

The “BGR-GISGeochemDB“ – An evolving geographical database on the geochemistry of shales, natural gases and petroleum in Germany

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Abstract

Data on the distribution and geochemistry of black shales and coals and potentially expelled petroleum and natural gas is crucial for an understanding of (i) the extent of former basins, (ii) the depositional history of individual shales, as well as (iii) active and past petroleum systems. Respective data sets on the rocks should include information on the current depth, the abundances of total organic matter, the maturity (e.g. from vitrinite reflectance or Rock-Eval T_{max}), and for rocks, petroleum and natural gases hydrocarbon compositions and stable carbon and hydrogen isotope signatures. As a result of projects that were realized within the last 40 years, BGR administrates a large GIS-Database of geochemical data including >4.000 shale, >1.200 petroleum, and >700 natural gas samples from Germany (for well samples usually connected with the 12 digit NIBIS-Well Identifier). The database also contains published and unpublished georeferenced reconstructions on the distribution of shales in Germany, salt structures, as well as operated and abandoned petroleum and natural gas fields.

Several projects relied on the geochemical data from the BGR-GISGeochemDB and selected examples are presented here. For instance, at a natural petroleum seep south-east of Hannover it was possible to correlate the oil with spatially related petroleum occurrences from the locally oil-mature Posidonia shale. However, geochemical characteristics argued against a direct spill from regional oil fields. The Posidonia shale was also confirmed as source in another setting; an unexpected petroleum finding in a stratigraphic well, drilled by BGR in 2016 close to Hoheneggelsen. A final example is the finding of specific oil-associated gases in selected petroleum fields of the Lower Saxony Basin. Here, geochemical characteristics ($\delta^{13}C$ of methane to propane) and the localities of the fields clearly point to “coal-gases” as source of the natural gases. This finding also indicates a continuous charge of these Carboniferous gases, replenishing the pressure in respective reservoirs (Gerling et al., 2016). In addition to comparable future research studies, we consider the dataset also powerful for a better understanding of natural and potentially man-made leakages of petroleum and natural gas.

Access to BGR-GISGeochemDB is restricted to BGR for internal projects, because most data are confidential. However, information on the current owners of the samples/data is integrated to allow contacting them in cases of collaborations or data queries for scientific projects.