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Drilling Induced Borehole Breakouts - New Insights From LWD Data Analysis

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Logging while drilling (LWD) borehole images are widely used for the analysis of borehole breakouts. These breakouts develop when the circumferential stress around the borehole exceeds the compressive strength of the rock. Furthermore, they can show a temporal development. The aim of this thesis was the investigation whether a causal relationship between drilling operations and the development of breakouts exists.

For this purpose, a software tool has been developed, as an add-in for the Baker Hughes proprietary software JewelSuite, to interpret the data. The observations displayed a general relationship between breakouts and tripping operations as well as events with switched-off pumps. Various pressure reductions have been identified in breakout sections. The pressure reductions of the highest magnitude are caused by the switch-off of pumps during connections. A sensitivity analysis, examining the influence of the observed pressure changes on the stresses around the wellbore, has shown a strong dependency on the borehole orientation. Further, it became visible that the downhole temperature responses negatively to drilling operations. Switched-off pumps are responsible for the temperature reductions of the highest magnitude as well.

An investigation of the temporal development of breakouts has shown that breakouts tend to grow both azimuthally and depth-wise. Pressure changes between relogs may be an explanation for this time-dependent behavior. A causal relationship between breakouts and drilling operations could not be proven on the base of the investigated data set. Future research based on the findings of this work, however, may clarify this relationship by using relog data of higher quantity and quality or data from multiple imaging tools of the same run.

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