocks: Analysis of AE events and radial strain evolution", ARMA (2014).
- 4. S. Pradhan, A. Hansen and Bikas K. Chakrabarti, "Failure processes in elastic fiber bundles", Rev. Mod. Phys. Vol. 82, No 1, 499-555 (2010).
- 5. A. Hansen, P. C. Hemmer and S. Pradhan, "The Fiber Bundle Model: Modeling Failure in Materials", Wiley-VCH, Berlin (September 2015).
- 6. S. Pradhan, J. T. Kjellstadli and A. Hansen, "Variation of elastic energy shows reliable signal of upcoming catastrophic failure", Front. Phys. Vol. 7 106 (2019).
- 7. J. T. Kjellstadli, E. Bering, M. Hendrik, S. Pradhan and A. Hansen, "Can Local Stress Enhancement Induce Stability in Fracture Processes? Part I: Apparent Stability", Front. Phys. Vol. 7 105 (2019).

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