Florian Hahn (Fraunhofer), toas (delta h), Fiona Todd, Gus, Chris

* Toas: manager of a 15-people consultant and XXX company. Developed a software initially by University of Bochum (SPRING): groundwater flow and heat transport modelling. HEATSTORE PROJECT (data: water level, natural springs, old plans and mine documents, geological data), mining data (open voids, backfilled voids, carboniferous roof/floor, fault systems), flow rates (outflow, inflow), from regional to local scale, mining influence &dewatering (flooding level, water provinces connected [box model], overflows at different level 🡪 need to model regional scale to get boundary conditions = water levels at smaller scale). Big models have no flow boundaries.
  + Groundwater model Kreidebecken. MTES – groundwater areas are large areas discretised by finite element, large faults
  + Site model – local aquifer system for heat transport model. Refined geology (i.e. more layers, regional faults + mine system: 1D elements)
  + Stochastic fracture generation to get % fracture in rock volume and estimate hydraulic conductivity for each layer to parametrize heat transfer and flow model (faults = 1D fracture elements implemented as a pipe in 2D models; 1D or 1D elements in 3D models). Fracture elements located between fracture nodes (cubic low pipe flow) connected to FEM (Darcy law). Water flow in the mine used as boundary condition extracted from 3D model – HT propagation where fractures connected to mine workings.
  + First verify groundwater model (verification with location of springs)
  + Steady state temperature distribution
  + Heat transport model (transient simulation) of injection/production
* Fiona presented her work
* I presented my work
* Gus – GREAT cell: stress field around a sample, fibre optic strain measurements, thermo-hydro-mechanical fracture flow, relationship permeability vs strain.
* Jesus work presented by Chris – simulation heats storage and heat recovery in mine workings –> 50 % heat recovery. Put value on the hole – only needs 10 years to recover the value of coal extracted from the workings
* Chris present geobattery: Store waste heat from ACF (9MW heat at 20-25°C+ additional future 25-40°C heat power to dissipate) in Midlothian coalfield workings (roadway just below are accessible from Edinburgh). Use natural fluid flow toward Edinburgh to heat up the near surface area; increase efficiency of heat pump. Would permit increase sustainability of geothermal energy in the ground (as mining of heat for a single house - requires 20 000 m²).
* Main issue: 8 km south of Edinburgh and no direct grid connection. But heating grid in Edinburgh (gas)
* Discussion on Bochum. Solar thermal plant to inject. Longwall mining 65 m below ground.
* Influence of water flow on heat storage side of things . Injection does not show any correlation between injection and seismic events.9-days injection 600m3

Take-home:

* Mechanical model Fiona
* Torsten work heat modelling – bilston glen OGS integration
* Geobattery
* Florian-Gus cell