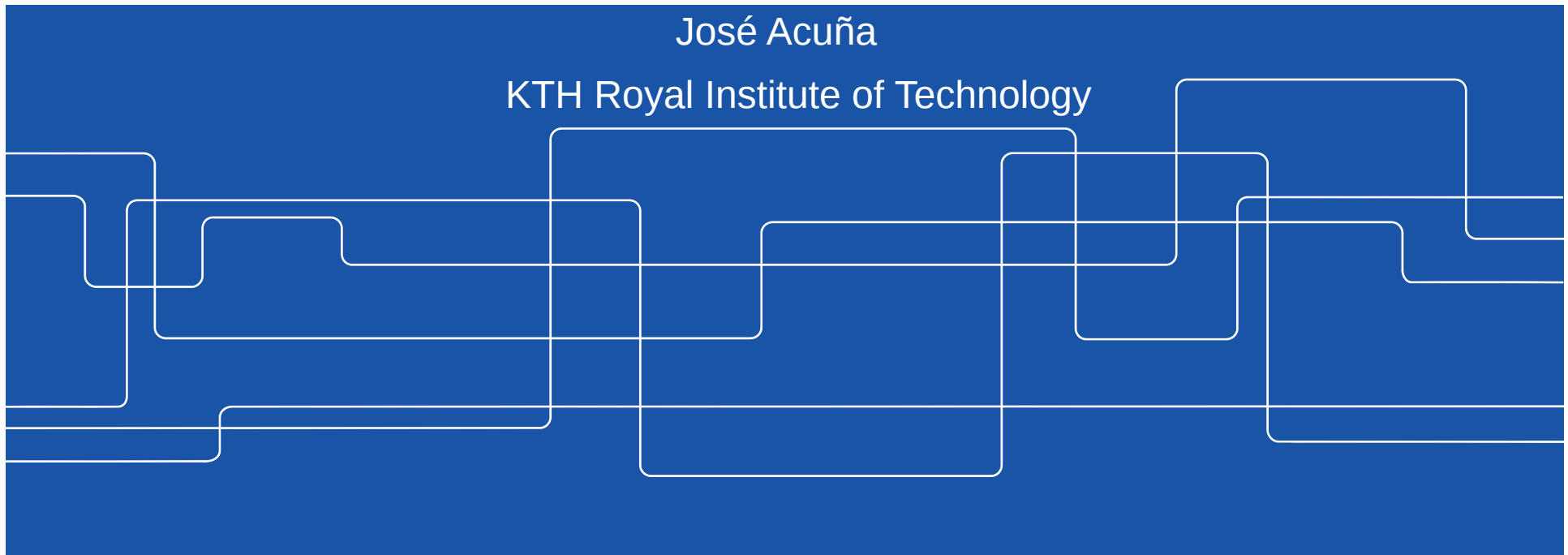




Design and Monitoring of borehole heat exchangers using distributed temperature measurements

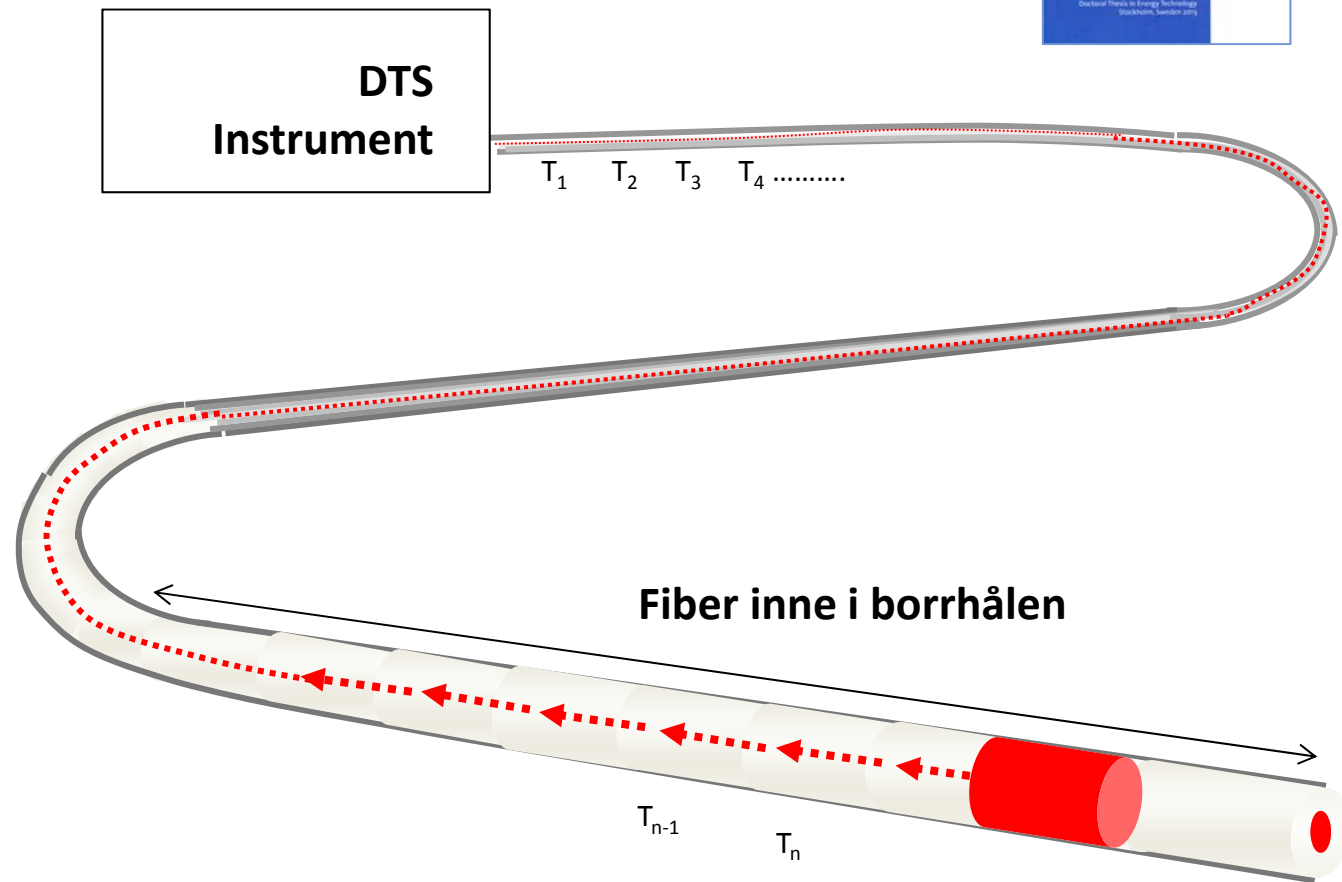
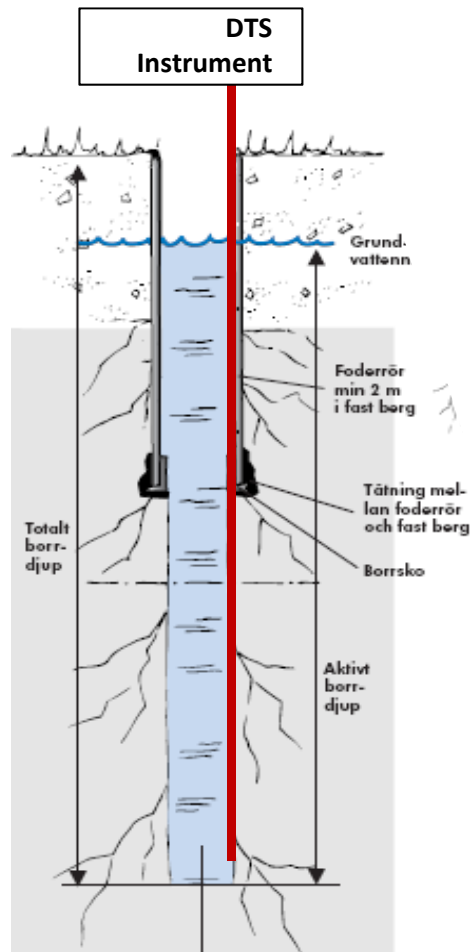
José Acuña

KTH Royal Institute of Technology

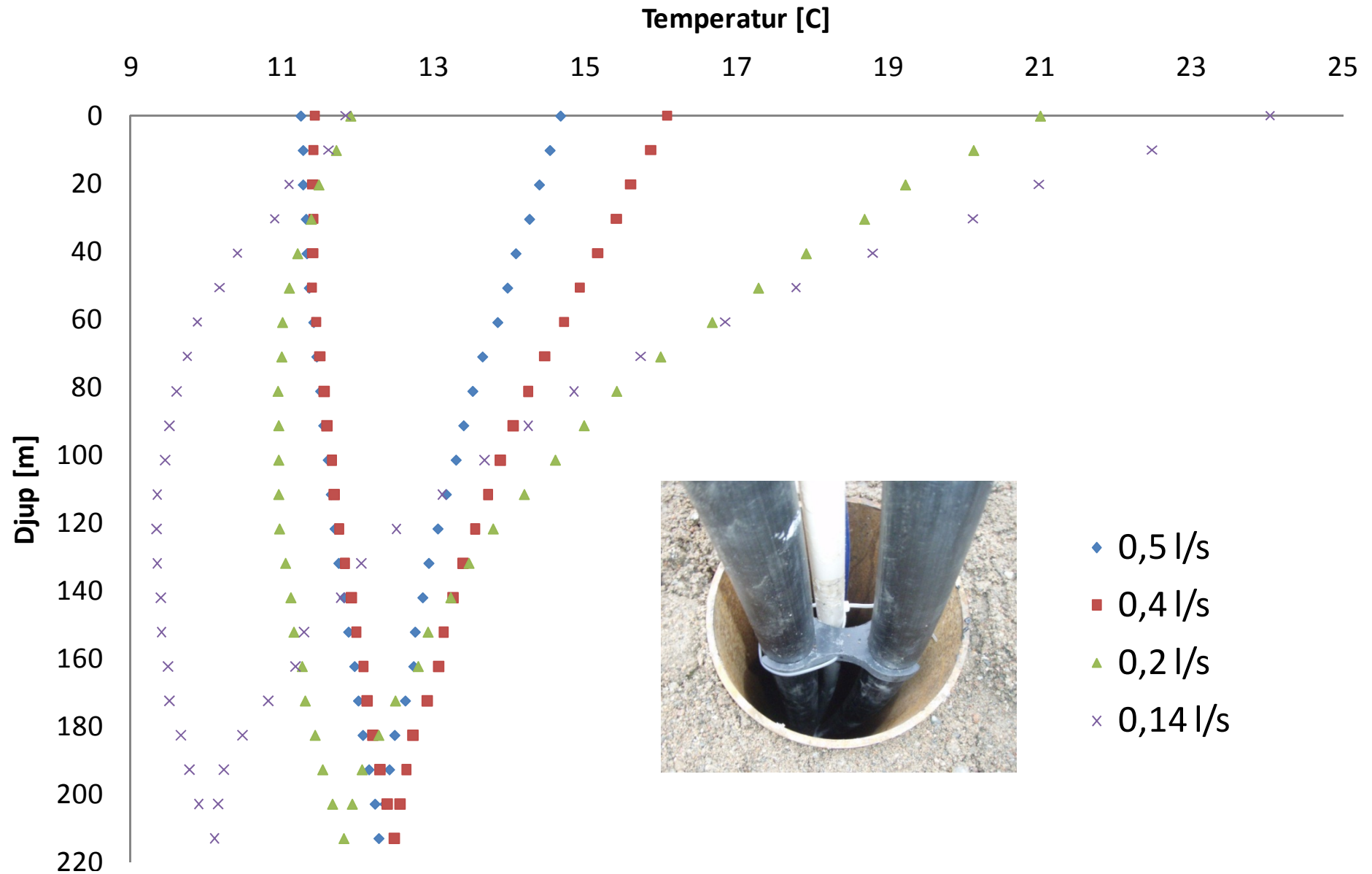




Distributed Temperature Sensing

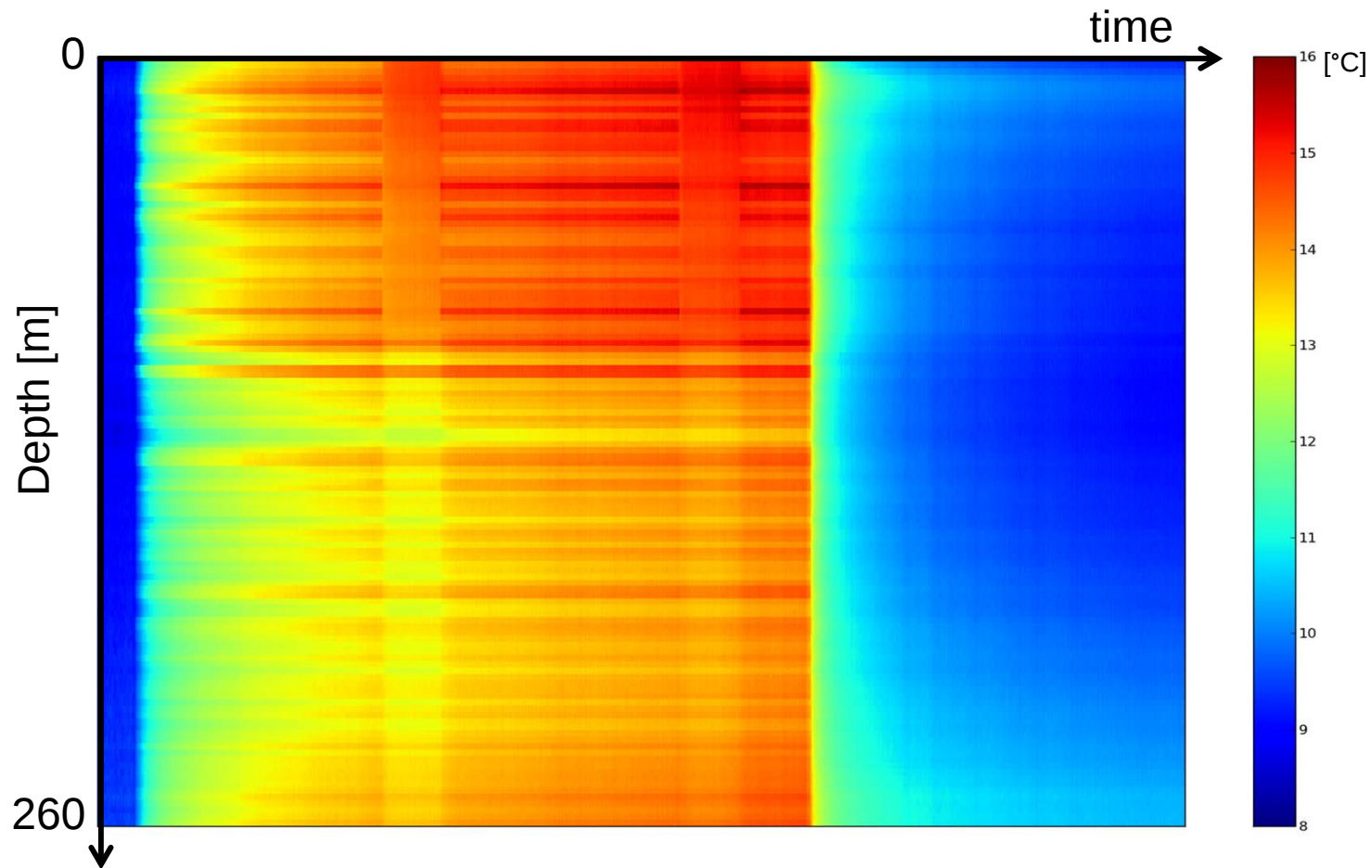


Measurement example: U-pipe BHEs



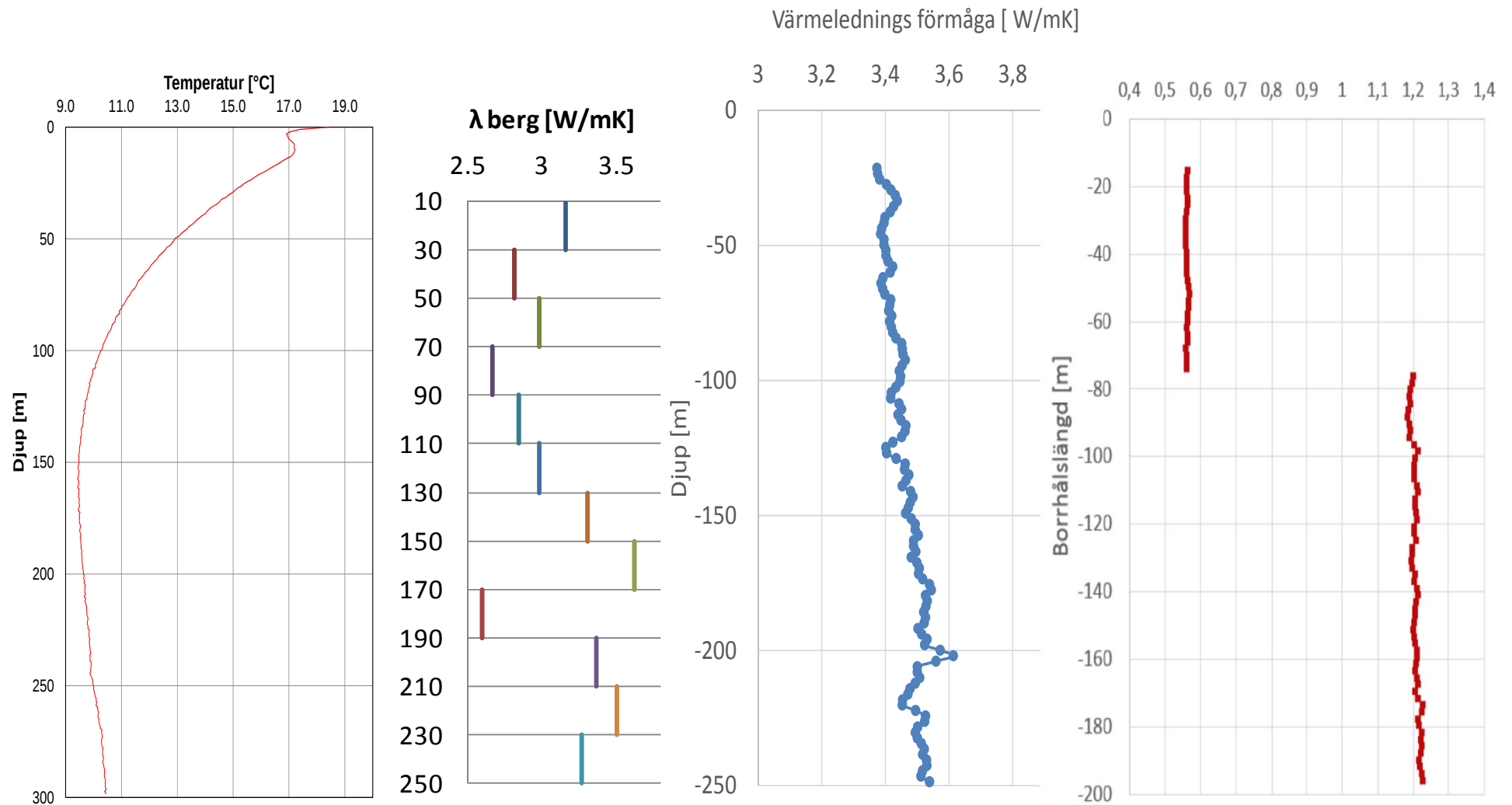


Measurement example: DTRT





Example of results from DTRT





Stockholms University

130 boreholes
230 m deep

Winter: 1400 kW
2,5 / 6,0 °C

Summer: 2500 kW
31 / 25 °C



Hesselmannska
stiftelsen



AKADEMISKA HUS

SKANSKA

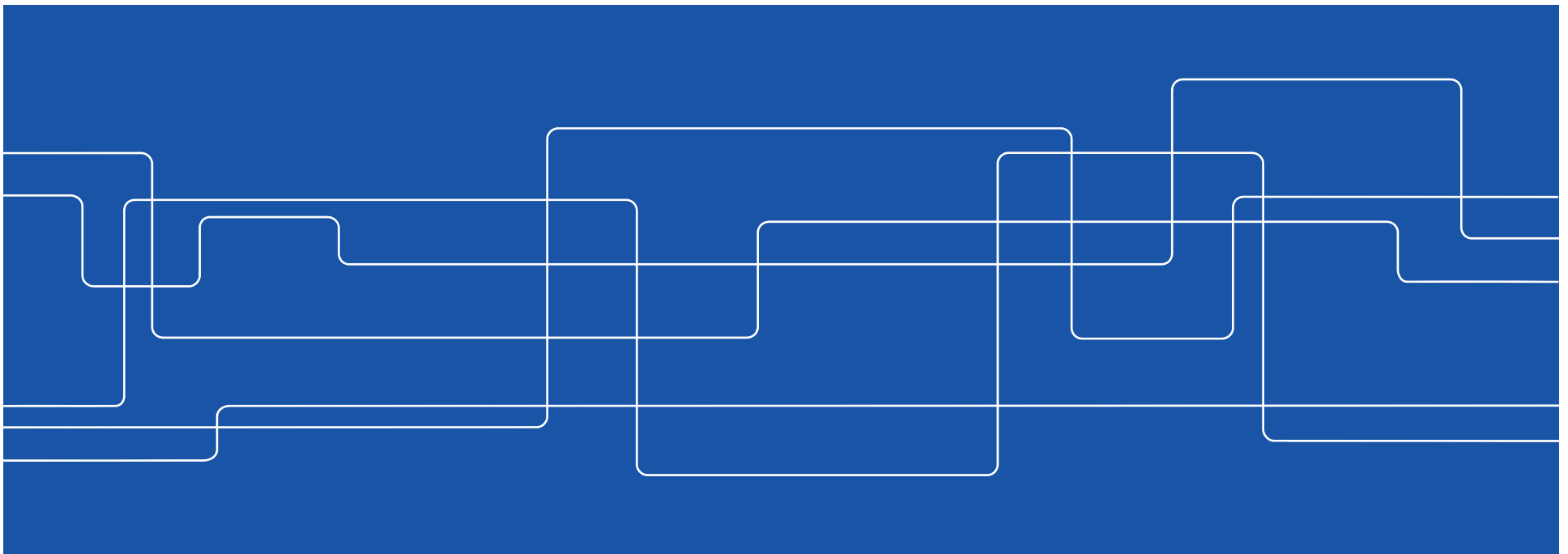


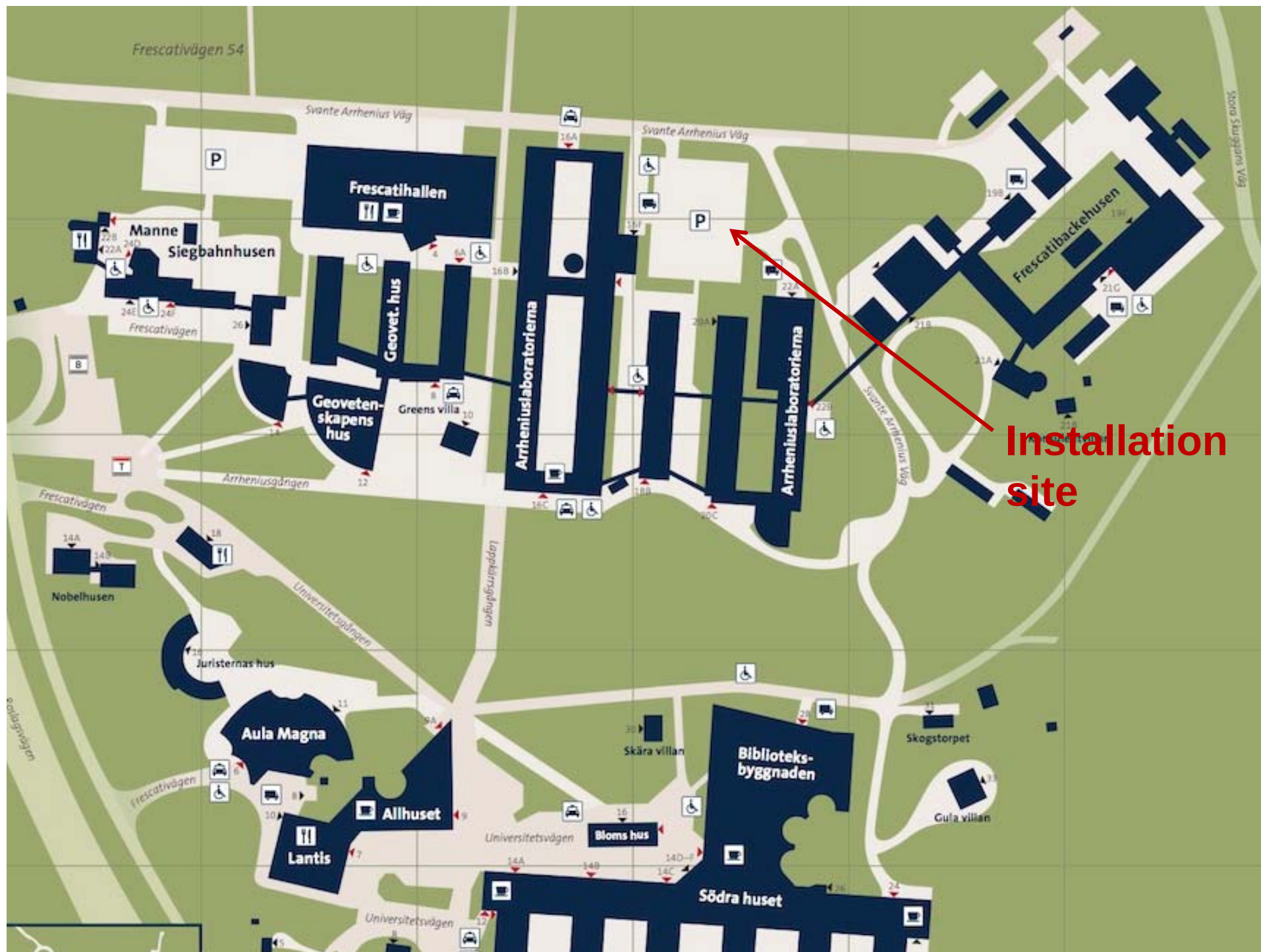
Stures
Brunnsbornningar AB



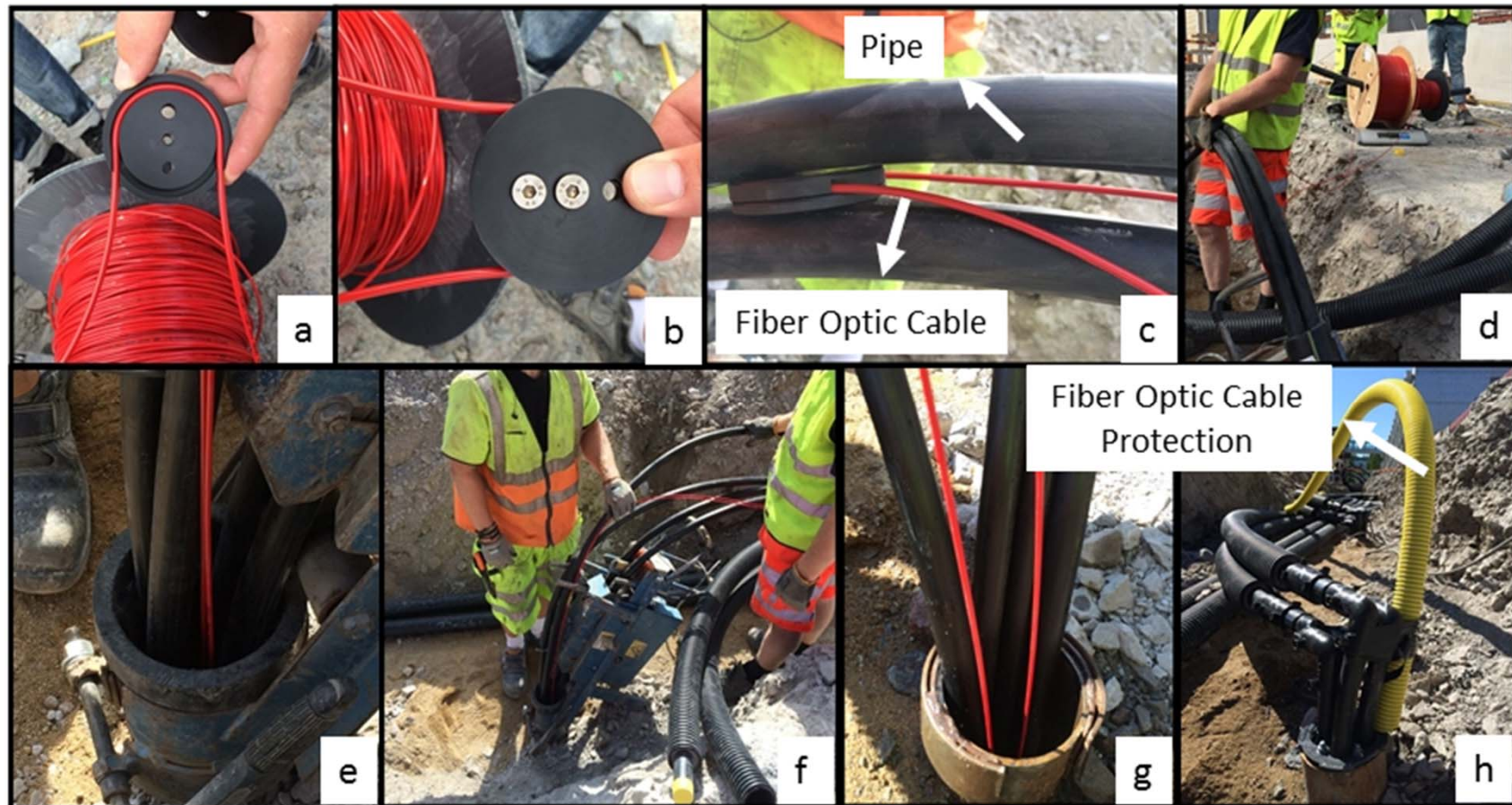


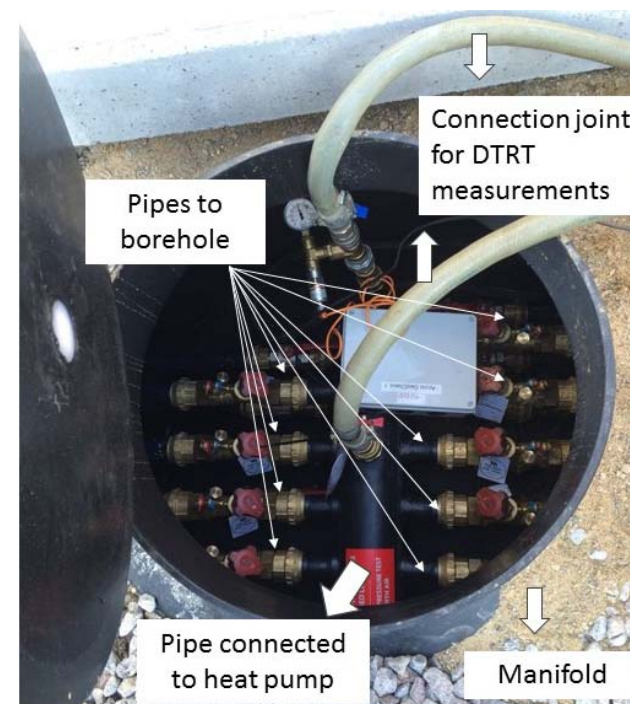
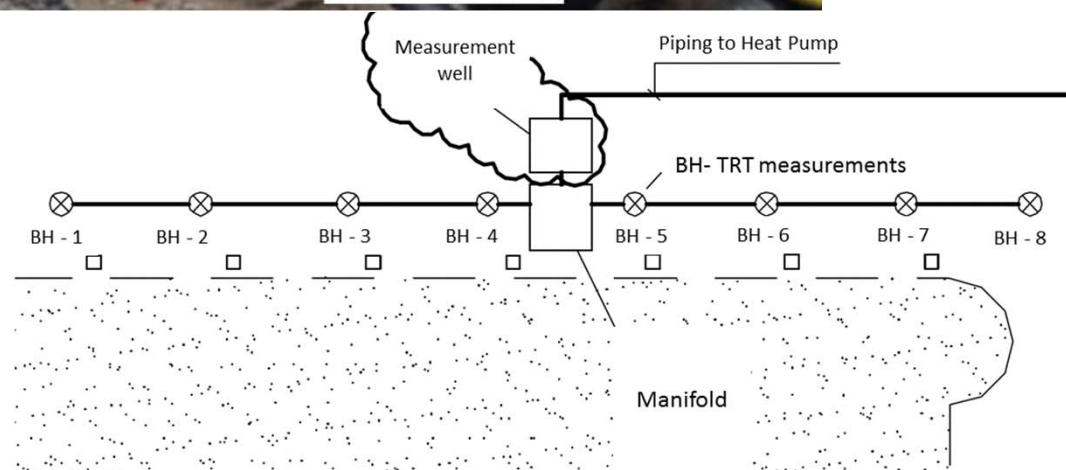
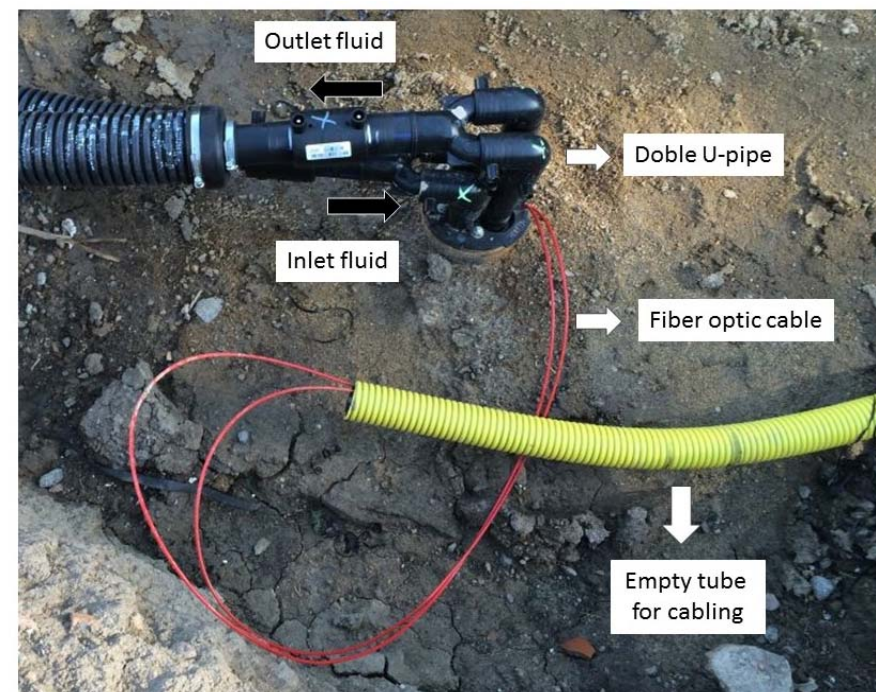
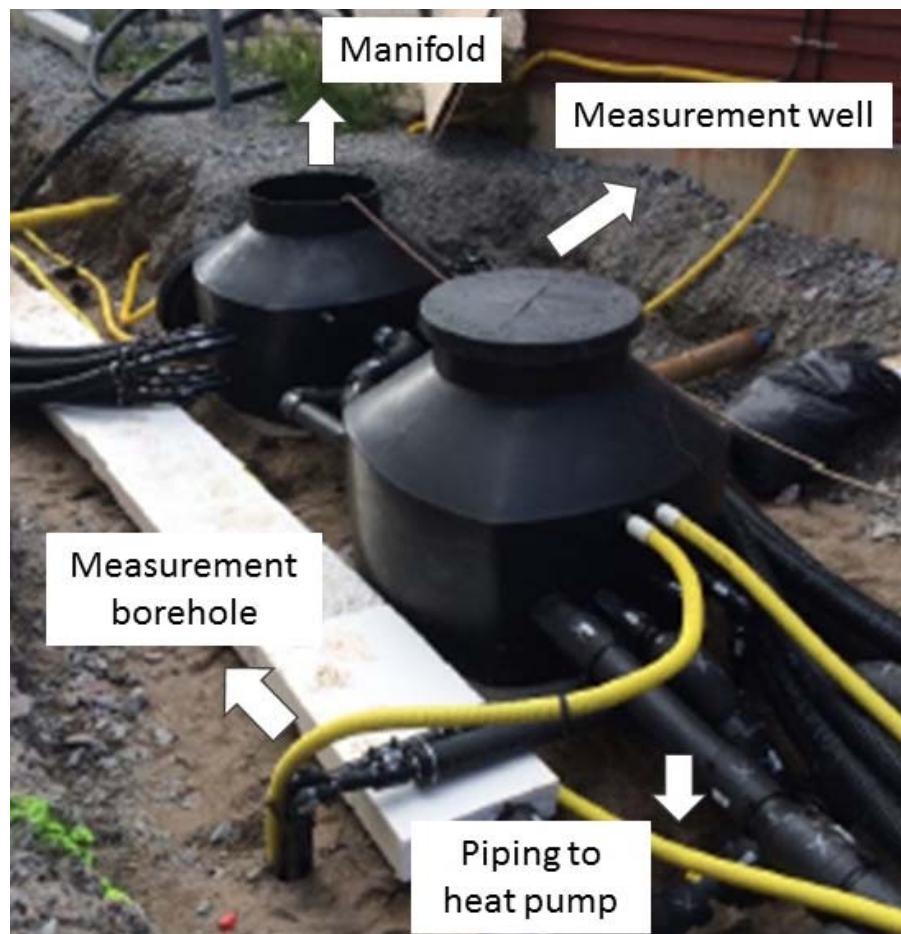
How to include DTS in design and monitoring of large bore fields ?

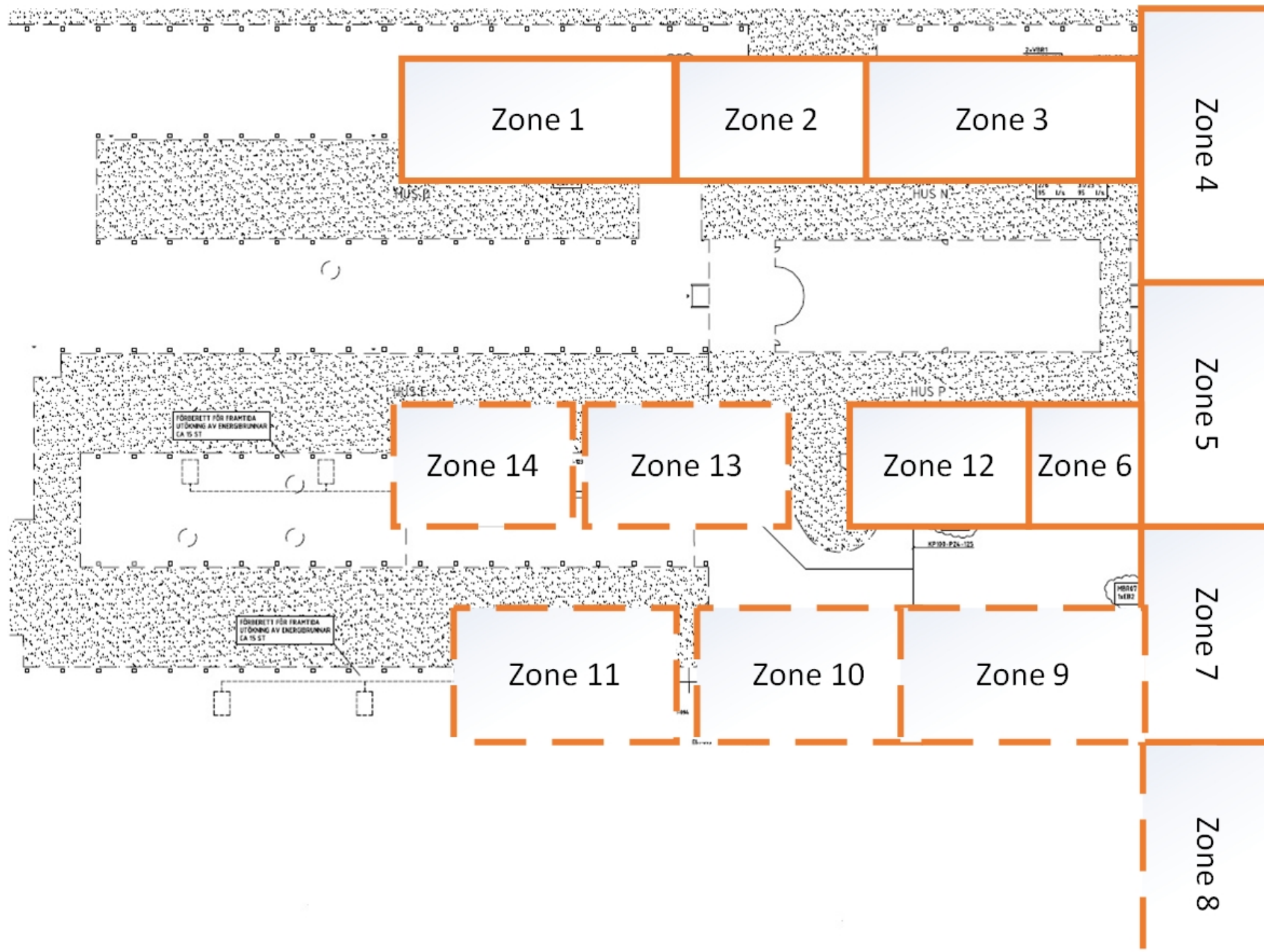




Optical fiber cables outside the BHE pipes

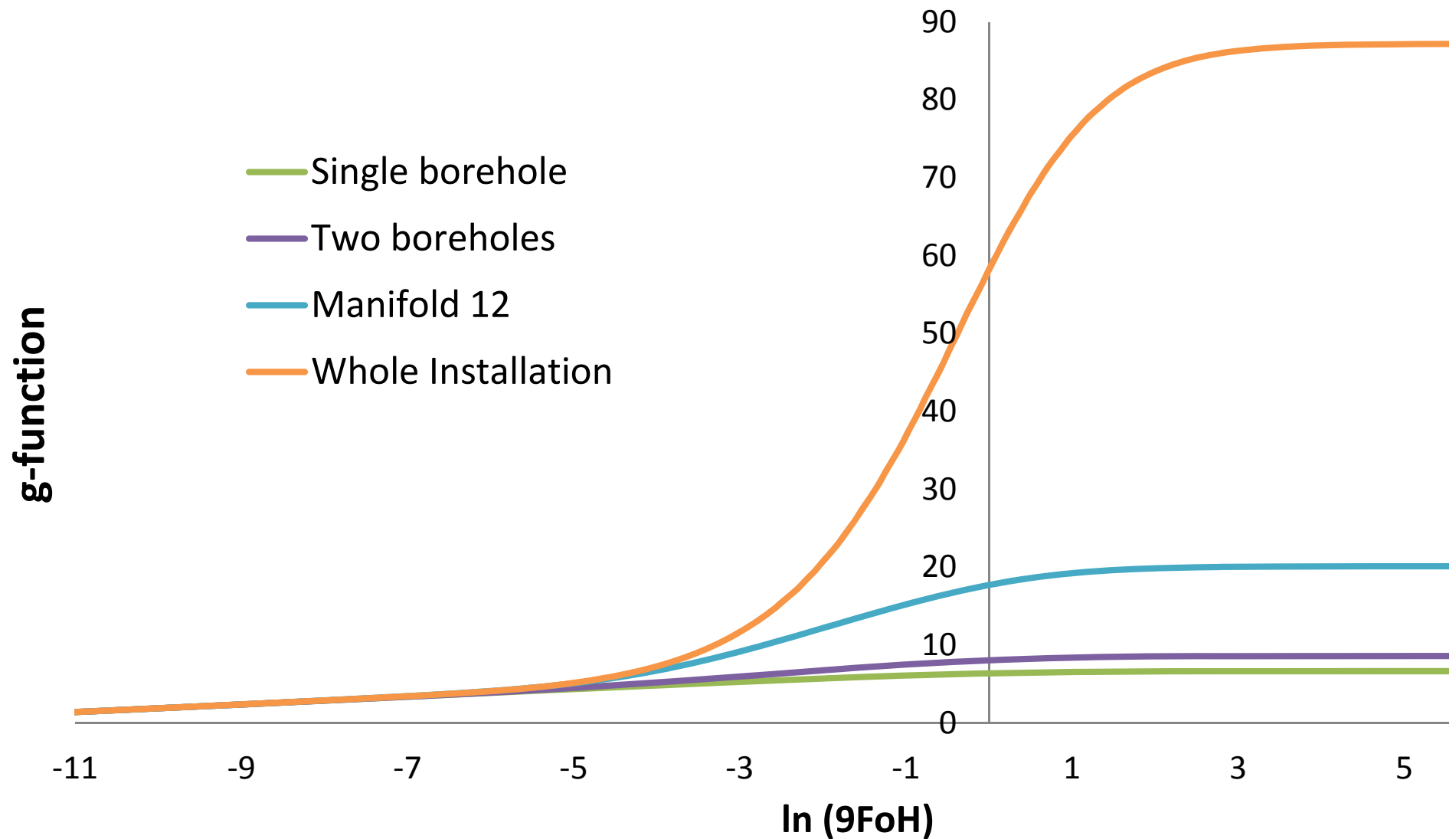






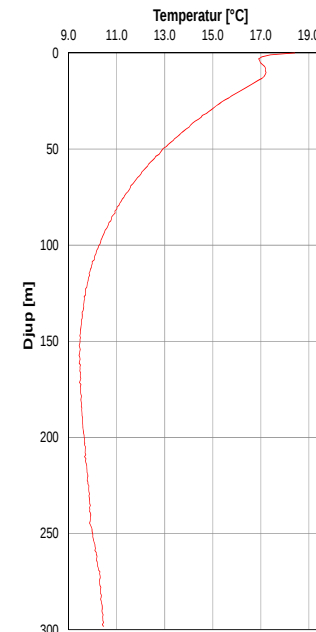
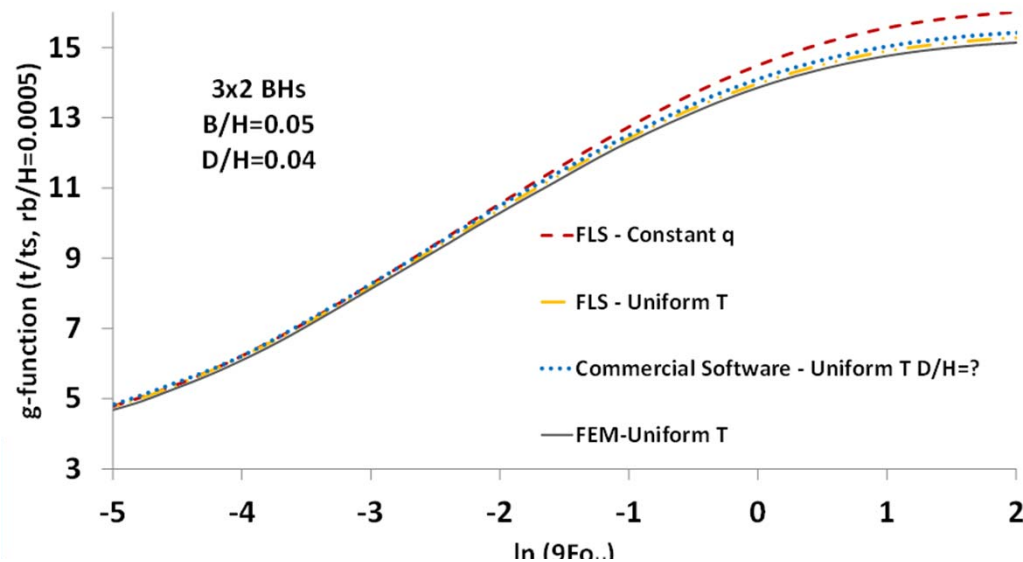
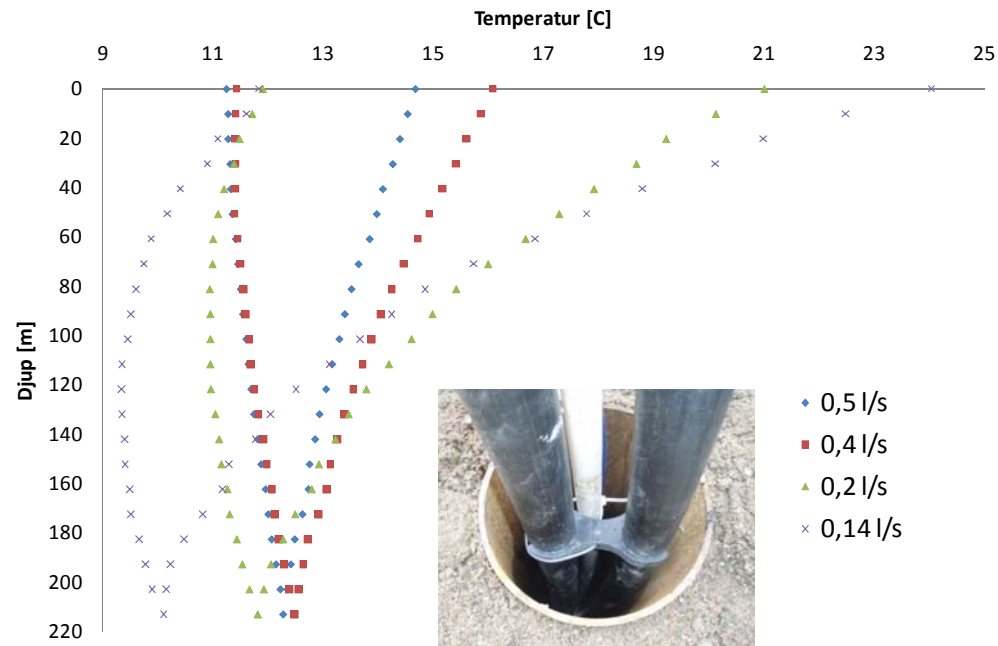


Some g-functions in zone 12

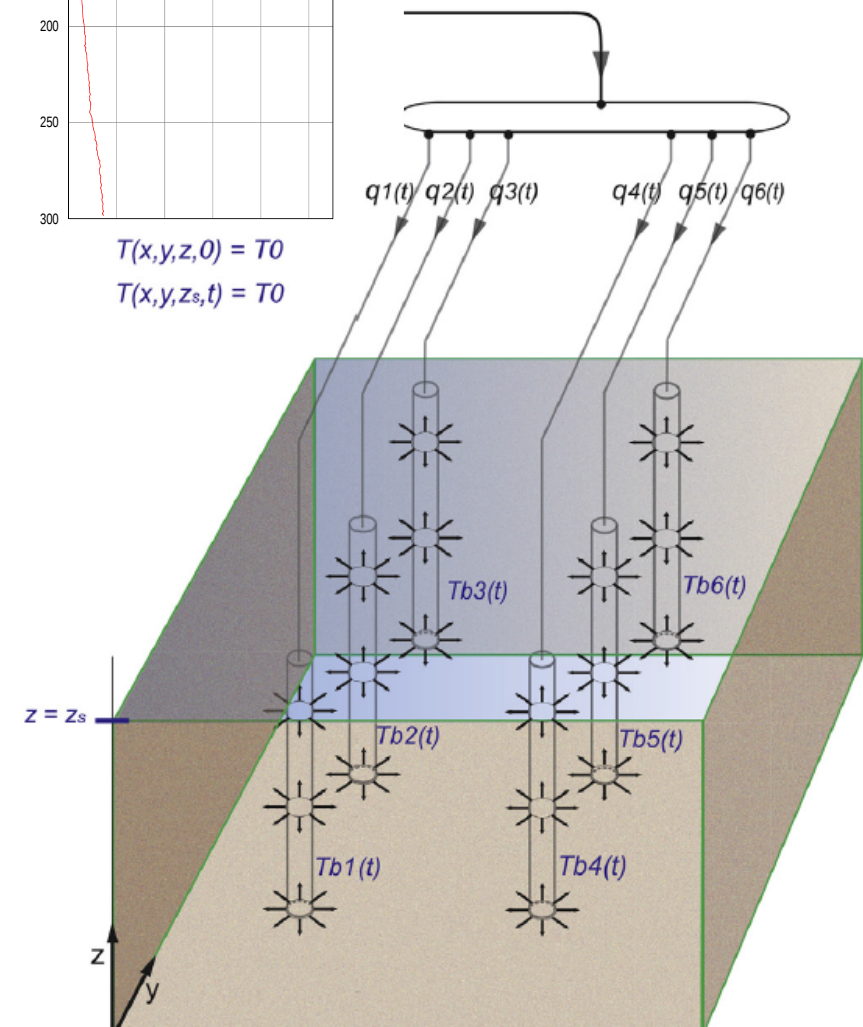




Theory and practice



Measured data vs. models by Patricia Monzó and Alberto Lazzarotto





First DTRT: Frescati

Preliminary results

Section	From [m]	To [m]	k [W/m/K]
1	10	25	2.81
2	25	40	2.57
3	40	55	2.61
4	55	70	2.62
5	70	85	2.18
6	85	100	2.47
7	100	115	2.33
8	115	130	2.38
9	130	145	2.61
10	145	160	2.30
11	160	175	2.63
12	175	190	2.50





KTH team: FRESCATI PROJECT

KTH energiteknik

KTH byggnadsteknik

KTHs team:

Patricia Monzó, doktorand

Davide Rolando, researcher

Alberto Lazarotto, doktorand ([PhD tomorrow !!](#))

José Acuña, researcher

Prof. Björn Palm

Prof. Folke Björk



An example from USA

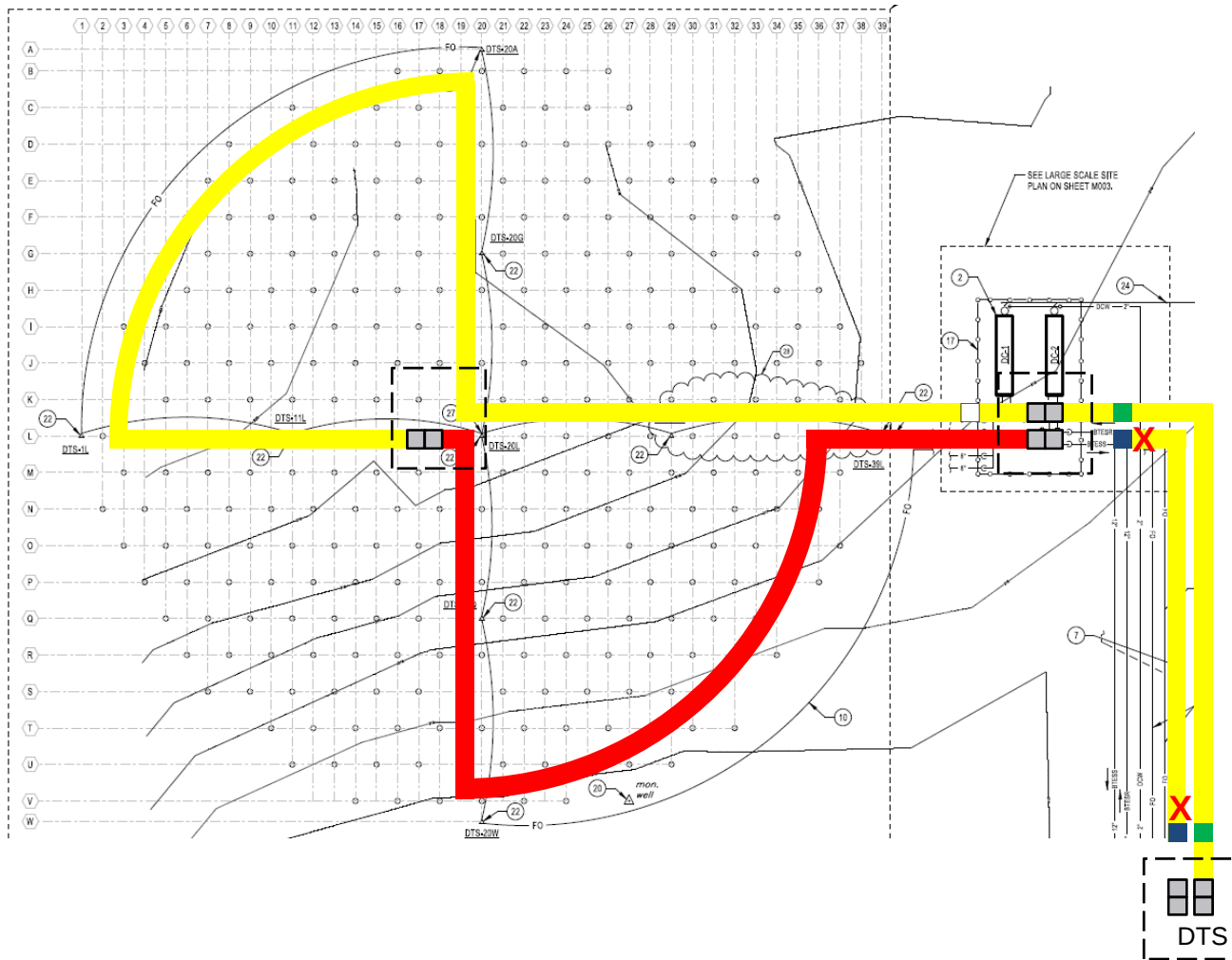


Borehole Thermal Energy Storage (BTES)

- Albany, GA
- BTES
- 306 boreholes
- About 64 m deep



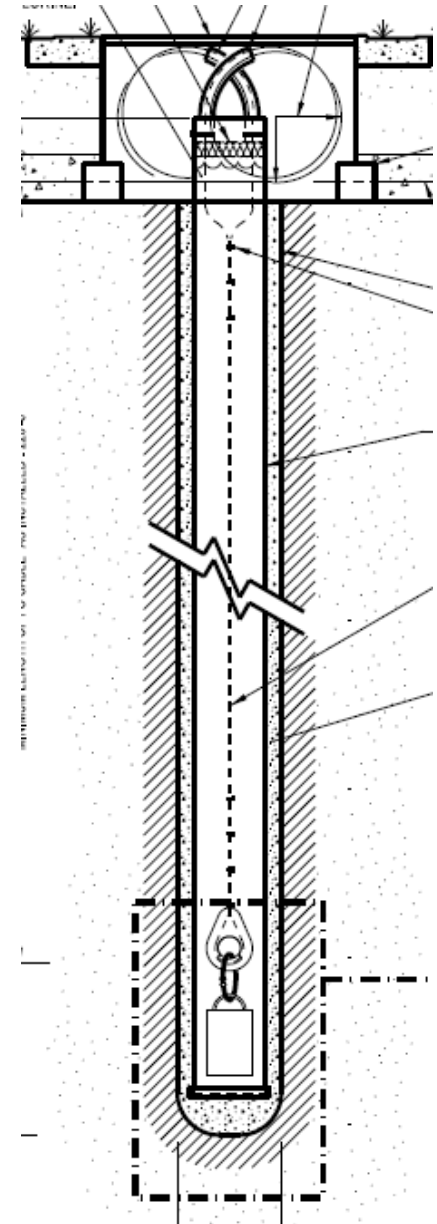
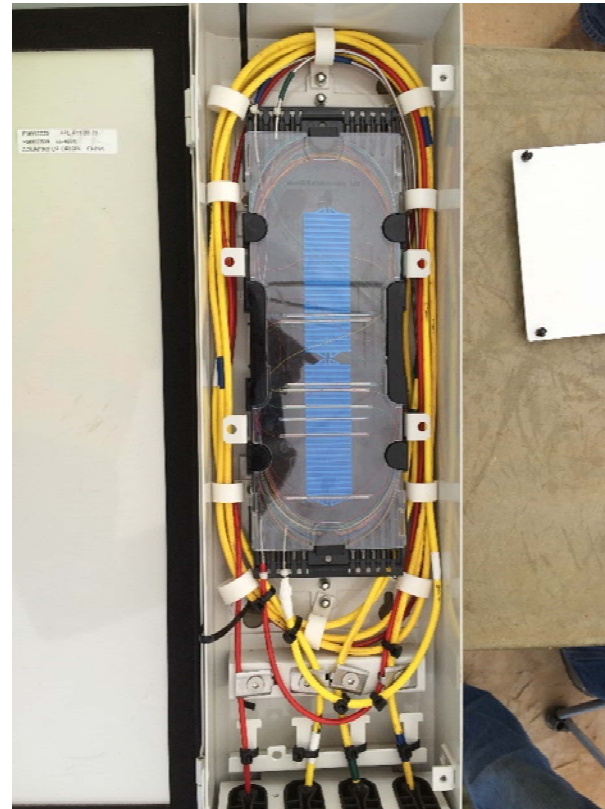
DTS at the BTES





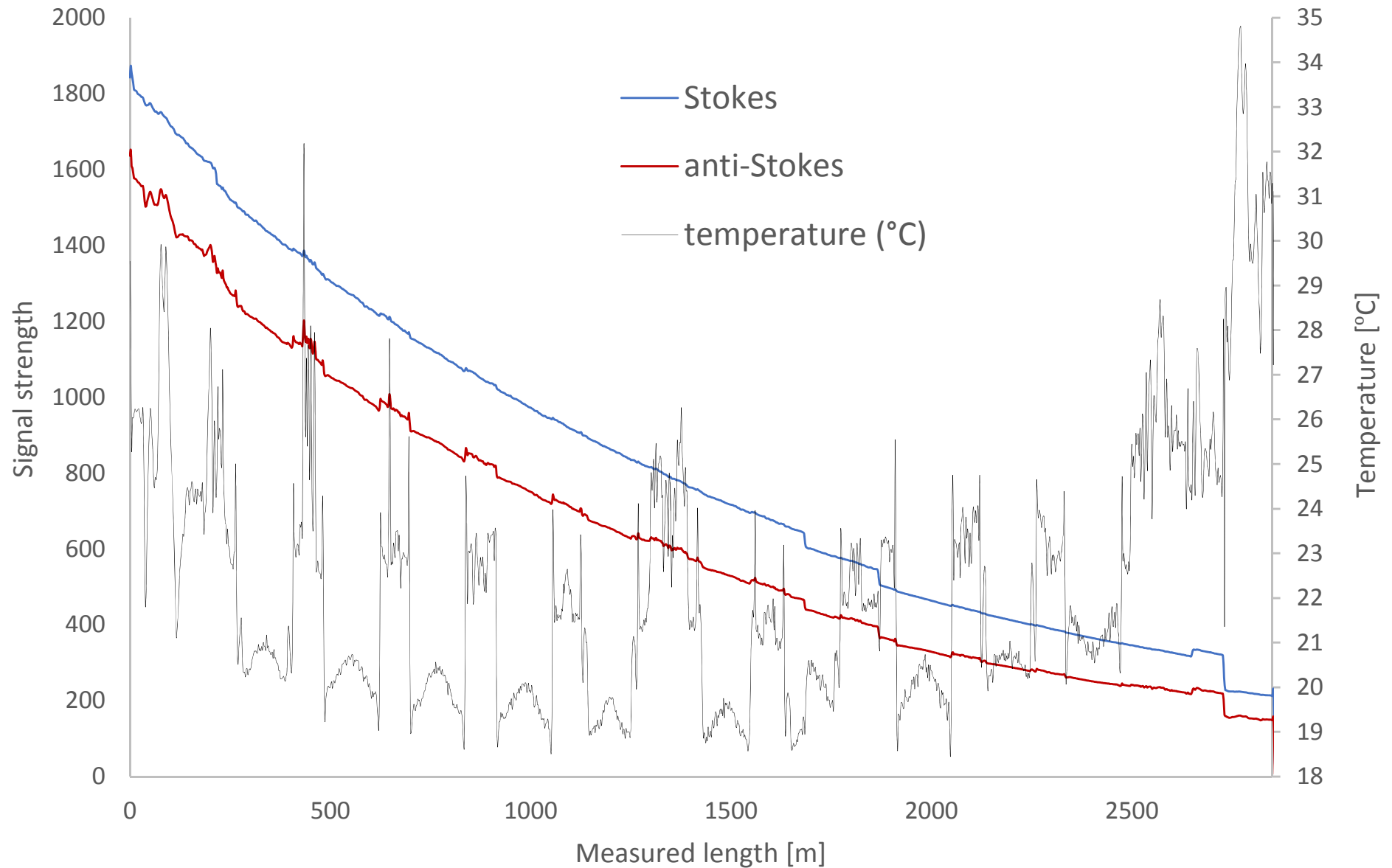


Monitoring borehole, splice box





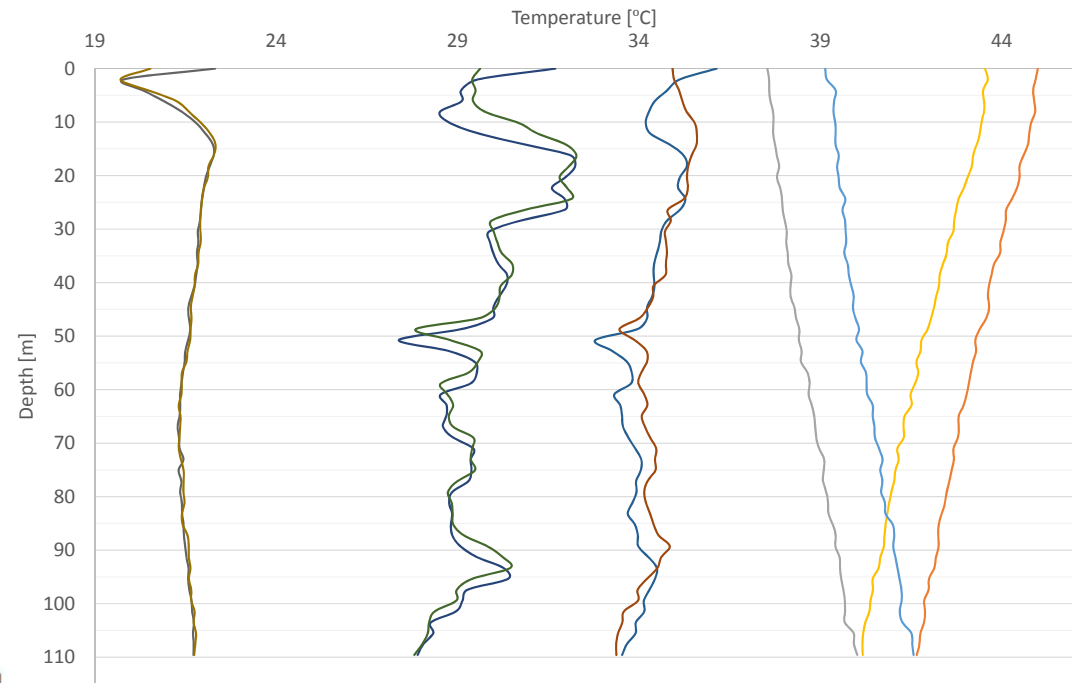
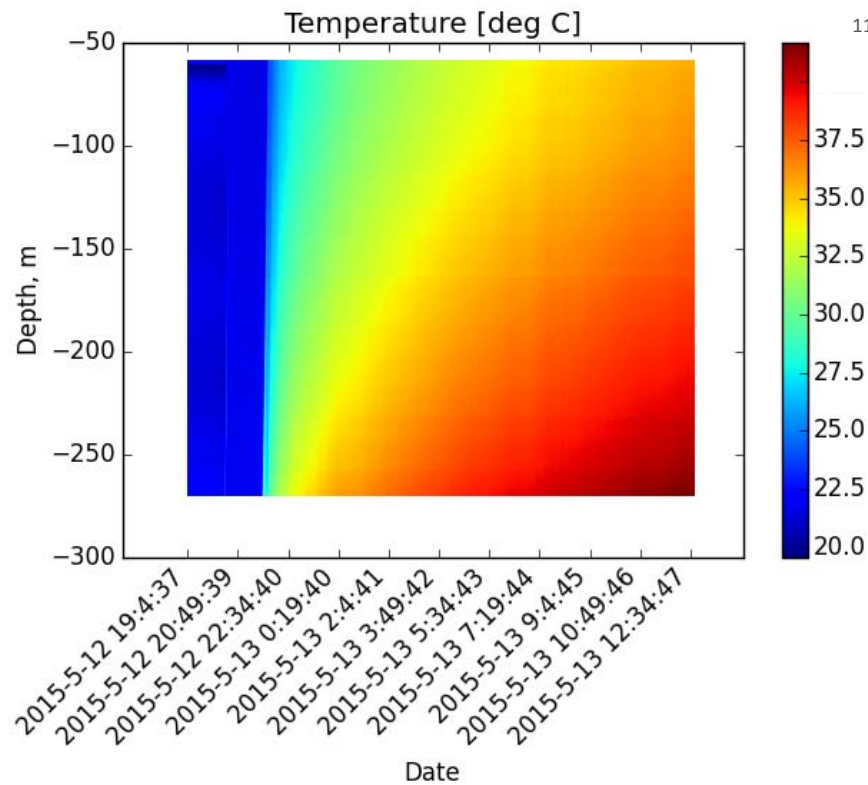
First DTS measurement (raw data)





DTRT

A DTRT has been recently carried out in order to get a better insight about the geology





TACK!

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