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Baden Arena Kongress 1 – Tiefe Geothermie

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Baden Arena Congress 1 – Deep Geothermal Energy

Critical Stress Analysis- Applications in EGS (Enhanced Geothermal Systems): Auburn Geothermal Well Study Case

Kritische Spannungsanalyse - Anwendungen in EGS (Enhanced Geothermal Systems): Fallstudie zur geothermischen Bohrung in Auburn

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The advancement of deep geothermal energy systems largely relies on a thorough comprehension of the subsurface's stress conditions and fracture permeability. Some significant implications of this understanding include the ability to predict which fractures and orientations are most suitable for reservoir development, as well as the capacity to anticipate the risks associated with induced seismicity. This holds particular significance in the context of Enhanced Geothermal Systems (EGS) projects, where permeability constraints pose unique challenges.

The Critical Stress Analysis methodology involves consideration of various factors, such as the magnitude of the principal stresses, their representation in a Mohr circle, measurements of pore pressure, and the orientation of fractures.

In this study, we reanalyzed data obtained from the Auburn geothermal well situated in Auburn, New York, an exploratory geothermal well drilled to a depth of 1.6 kilometers in 1983, along Paleozoic sedimentary rocks and pre-Cambrian basement formations. The well was subjected to hydraulic fracturing stress measurements and geophysical logging, yielding in situ stress measurements and valuable fracture-related information. This information is crucial for the application of the Critical Stress Analysis methodology.

We utilized data on natural fracture orientations that were previously compiled in other studies and validated through borehole image logs (Hickman et al., 1985; Plumb & Hickman, 1985). Our analysis also incorporated stress state interpretations, production reports, and well log data, including spinner log surveys. With this information, we interpreted pressure values to determine the critical stress state and failure on pre-existing fractures. Furthermore, we identified permeable flowing zones in specific orientations within the fracture sets and compared them with the optimal failure orientation.