

Demonstration of ALT televiewer and gamma instruments

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Successful milestones were reached in the HITI project when a downhole televiewer and a downhole natural gamma ray instrument, both developed and built by HITI partner ALT was shown to perform at temperatures of 285°C and 300°C respectively.

On the first day of the two-day demonstration campaign, the ABI92 televiewer was shown to perform up to 285°C, giving high resolution data (see Figure 2). The tests were performed inside a liner and the images can be used to identify the liner's perforation (see Figure 3).

On the second day, the gamma instrument, GR85, was able to operate to 300°C in the same well, with no loss in data quality (see Figure 4). Temperature and pressure was measured independently using a calibrated Kuster K10 high temperature tolerant tool, owned by ISOR.

The well at Krafla geothermal site is in many ways ideal for the performed testing: There is no well head pressure, allowing easy access, with no steam or fluid flowing from the well. The temperature gradient is relatively sharp and the well stays above 250°C in the whole liner, which is hanging in the production casing at 840 m. The well is deviated, allowing testing of new in-line centralisers. Finally, the well temperature exceeds 300°C relatively deep in the well (at 2015 m), allowing the pressure performance to be tested also.

Both televiewer and gamma tool tests lasted for several hours in the hot environment and only heat generated internally was seen to affect the electronic temperature. The internal temperature rise was approximately 5.5 °C per hour at 270 °C borehole temperature, meaning that the tool could last around 18 hours in that environment.

A high temperature cable was used in this project, provided by Rochester (4 conductor) and connected to a high-temperature cablehead provided by Calidus Engineering, also a HITI partner. Both cable and cablehead performed very well and now these instruments are considered to be ready for possible conditions in the first IDDP well at Krafla, currently being drilled.

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Figure 1. Natural gamma ray instrument with in-line centralisers being prepared for a demonstration run up to 300°C.

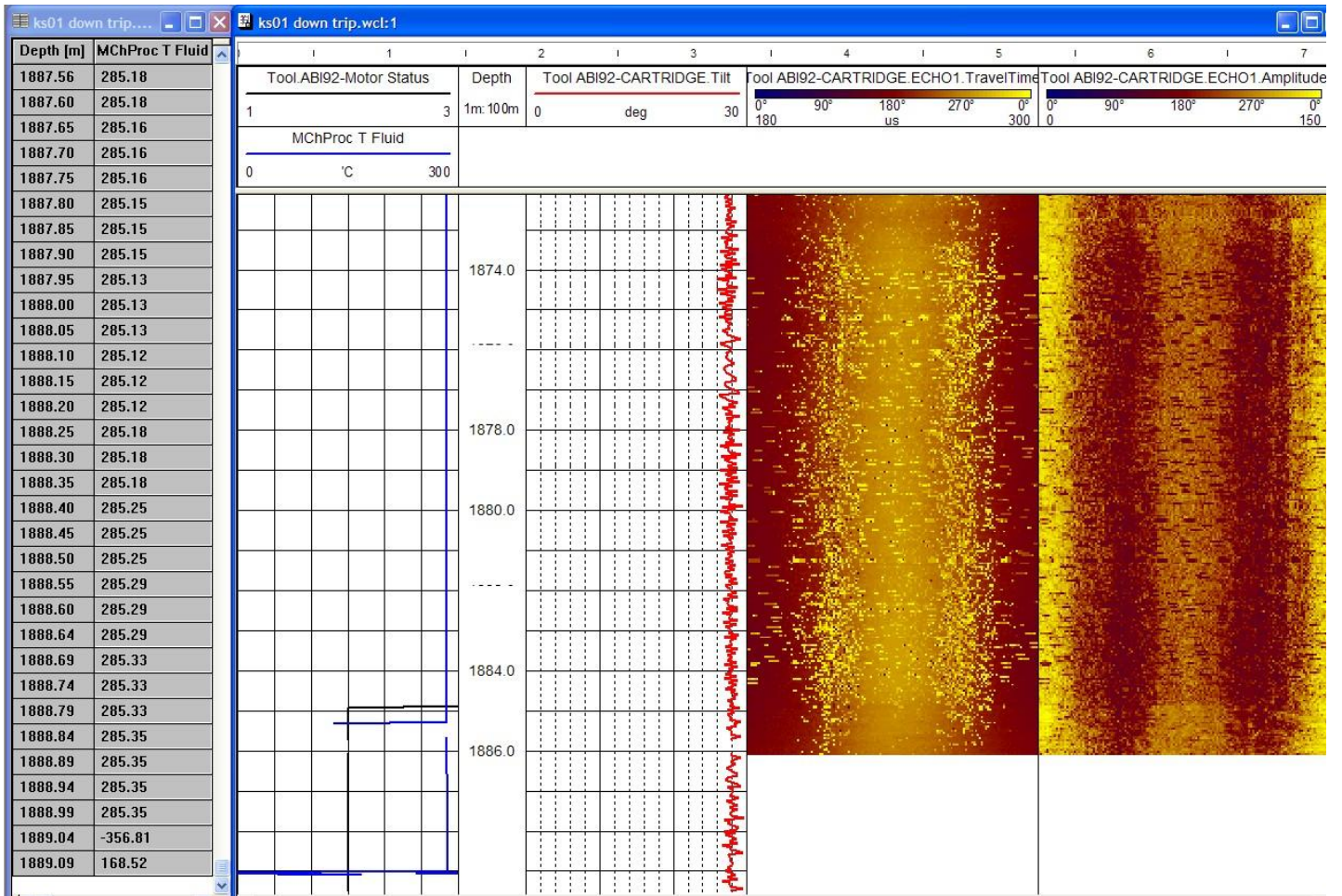


Figure 2. Highest temperature reached by the acoustic televiewer, 285°C at 1886m. The motor stops at the maximum temperature, but can be restarted at lower temperatures to continue measurements.

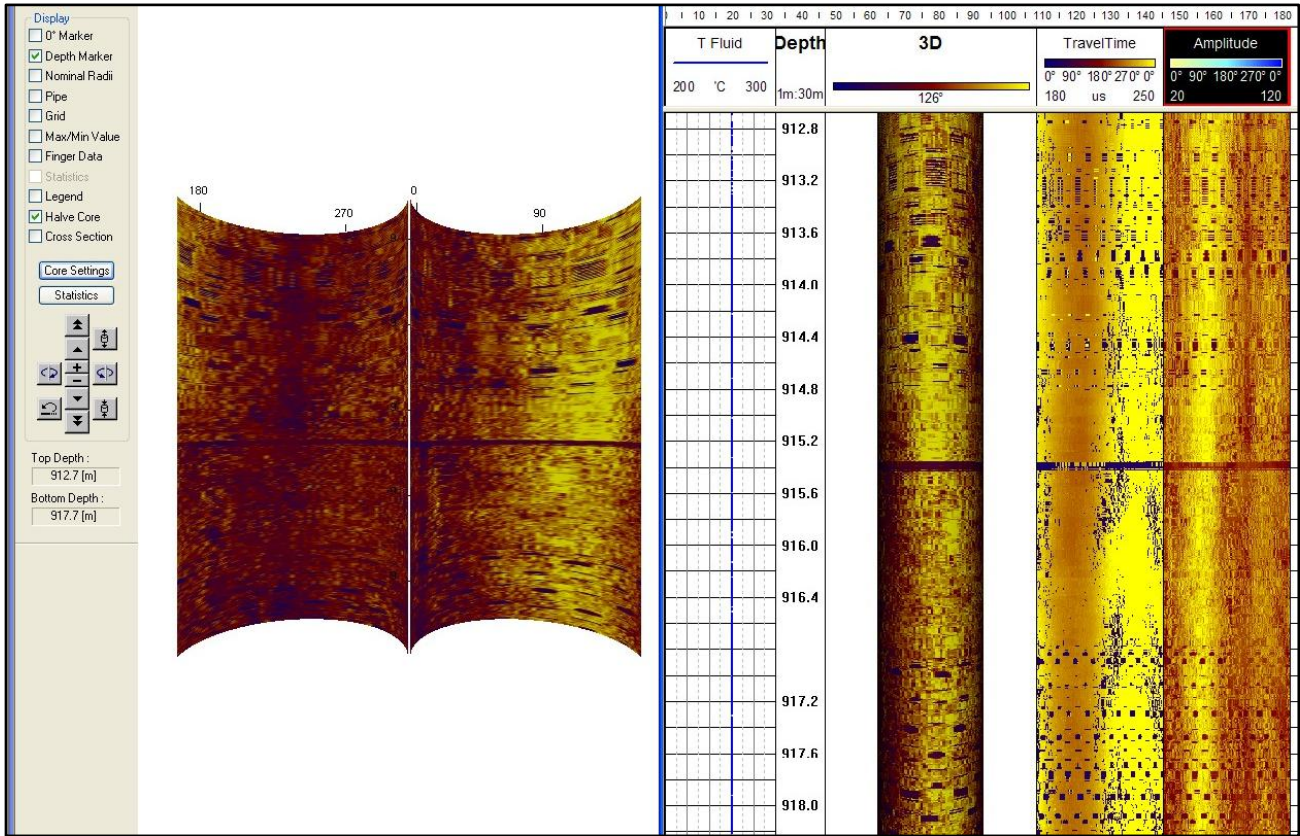


Figure 3. Liner perforations and joints are clearly visible.

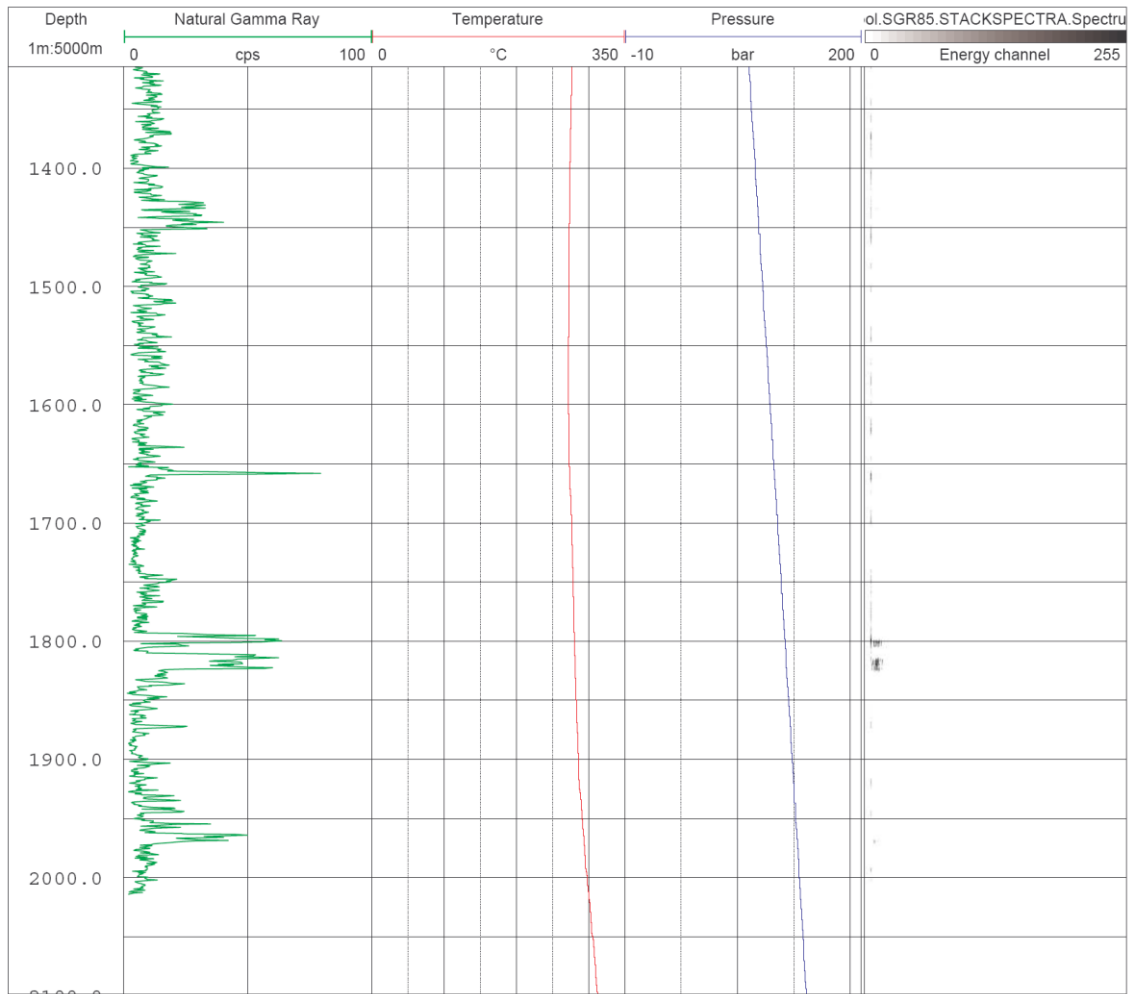


Figure 4. Natural gamma ray measurement performed up to 300°C at 146 bar (deviated well, KS-01 at the Krafla geothermal field)