Workflow For Mapping Integrated Above- And Below-Ground Geothermal Favourability In Central Europe
REGIONAL GEOTHERMAL EXPLORATION

End-User Demand

Subsurface Resource

Constraints

Earliest possible integration of regional and sub-regional geospatial data sets
Across all components of the workflow
Regional Geothermal Exploration

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Subsurface Resource

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Subsurface Resource – A Hierarchy of Controls

- **Temperature**
- Faults and stress state
- Lithology
- Recharge
Subsurface Resource – Temperature

Crustal Architecture

Radiogenic Heat Production

Sedimentary Cover

Temperature at Depth
Subsurface Resource – Faults

- Faults provide pathways for fluids to carry heat (map shows major faults at scale 1:1M)
- Orientation with respect to $S_{H_{\text{max}}}$ (maximum horizontal stress) determines if the fault is open or closed to fluid flow.
Subsurface Resource – Lithology

- Different technologies are adapted to different lithologies
- Traditional doublets prefer high permeability rocks (fractures, karst, coarse clastic, ...)
- Enhanced Geothermal Systems (EGS) prefer frackable rocks (suitable Young’s Modulus, Poisson’s Ratio, $S_{H_{\text{max}}}$ orientation)
- Advanced Geothermal Systems (AGS) prefer low permeability rocks
Subsurface Resource – Recharge

Mean Annual Precipitation (mm)

Replacing what is lost to the atmosphere
REGIONAL GEOTHERMAL EXPLORATION

End-User Demand

Subsurface Resource

Constraints

Earliest possible integration of regional and sub-regional geospatial data sets
Across all components of the workflow
Demand – Favorability Mapping

- Start with diverse data (points, rasters, pictures, ...)
- Convert to rasters in sensible units
- Scale to favorability (0 to 1)
Example – Population Density
Example – Industrial Density
Example – Heating Demand
Example – Existing Power Generation
Example – Potential Green Power Generation
Earliest possible integration of regional and sub-regional geospatial data sets
Across all components of the workflow
Posing Questions – Where would I find...

• A densely populated city,
• with high industrial demand,
• where the summers are hot and the winters are cold,
• far from electric transmission lines and conventional power generation, and
• on top of a good geothermal resource?
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