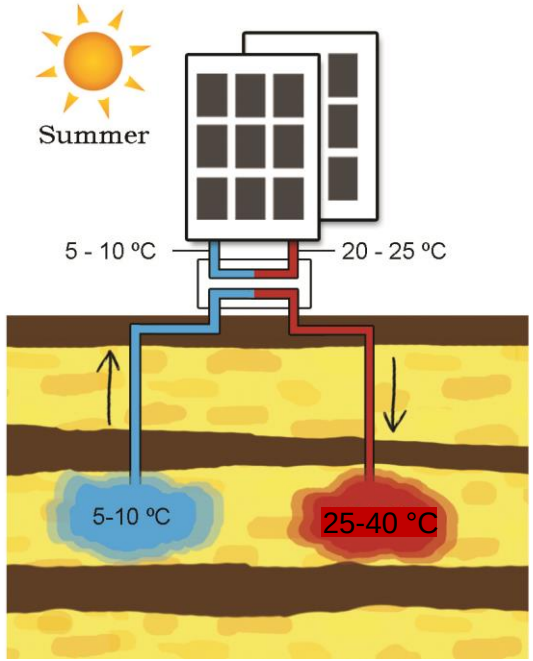
(HT-)ATES system of Koppert-Cress

Dr. Martin Bloemendal
26-02-2021



Koppert-Cress (KC) pilot

KOPPERT CRESS
Architecture Aromatique

Adji Cress

Smaak	Pittig, zuur
Gebruik	Frisse gerechten, guacamole, zeebaars
Teelt	Maatschappelijk verantwoorde teelt met biologische gewasbescherming
Beschikbaarheid	Jaarrond
Houdbaarheid	Tot zeven dagen bij 2-7°C

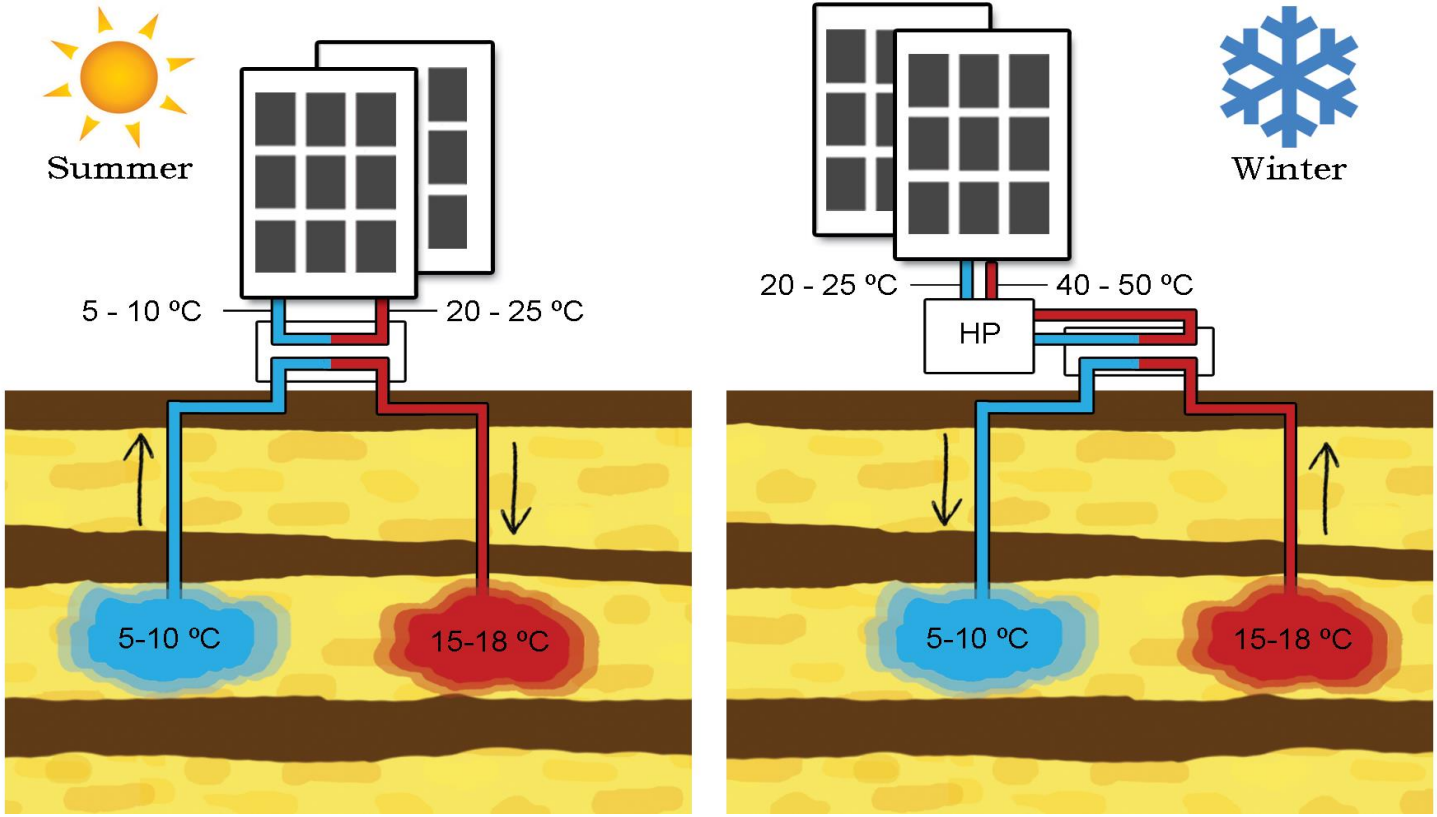
Adji Cress *(Zanthoxylum)*

Oorsprong
Adji Cress is een gewas dat zijn oorsprong vindt in het Verre Oosten, met name Japan, Zuid Korea en China. In Japan is het van oudsher een delicatesse in combinatie met vette vis.

Beschikbaarheid en houdbaarheid
Adji Cress is jaarrond verkrijgbaar en kan tot zeven dagen bewaard worden tussen 2°C en 7°C.

De optimale temperatuur, waarbij de kwaliteit het best

ATES



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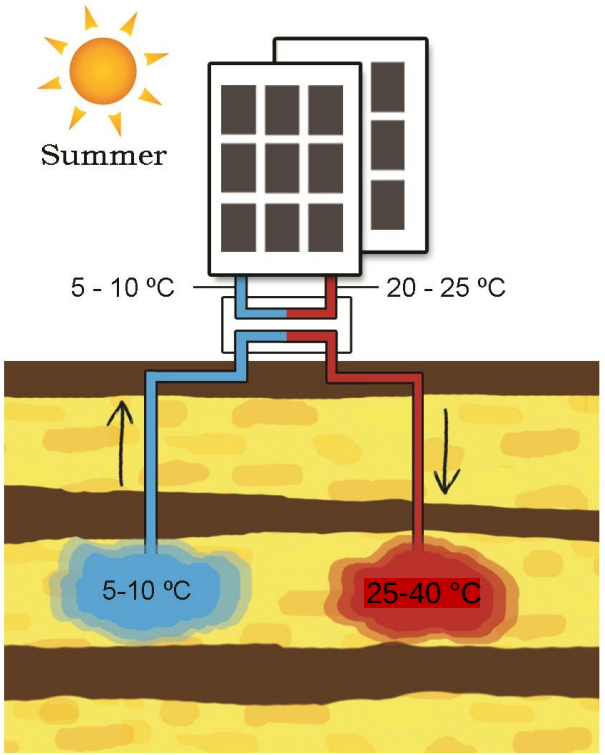
Koppert-Cress: HT-ATES pilot

- >25°C
- Permitted
  as “pilot-project”
- max 40°C
- Goal: Performance &
  monitor impact



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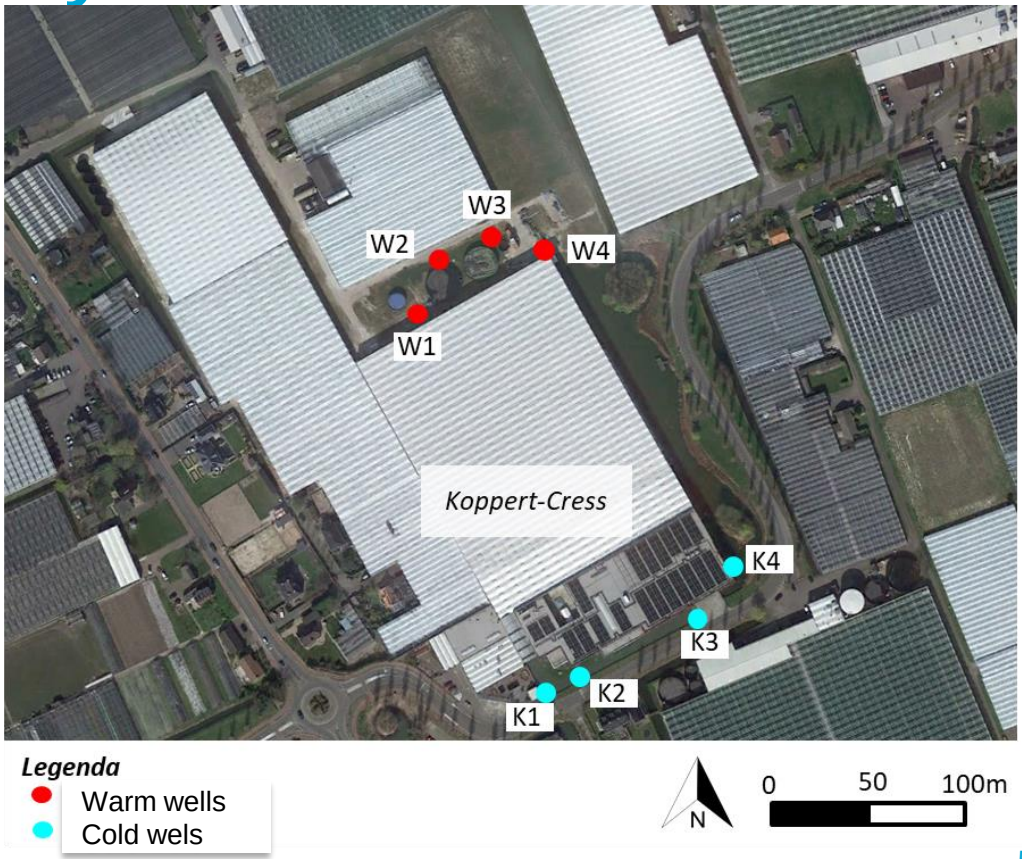
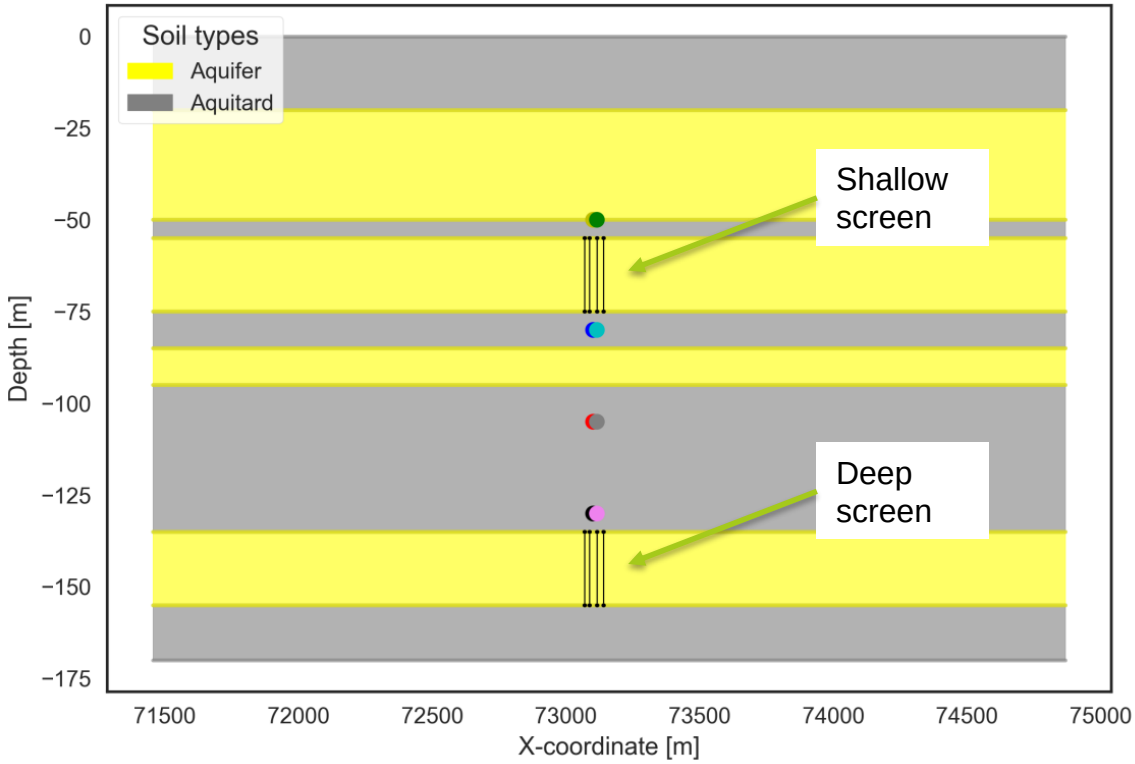
The ATES system of KC



The ATES system of KC



The transition to HT-ATES

- Heating demand > Cooling demand
  - System not in balance
- Add extra (HT) heat
- Transition: storage temperature increases after 2015

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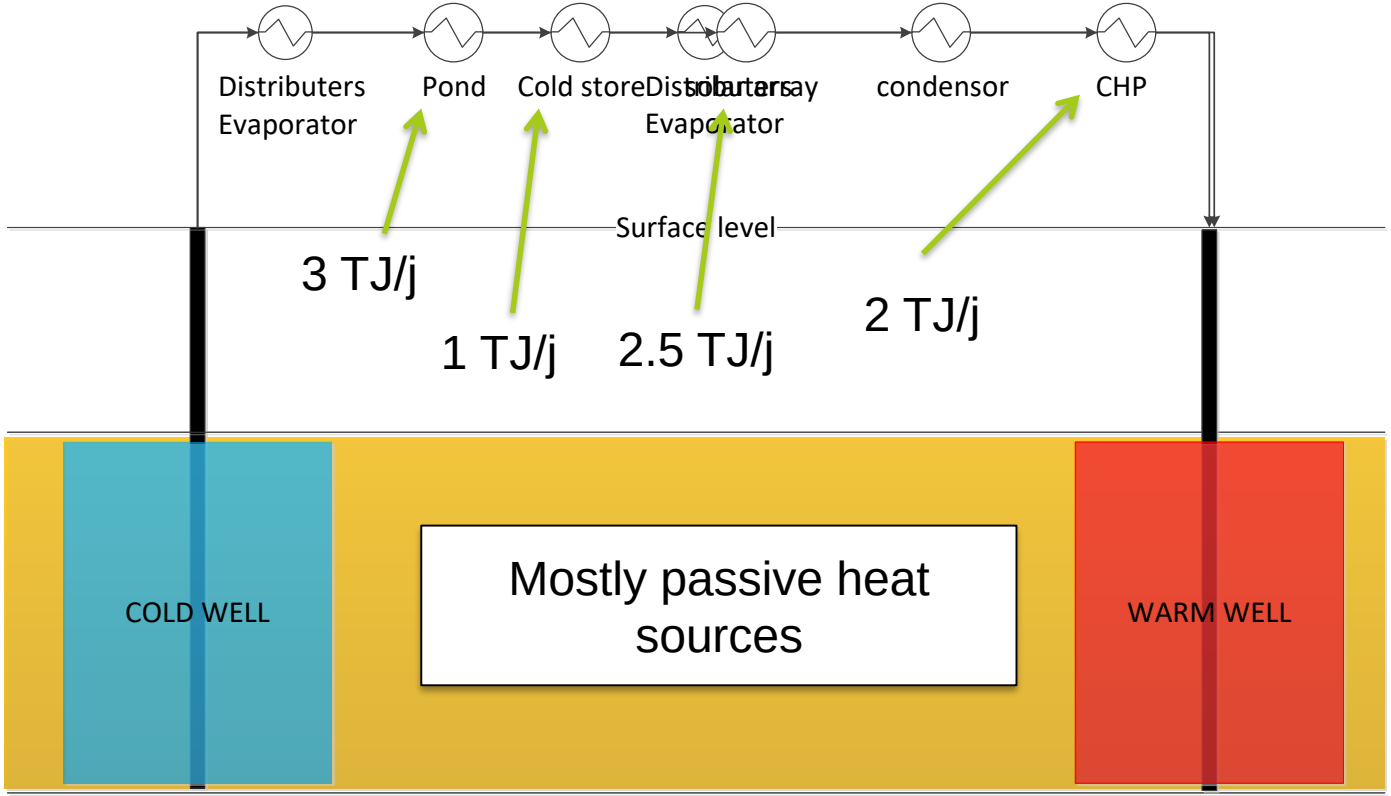
Extra heat and higher temperature



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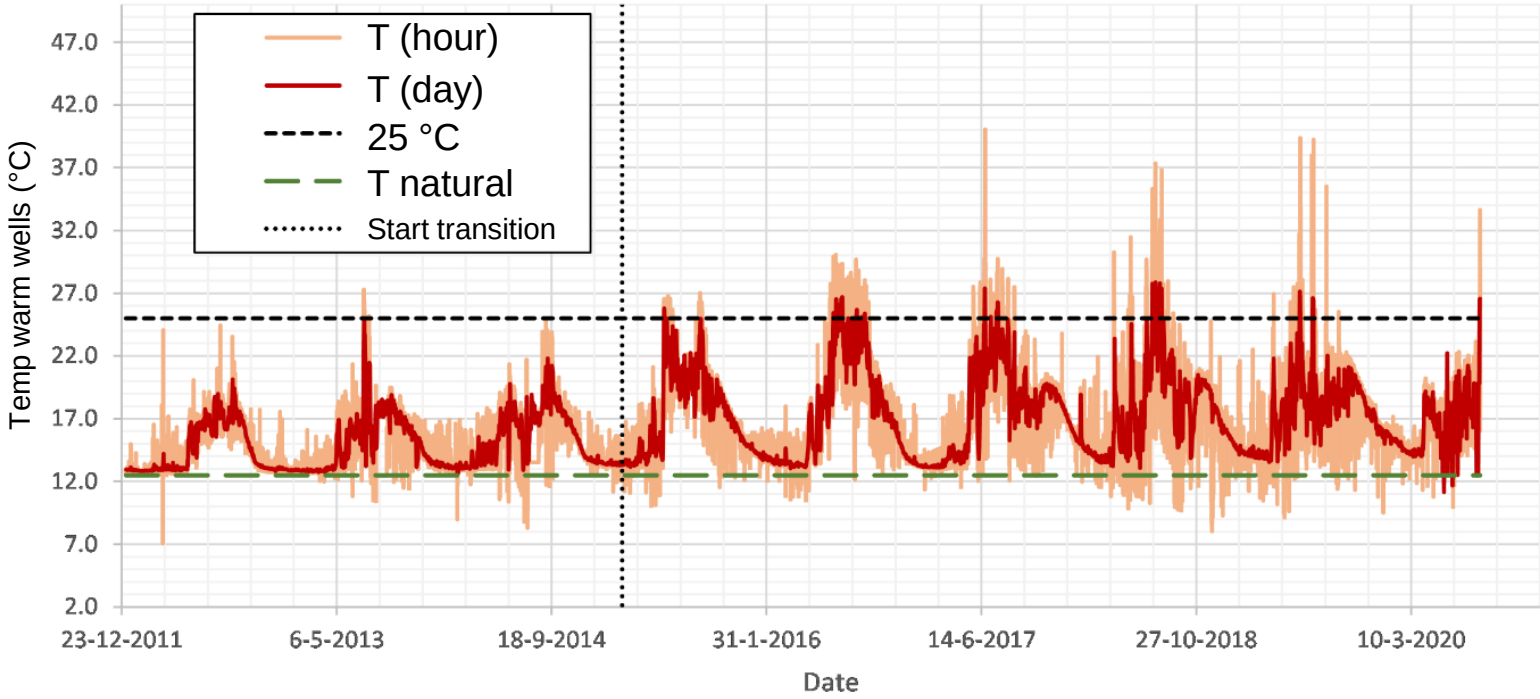
Increasing T_{in} & ΔT



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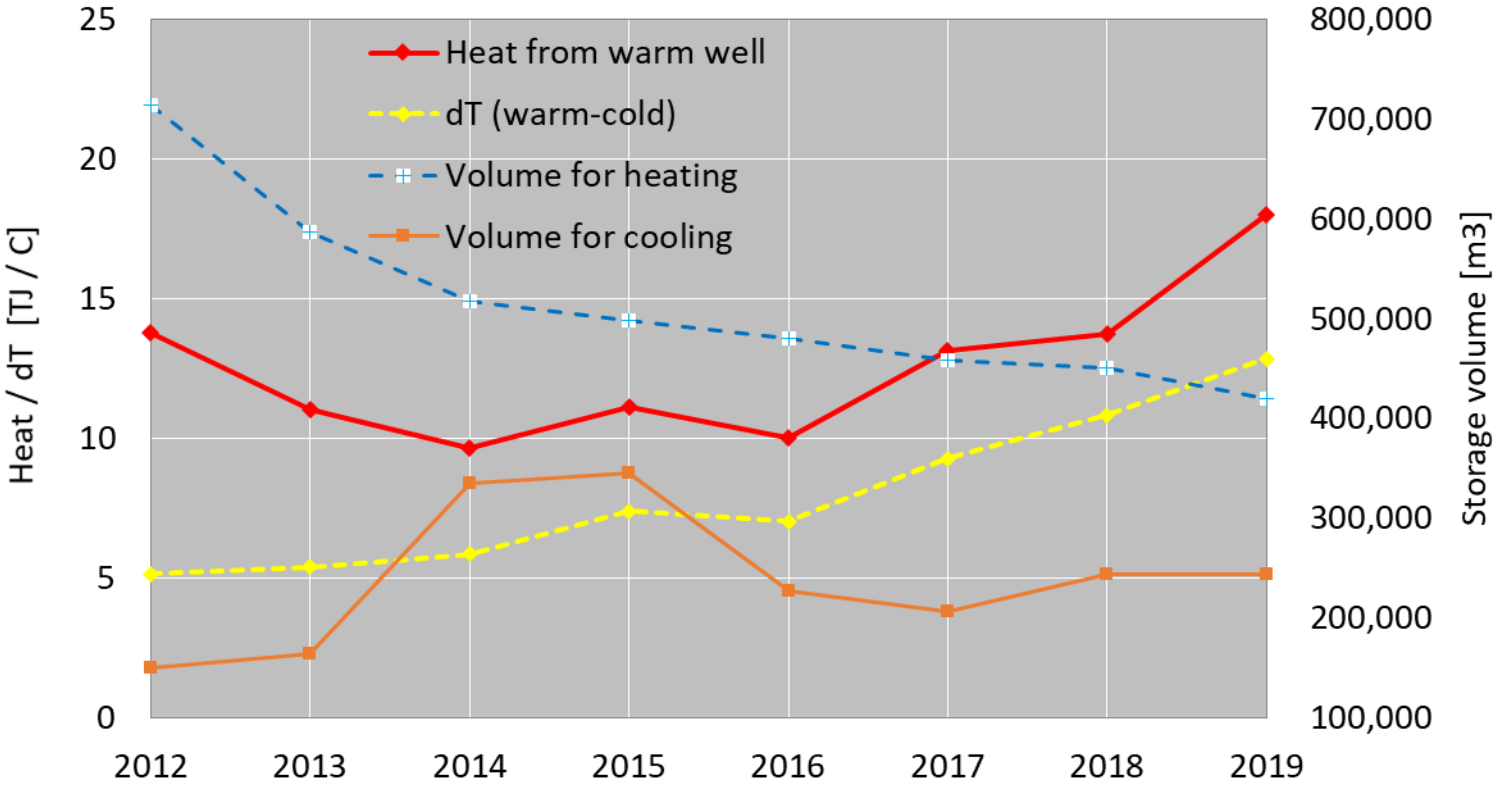
Increasing T_{in} & ΔT



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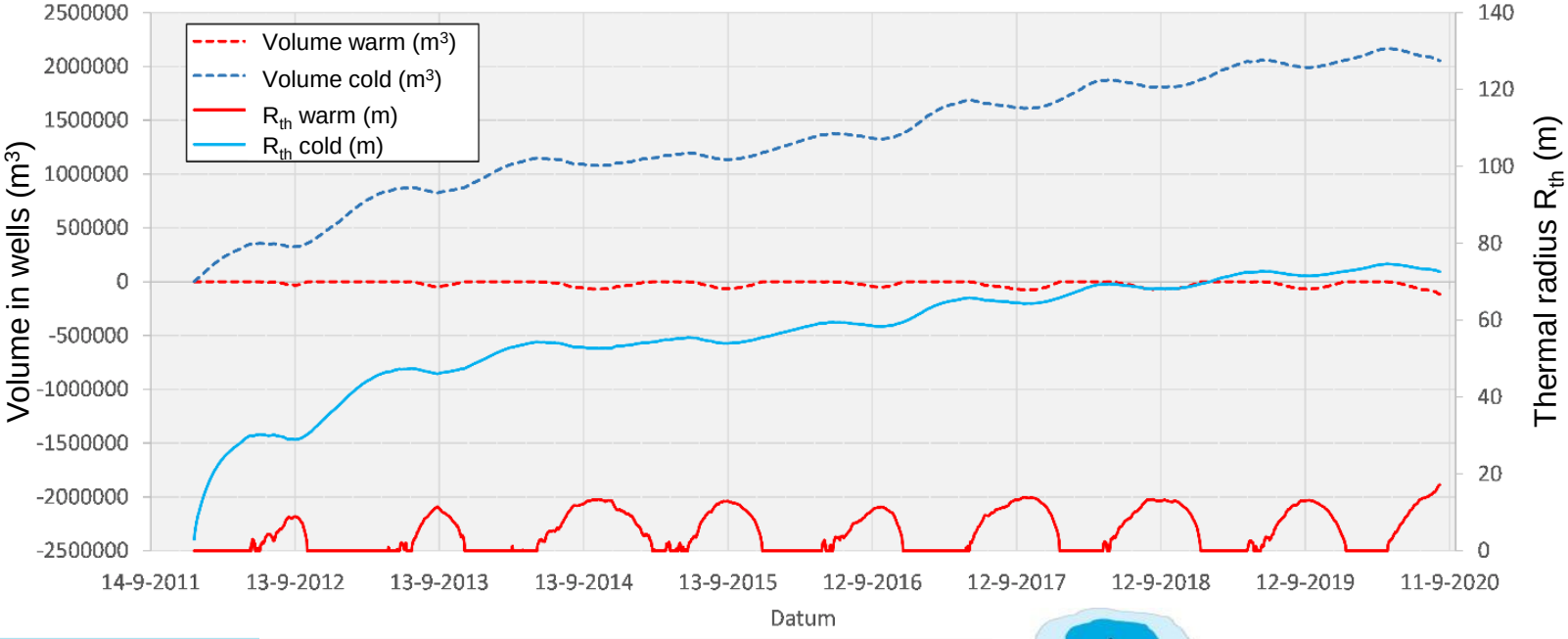
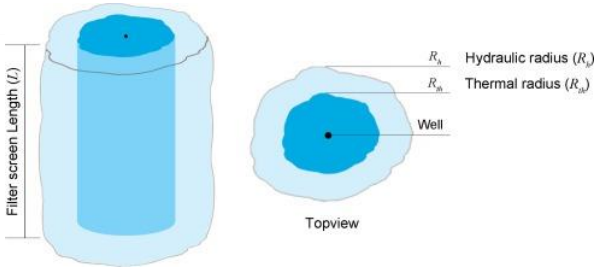
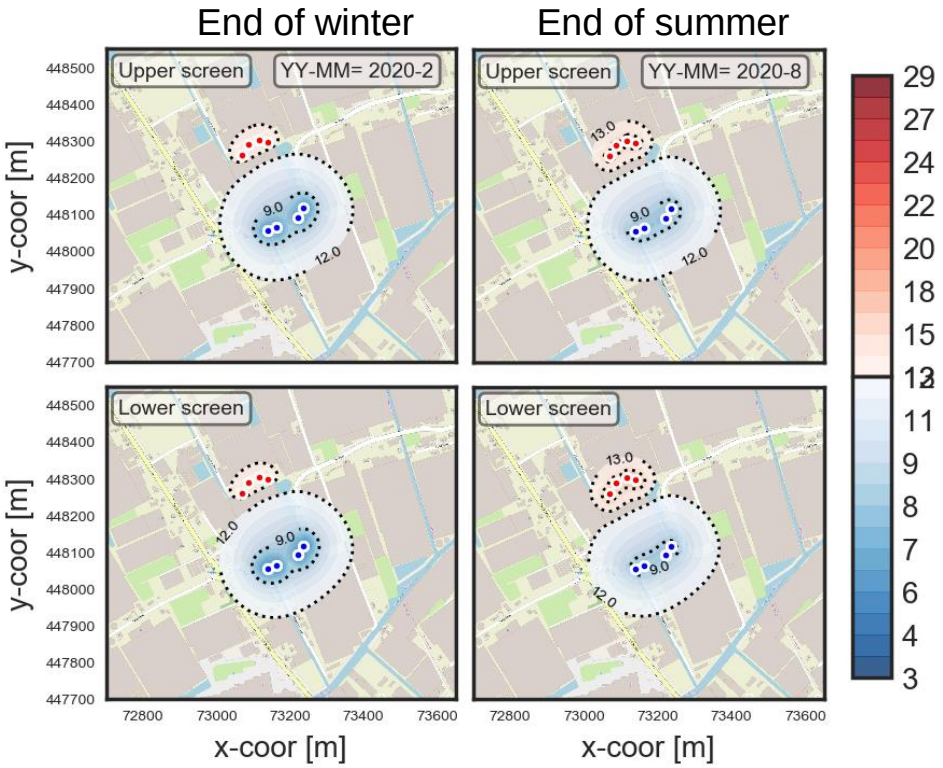
ATES system not in balance

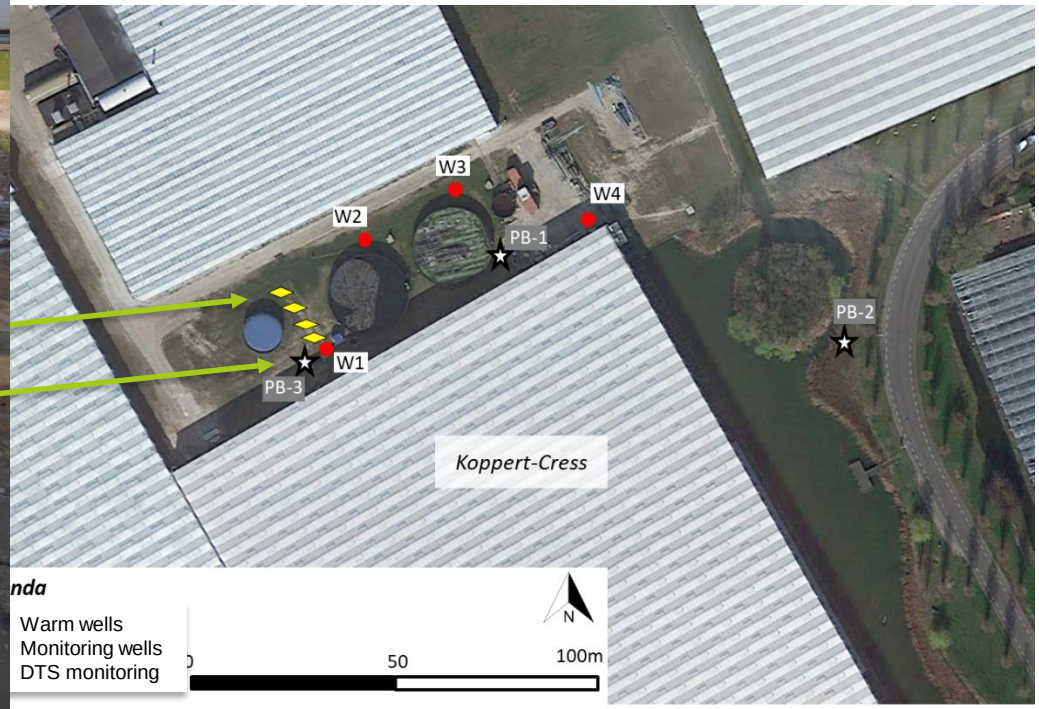




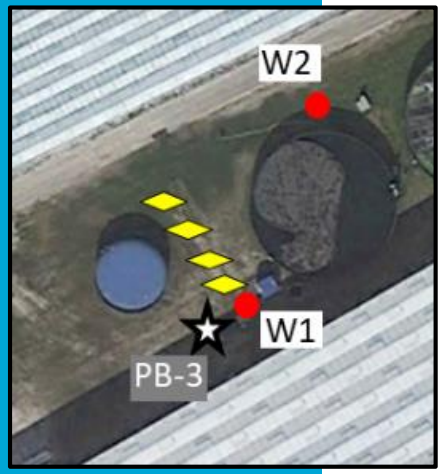
ATES system not in balance

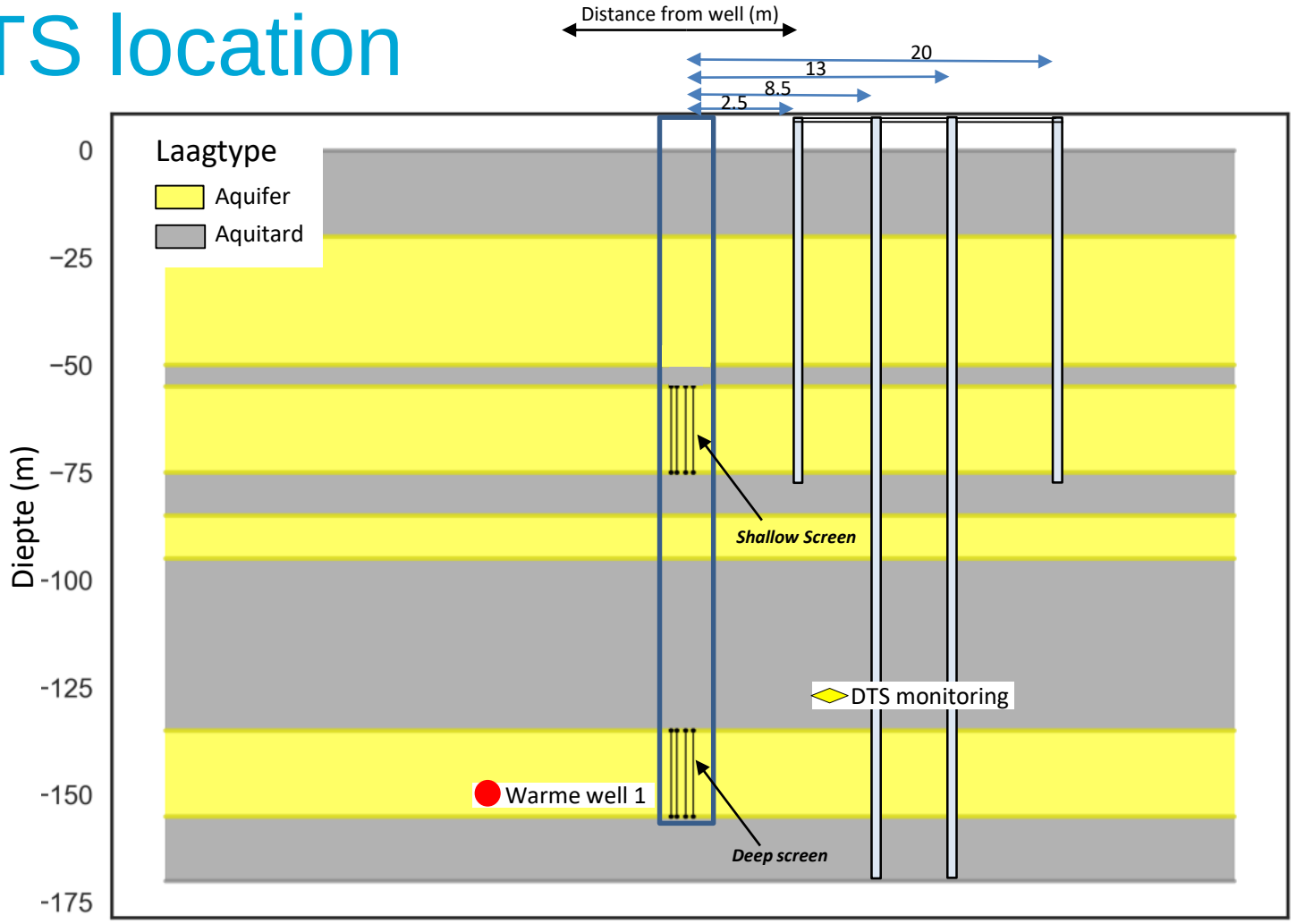


nitoring system



DTS location





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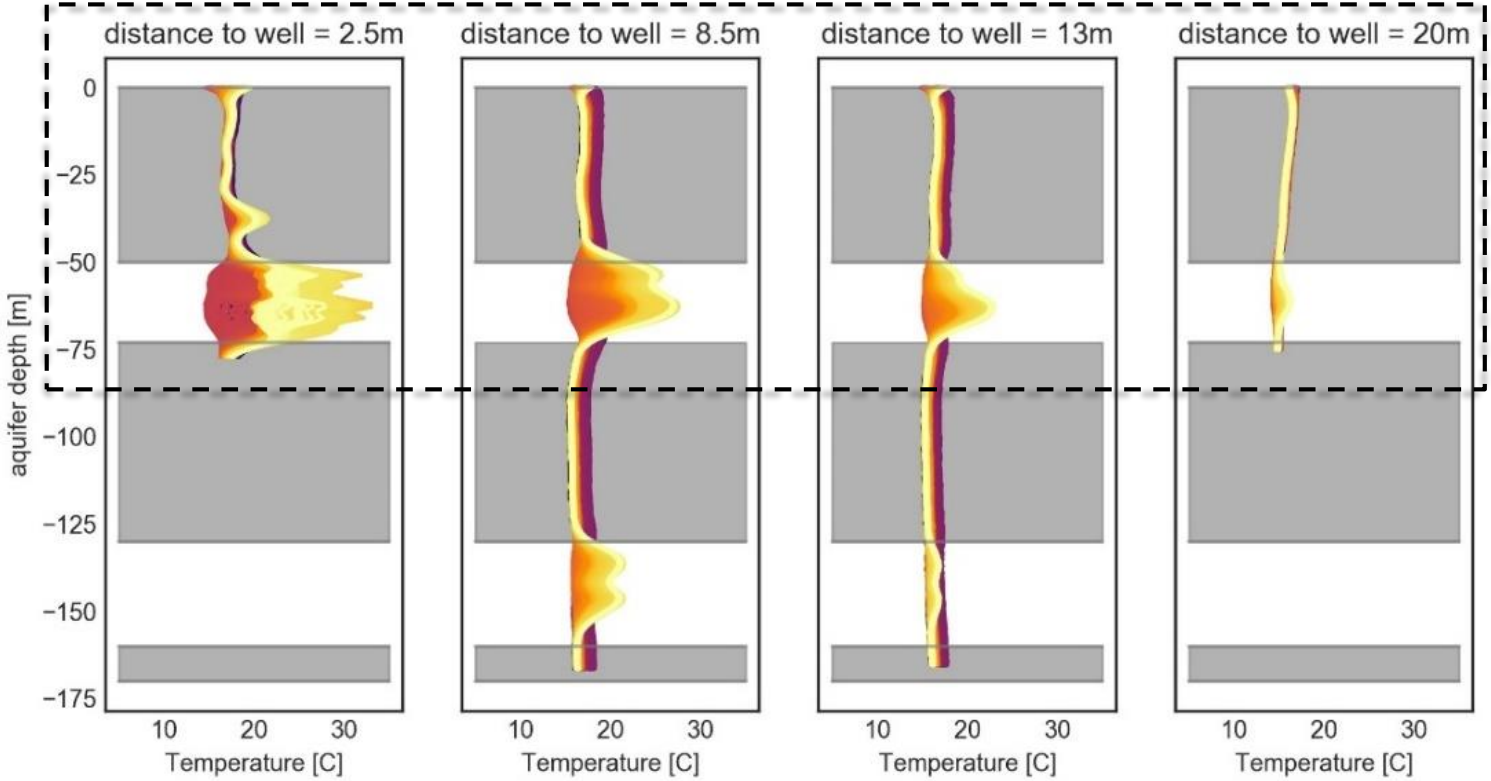
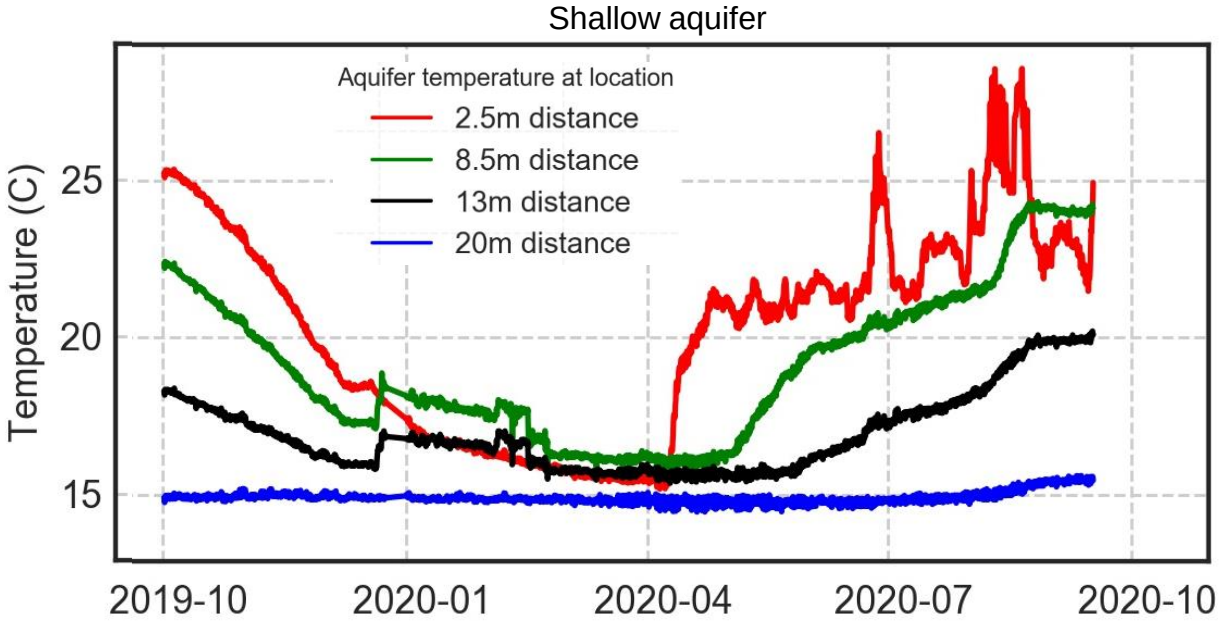
DTS monitoring



Summer 2020

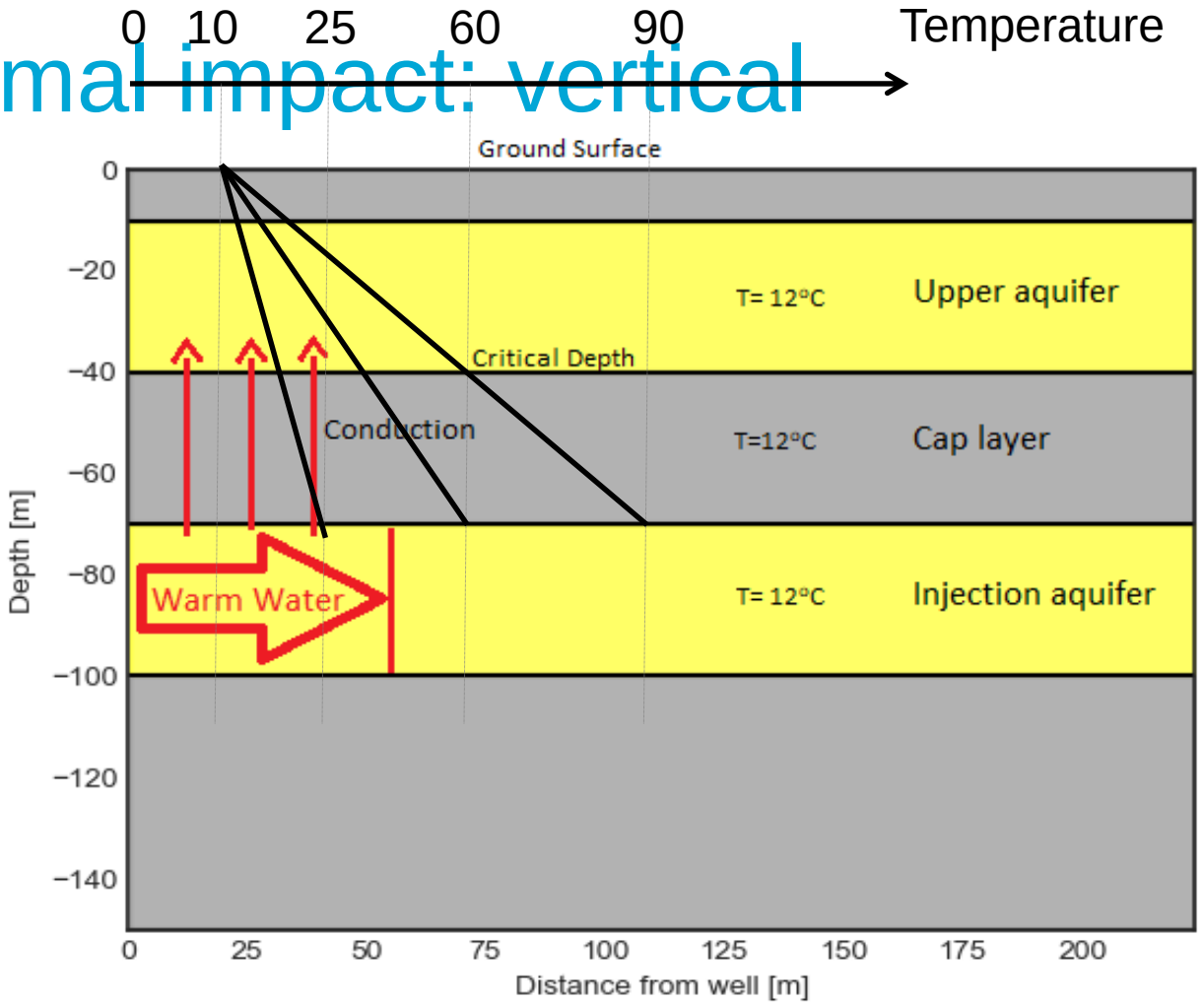
Thermal impact: horizontal



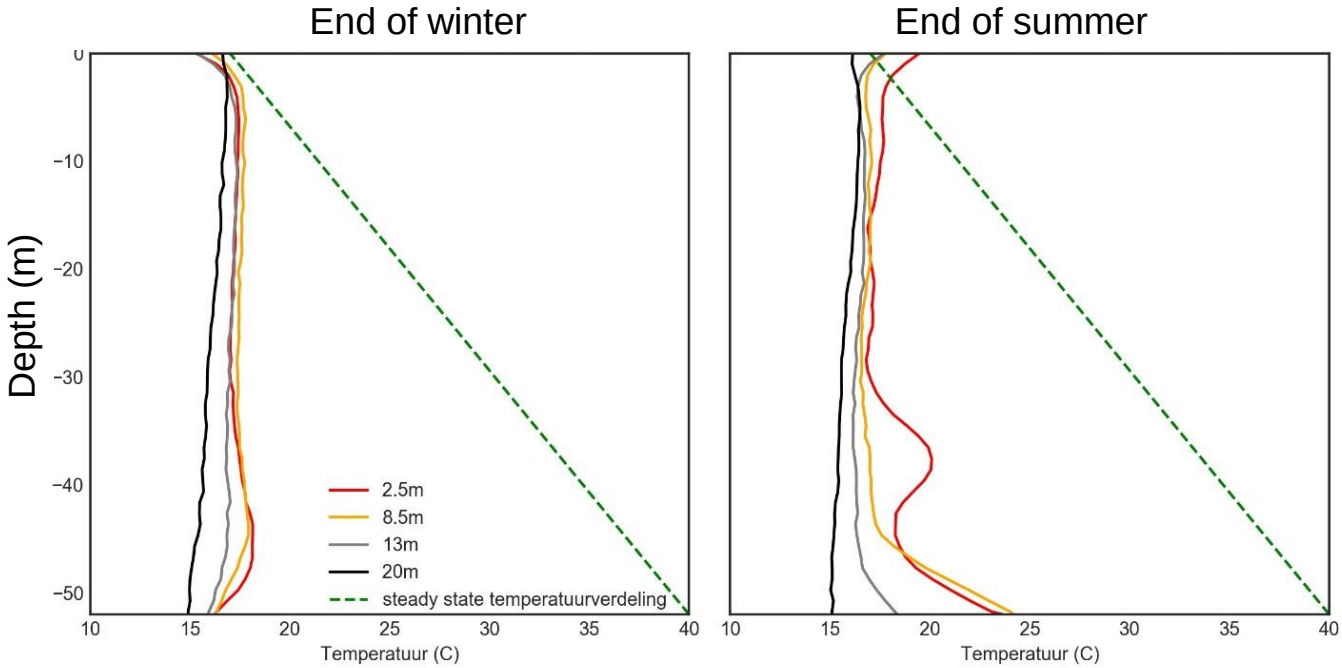
Long-term horizontal impact is small

Thermal impact: vertical

<u>Reference:</u>
Steady state conduction through clay layer



Thermal impact: vertical



Long-term vertical impact is small

Conclusions

- Inbalanced system can be efficiently compensated with external heat
- Thermal impact is small
  - All heat is extracted
  - <40C
- DTS Monitoring:
  - Suitable to measure temporal Temp differences

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What else did we investigate?

- Performance of heating/cooling system
  - 10% lower operational costs
  - 30-70% less GHG
- Groundwater monitoring
  - Chemical analysis
  - Micro-biological analysis

https://library.kwrwater.nl/publication/61755396/

Future research for this case-study

The transition is not done yet…

- Future: more heat available (geothermal energy)
- More heat in warm wells: balance
- Long-term heating of subsurface around warm wells
- Continue monitoring → to be continued!

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(HT-)ATES system of Koppert-Cress

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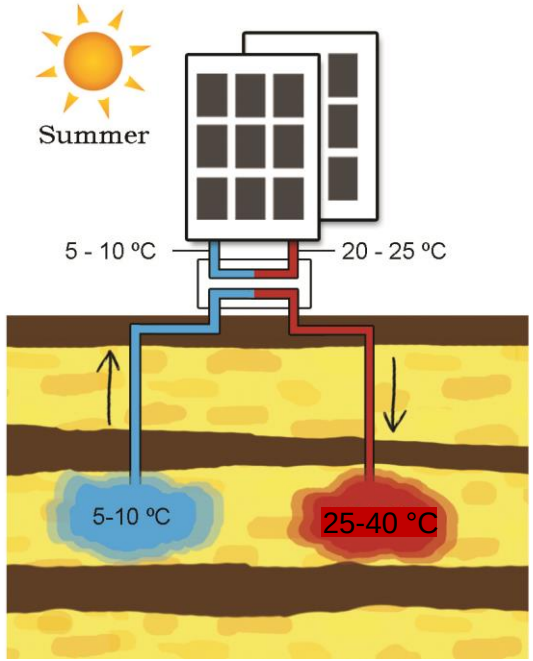


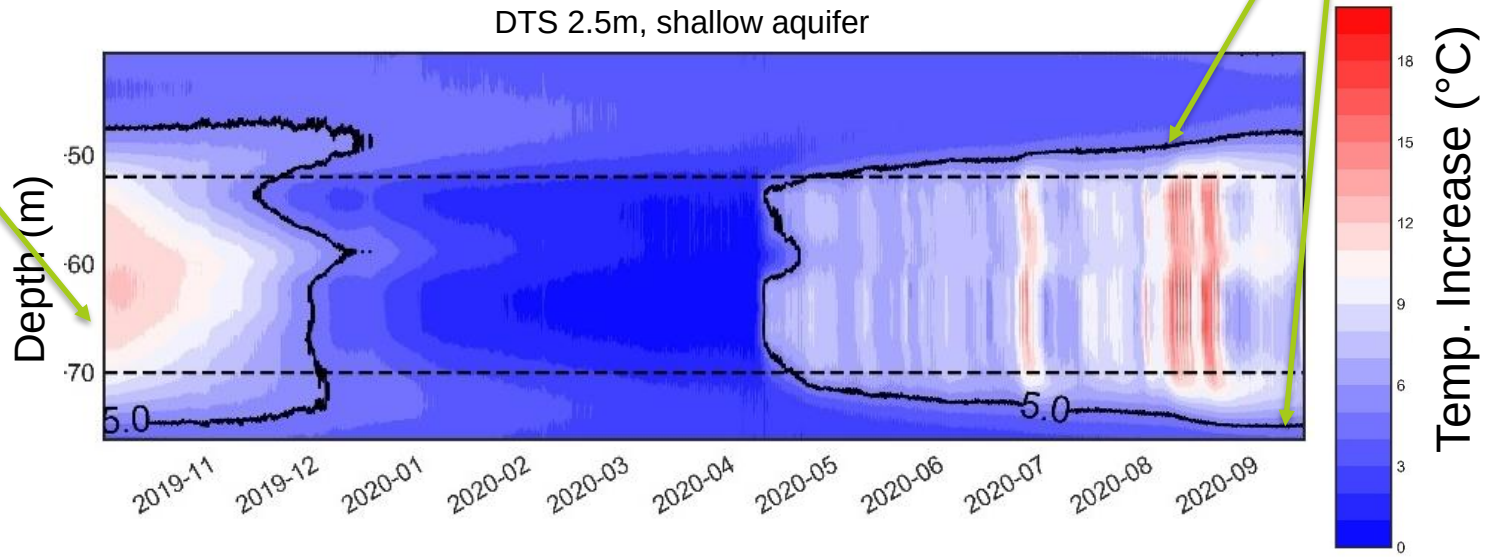
The content of this presentation: *Bloemendal, J.M.Beernink, S. Bel, N. van Hockin, A.E.Schout, G. (2020). Transitie open bodemenergiesysteem Koppert-Cress naar verhoogde opslagtemperatuur. Evaluatie van energiebesparingen en grondwatereffecten. KWR RAPPORT - KWR 2020.156*

Contributions from: Stijn Beernink & Niels Hartog

Thermal impact: vertical

aquifer

aquitards



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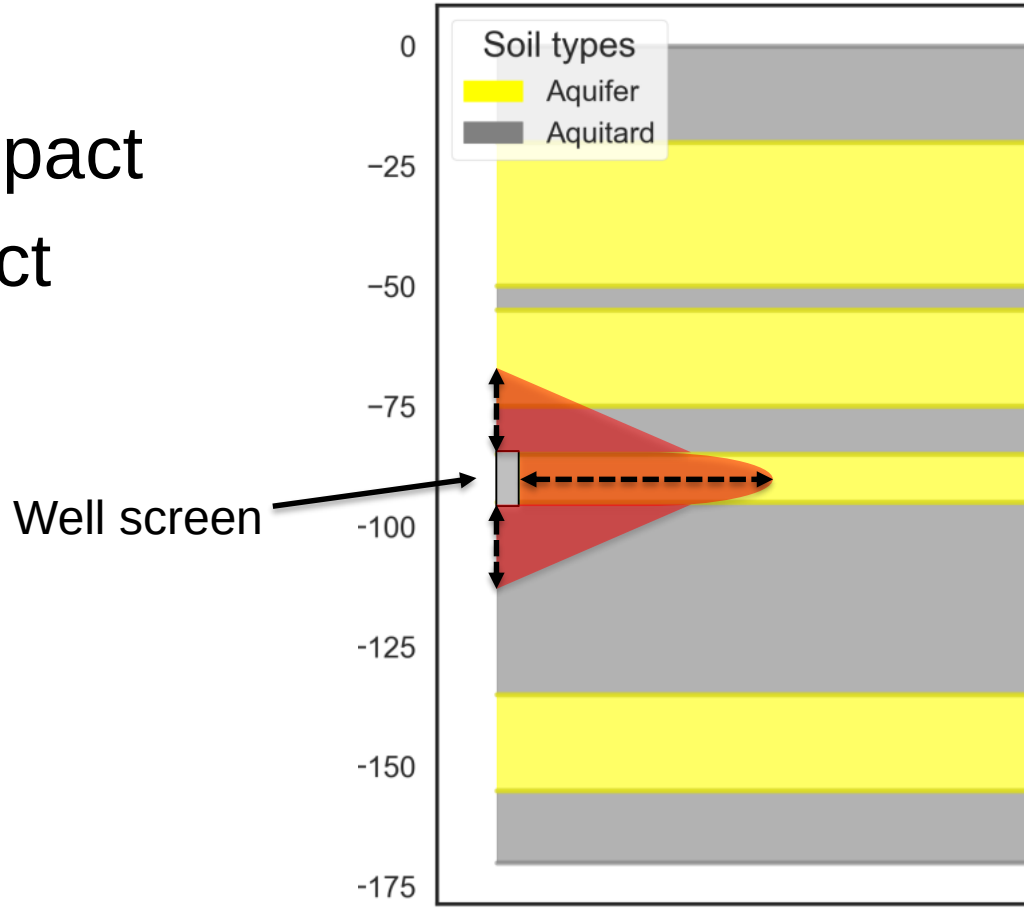
From temperature data to thermal impact

- Horizontal impact
- Vertical impact



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