Contribution ID : **122** Type : **Poster**

Tintina fault core analysis for potential geothermal development

Wednesday, 9 October 2019 17:40 (20)

Drill core from the Tintina Trench was extracted near Ross River region, Yukon; Canada. The Tintina Trench is a late Miocene graben that was formed along the antecedent early Tertiary Tintina fault. The graben is a natural catchment for alluvial and glacial sediment. In 2018, the Yukon Geological Survey drilled a 500 m geothermal gradient well in the area. Core from the well was logged, and a variety of analyses were conducted to evaluate the subsurface in the study area. The following analyses were completed: qualitative XRD analysis, thin section analysis, and porosity measurements. In combination, the results collected enable a robust evaluation of target areas for potential geothermal development in the future. 73 samples were selected for XRD analysis. The results showed that detrital quartz, k-feldspar, and clays (kaolinite and smectite) are the most prominent minerals throughout the entire well core. In addition, 13 samples were prepared as thin sections and analyzed to examine the grain porosity characteristics. The most prevalent porosity characteristic observed was fracture porosity and similar highly interconnected hairline features striking throughout the samples, often parallel to bedding. Some of the fractures observed may have been from thin section preparation or the core log process. The grains tended to be angular to sub-angular, which is typical for detrital grains. The clays occupy the space between larger grains, generally quartz or k-feldspar. Porosity measurements determined the total grain volume in the core at depth. It was determined that the percent pore volume out of the entire bulk volume ranged in the samples from 2.6% to 24.5%. The highest observed porosity was at 366 m, reaching 24.5% porosity of the total bulk volume. The requested standard deviation for the pycnometry measurements was 0.05 with an average of 4-6 runs to achieve 3 within the requested standard deviation. The well has an average temperature gradient of 31 ⁰C/km. This gradient suggests marginal potential for electricity production and good potential for direct use of the heat.

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Session Classification : Poster Session