

# UK Geogeneity Observatories – the value of field laboratories for shallow geothermal and underground thermal energy storage

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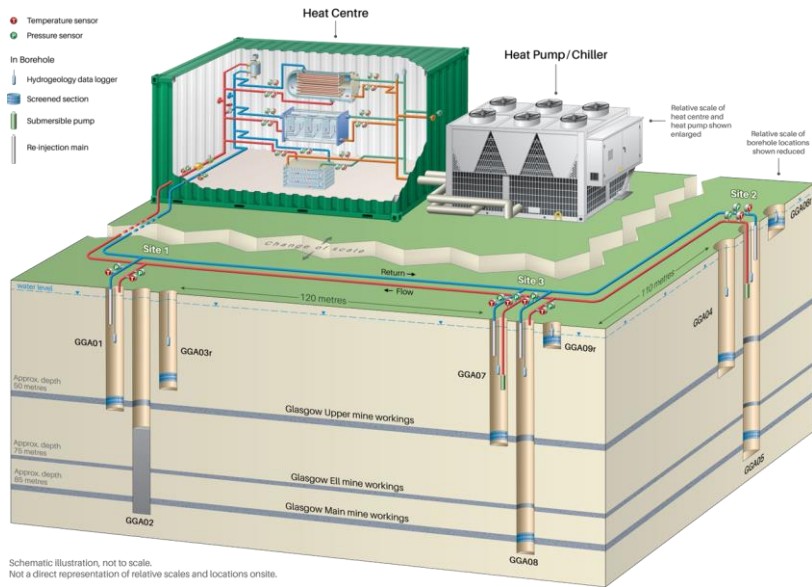


# UK GEOENERGY OBSERVATORIES

## Glasgow Observatory

Mine water geothermal/Mine thermal energy storage

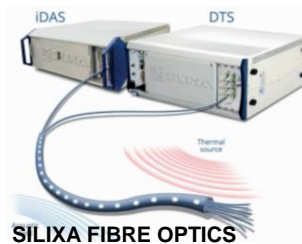
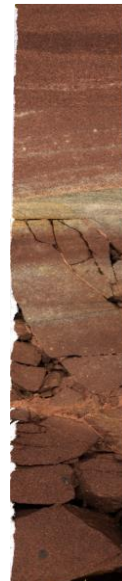
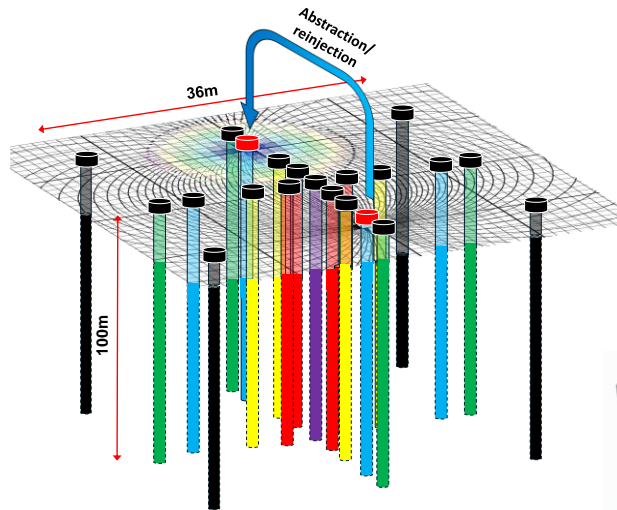
- At-scale, highly-instrumented research and innovation infrastructure for mine water thermal energy.
- Typical of many former coalfield communities: Industrial legacy and urban regeneration.
- Extensive open datasets for environmental monitoring associated with mine water energy (<https://www.ukgeos.ac.uk>)



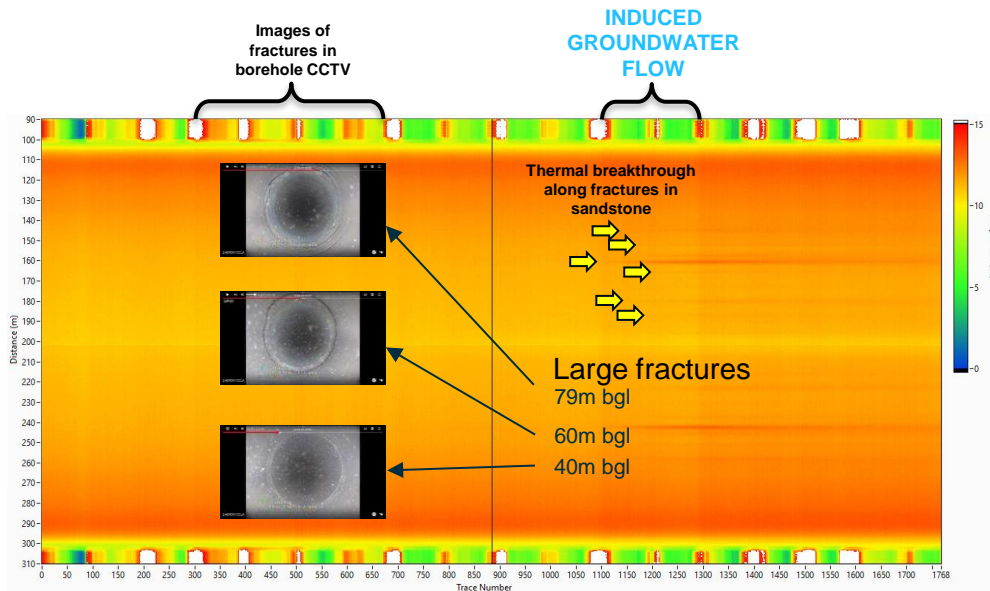
## Cheshire Observatory

Aquifer geothermal/Aquifer thermal energy storage

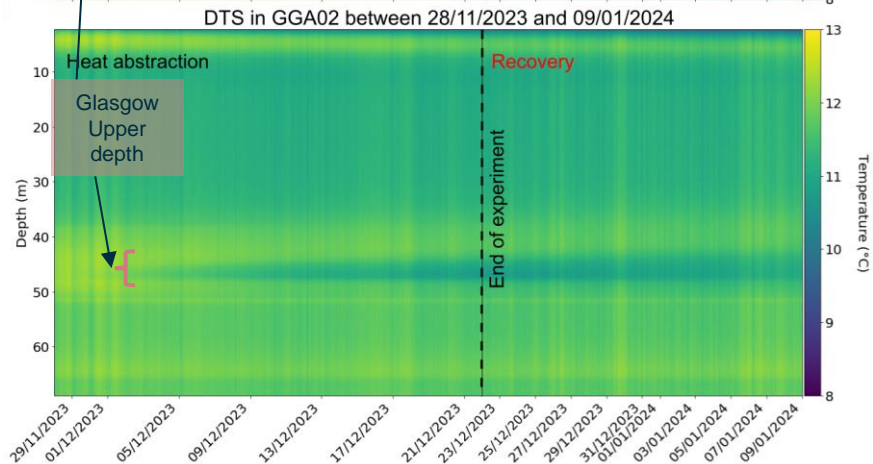
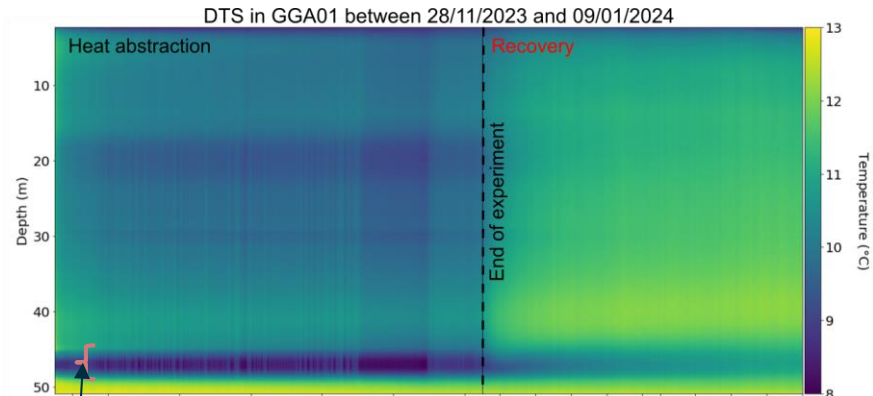
- Aquifer Geothermal – fluids are stored in pore space or fractures
- Sherwood Sandstone aquifer
- Bedrock at 0.5 – 2 m beneath made ground and asphalt
- 21 boreholes – highly instrumented
- Designed to understand thermal and fluid flow paths



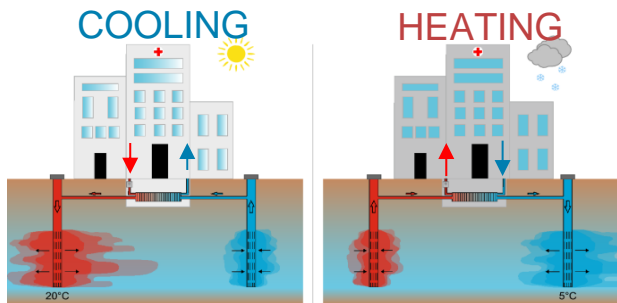
# Mapping of thermal plumes at UK Geogeneity Observatories



**Cheshire Observatory**



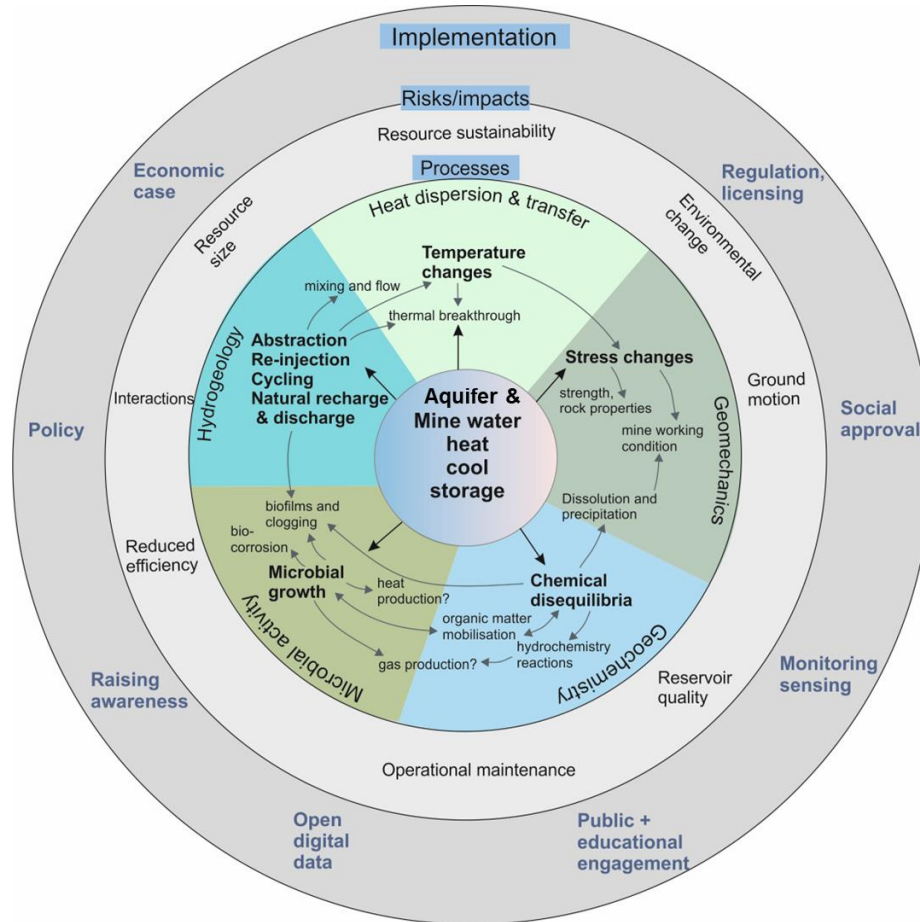
**Glasgow Observatory**



from: *Techno-economic and environmental analysis of an Aquifer Thermal Energy Storage (ATES) in Germany, Geothermal Energy volume 7, Article number: 11 (2019). Simon Schüppler, Paul Fleuchaus & Philipp Blum*



# WHAT AREAS CAN THE UK GEOENERGY OBSERVATORIES ADVANCE KNOWLEDGE



Characterisation of thermal resource

How to calculate size

How to calculate sustainability

Interactions between GSH/C & other infrastructure

Legacy mine workings

Wells, other GSH systems, buildings, tunnels, etc.

Operational GSH/C performance- scheme design

Optimise drill locations

Corrosion/changes in chemistry in infrastructure due to cycling

Operational GSH/C performance- geology

Effect of operating regime on thermal performance, system reliability and environmental effects

Information resources

Synthesis of learnings from Observatory construction

Decision support tools

Case studies for training

Heat flow modelling

Models & digital twins

Big data techniques

4D tracer migration tests

Effects of heating & cooling on aquifers and mines

Chemistry

Microbiology

Aquifer properties

In-situ monitoring of subsurface systems

Sensor development and testing

Optimised monitoring strategies

Understanding of baseline data