

**Are you listening? A proposed real-time drilling monitoring system for deep wells using passive bit-source seismic-while-drilling data in a physics-informed machine learning workflow.**

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Efficient drilling of deep geothermal systems will enable significant deployment of geothermal electricity production beyond conventional shallow systems. This research project proposes a novel drilling dynamics monitoring system to overcome some of the limitations of optimizing drilling in hard rocks at high temperatures for long wells. The proposed system will use passive bit-source seismic-while-drilling (SWD) data to "listen" to the drilling operation at the surface, then combine the seismic data with drilling data from the rig in a physics-informed machine learning workflow in real-time. The approach of recording at the surface reduces the need for expensive downhole sensors that may not function properly at high temperatures. In this poster we will present the proposed monitoring system workflow and show a detailed frequency analysis of downhole vibration data from a recently drilled deep, hot well. This study will help us understand what potential information we can extract from downhole generated vibrations when considering seismic data collected at the surface. We will also use the results to better understand the bit seismic source signature for SWD processing and to formulate parameter spaces that separate potential causes of drilling dysfunctions such as modes of vibration and bit wear.

Key Words: Geothermal, Drilling optimization, Seismic-while-drilling, Machine Learning

Theme: Surface and Monitoring Technology