Hydraulic tests carried out in two boreholes in the Bedretto Underground Laboratory for Geoenergies (BULG)

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Schweizer Kompetenzzentrum für Tiefengeothermie zur Strom- und Wärmeproduktion

ein Unternehmen von

DESTRESS

Demonstration of soft stimulation treatments of geothermal reservoirs

Two hydraulic test campaigns:

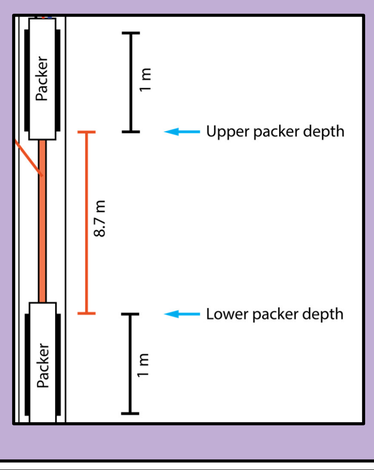
- October 2019 in CB1

  - 12 intervals tested in CB1 with a double packer system.

  - Tests: Static Pressure Recovery, Constant Rate Injection, Constant Rate Recovery & Constant Head Withdrawal.

  - The other available long boreholes at the time (CB2 and CB3) were kept shut-in

  - Pressure was monitored in CB2 and CB3 by ETH.



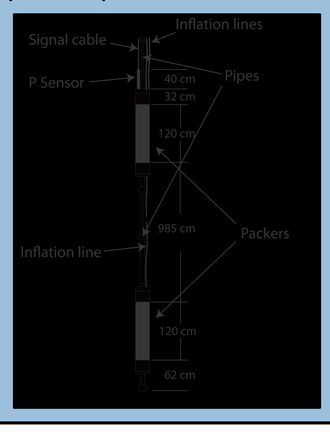
- September 2020 in ST2

  - 13 intervals tested on double or system packer configurations.

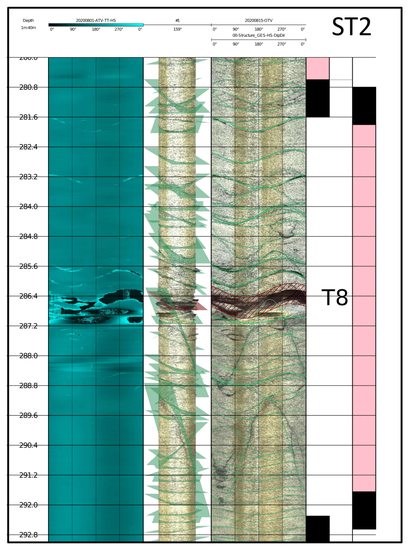
  - Tests: Static Pressure Recovery & Step-Rate Injection

  - ST1, ST2, CB1, CB3 and MB4: Uphole pressure monitored with piezometers in wellheads

  - CB2: Uphole pressure monitored in 7 intervals isolated by multi-packers.

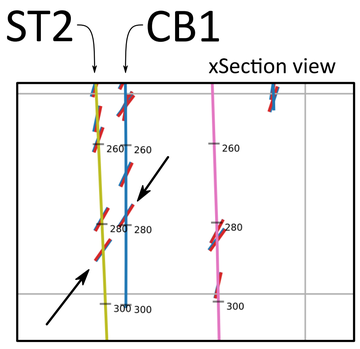


Structure & cross-borehole connetion

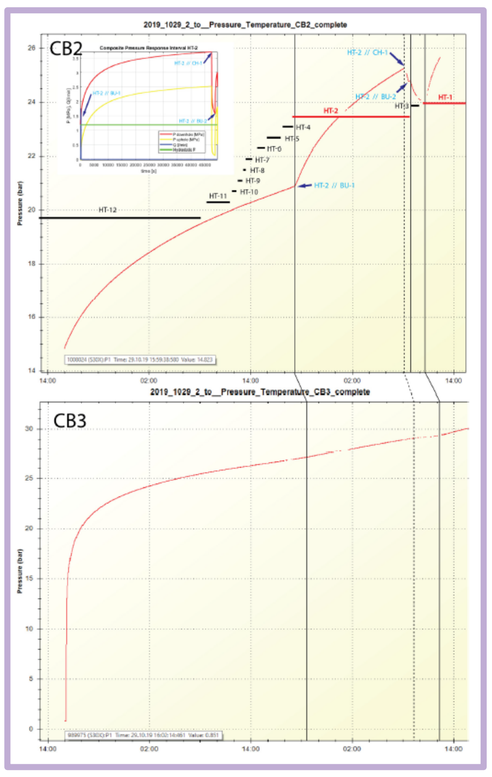


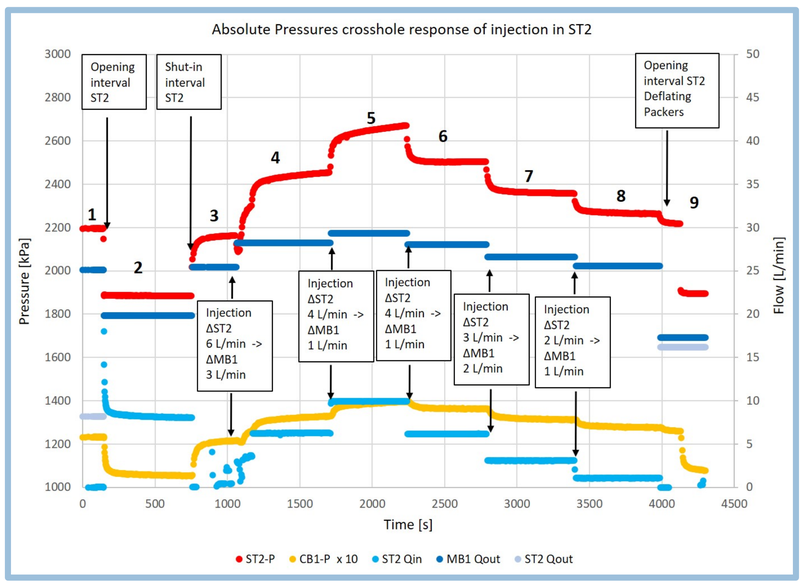
- A fault zone in present in both T8 and HT-12.

This fault zone is geometrically correlable between both boreholes



Cross-borehole connection

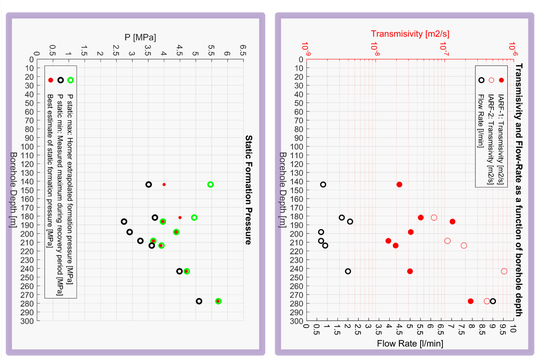


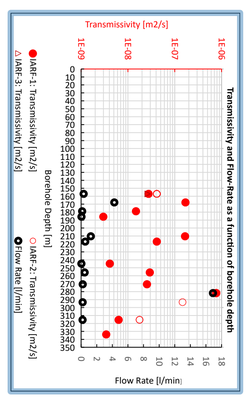


- CB1 tests: Observable response in CB2 and CB3 only for tests at intervals HT-1 and HT-2 (shallower tests).

- ST2 tests: Very high connectivity between the ST2 and CB1 through a structure at approx. 287m (ST2).

Results





- CB1 tests: Measured Flow rate and estimated Formation pressure and Transmissivity are higher in intervals HT-9 and HT-12

- ST2 tests: Measured Flow rate and estimated Transmissivity are the highest in interval T8.

- HT-12 (CB1) & T8 (ST2) are most probably connected through a fault zone.

Conclusions

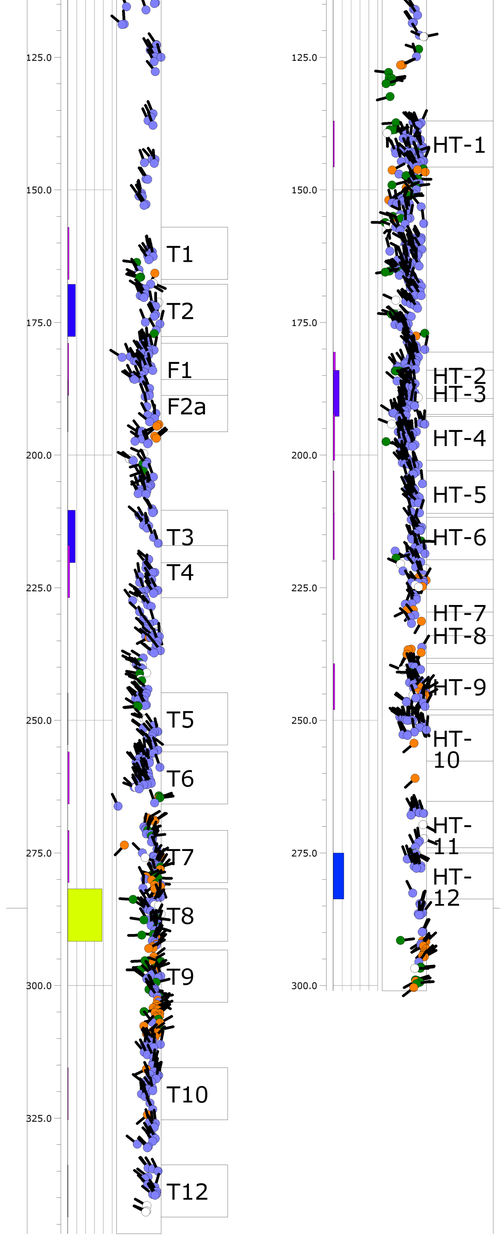
- Cross-borehole conection was observed between CB1, CB2 & CB3 and between ST2 & CB1.

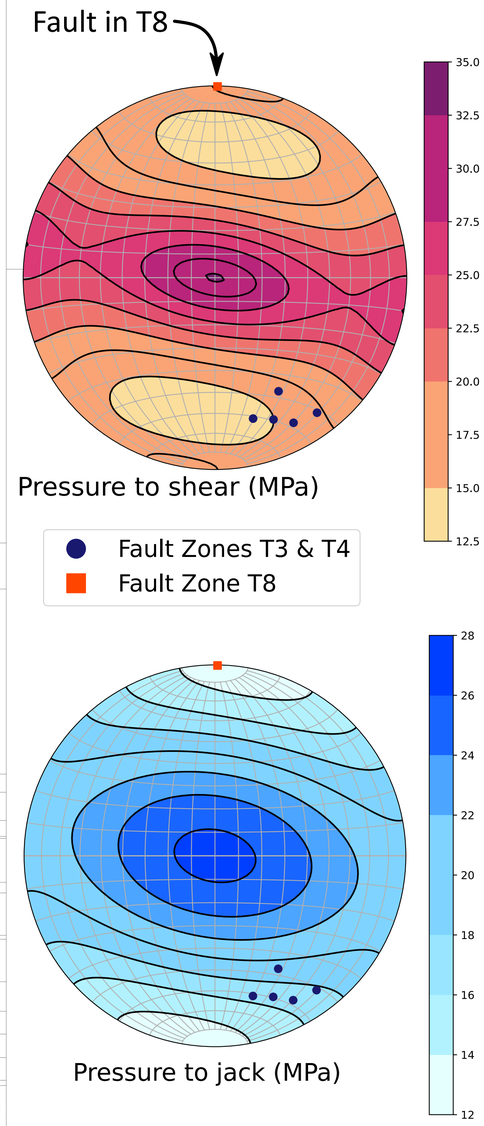
- This cross-borehole connection is not homogenous all along the borehole length but it is concentrated in very specific segments.

- The most efficient connection between ST2 & CB1 is most likely along a fault zone around 288m MD.

- Compared to other fault zones in the borehole, this structure has an orientation that is better suited to be reactivated by jacking.

Hydraulic Transmissivity, Structure & Stress





- The correlated Fault zone in T8 and HT-12 is oriented E-W in borehole ST2.

This orientation makes it more likely to be reactivated by jacking than the NE-SW orientation dominant elsewhere in the boreholes.