Dataset to Geothermal Resources and ATES Potential of Mesozoic Reservoirs in the North German Basin

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1. Licence

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3. Data Description

This dataset provides point-shapefiles, related to the figures presented in (Frick et al., 2022a, 2022b). It covers most of northern Germany, with the boundaries defined by the extent of the North German Basin, which is part of the Central European Basin System. The files contain information on the depth (m.b.s. = meter below surface), thickness, temperature, heat in place and heat storage potential of selected geological units and the formations therein. These data are an addendum to the data presented in (Frick et al., 2022a, 2022b), resolving 5 geological units and 9 formations.

The data are presented as regularly spaced point-shapefiles, with a spacing of 1000 m. The data were produced as part of the Helmholtz Climate Initiative (HICAM), which focuses on Net Zero 2050 (mitigation) and Adapting to Extreme Events (adaptation). As part of this initiative, estimates of the heat in place and heat storage potential of the subsurface play an important part for mitigation of fossil fuel bound emissions as they pose a promising alternative (geothermal energy). The data presented here, therefore give an overview of areas which might be suited for geothermal applications in the different geothermal target units and formations. We integrated the recently published TUNB Model (BGR et al., 2021) as well as available borehole data, data from the Sandsteinfazies and GeoPoNDD projects (Franz et al., 2018, 2015) and temperature data from two models (Agemar et al., 2014; Frick et al., 2021) the process of which will be described in the following.Sampling method

3.1. Methods

For assessing which of the studied units are, in theory, suitable for geothermal applications, 15 wells were analysed for their respective sandstone fractions and the resulting 5 geological units (see Abstract) were analysed further. For the calculations done for this dataset, the geometrical data of the TUNB model (BGR et al., 2021) have been imported into the commercial 3D modelling software Petrel (©Schlumberger). From the geological information on the elevation of the bases of all resolved geological units we derived the thicknesses of all studied geological units where some simplifications were applied in regions where the geometry of the Permian Zechstein units leads to complex geological settings which were not focus of this study. We also derived the respective middle depth of each stratigraphic unit for extraction of the temperature later on. The depths derived were used to sample the subsurface temperature from 2 different temperature sources. The first on is the 3D transient thermohydraulic model of the Central European Basin System (Frick et al., 2021), the second one is the 3D interpolation temperature data from the geothermal information system of Germany, GeotIS (Agemar et al., 2014). These data were then imported into a GIS application (QGIS, qgis.org). Here, all further processing and calculations were carried out as described in (Frick et al., 2022a). We also supply the datasets for population density (CIESIN, 2019) and heat demand (Möller et al., 2020) which were used to clip the datasets for the parent publication.

3.2. Data processing

4. File description

The files provided are point-shapefiles which have 8 columns. These are labelled by name as follows: geotis = sampled temperature from GeotIS, cebs = sampled temperature of the CEBS model, mbs = meter below surface (of middle depth of unit), thick = thickness of unit (sandstone thickness, see Frick et al., 2022a), hip_cebs = calculated heat in place using the CEBS model as input temperature data, hip_geotis = calculated heat in place using the GeotIS dataset as input temperature data, hps_cebs = calculated heat storage potential using the CEBS model as input temperature data,

hsp_geotis = calculated heat in place using the GeotIS dataset as input temperature data. As is common practice, the shape files are provided as an assembly of 6 files with the endings cpg, dbf, prj, qmd, shp and shx. The coordinate reference system (also provided in the prj files) for all files is WGS84 UTM Zone 32N. The datasets for the heating demand and the population density have the file format geotiff, a common georeferenced image format which can be opened with any GIS application.

5. References

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